THE PAPUA NEW GUINEA
UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT 2022

COMPILED AND EDITED BY
PROFESSOR GARIBA DANBARO

APRIL 2023

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FOREWORD

Unitech continues to advance its capacity in the research portfolio. Unitech prides itself in growing world class technocrats for the real world. The real world for Unitech is PNG. Unitech must therefore ensure that it, not only provides the training but also facilitates programs to entice the mind of graduates, young academics and students to be critical thinkers, be curious, must inquire and be innovative in ensuring that the research questions are answered, and solutions provided. The challenge for Unitech is to ensure that science and technology is transferred to impact the livelihoods of Papua New Guineas to higher standards. ***Higher standards of education must translate to higher standards of living of our people.*** This is achievable through knowledge generation and ardent application of innovation beneficial to the PNG society, from the rural to the urban areas.

The potential for research and the need to address a lot of PNG's scientific and technological challenges is huge in PNG. PNG has an abundance of natural resources that its own citizens must be knowledgeable about. Our mountains, rivers, oceans, land, forests vegetables and plants, biodiversity, animals, minerals, oil and gas, our environment and much more, are what the government calls our strategic assets and Papua New Guineans must strive to know facts about these assets and add value through active research and application of innovation. PNG's infrastructure demands advanced engineering, architecture and construction skills to develop. Given the economic and environmental scenarios facing PNG, researchers are challenged to provide solutions for positive business and society results. In addition, downstream processing of our natural products and the research required for value adding is also important. These and many more are areas of research that academic staff and students must excel and build up the knowledge bank of science and technology here at Unitech.

Unitech also celebrates the current growth in the research culture. Not only is new knowledge generated but students are awarded Masters and PhD degrees in respective faculties. Unitech prides itself in home grown academics. So far, many of our young academics are nationals who are graduates of Unitech. Our academic staff are also publishing research-based papers in indexed and local journals and are scoring the points required for promotion. Some academic staff have been able to develop a great attitude towards research topping it up with prolific thinking and writing skills. These staff are acquiring the points and are being promoted to Senior Lecturer, Associate Professor and Professor positions. The academic capacity building is healthy for Unitech as we strive to match international standards and establish opportunities for mobility and employability.

To this end, I congratulate staff and students who conducted research and published papers as a result. Students who have participated in postgraduate research with published papers forming part of your thesis are also honored for your contribution. Unitech will again budget K1million for research in 2023 and staff and students are encouraged to apply for research funding. The management is fully aware that there are some advanced and sophisticated equipment on campus in some Departments that can be used to conduct high quality research. Please make use of these equipment. Other Departments may not have equipment to conduct research to PNGs benefit and the Management welcomes dialogue with researchers to develop strategies targeted towards attracting collaboration with industry or partner universities so that the research culture flourishes to the benefit of Unitech and the people of PNG.

Professor Dr Ora Renagi, OL
Vice Chancellor

STATEMENT FROM THE CHAIRMAN

POSTGRADUATE STUDIES, RESEARCH AND INNOVATION COMMITTEE (PSR&IC)

It is my pleasure to present to you the 2022 research report of the University of Technology (Unitech). The University is committed to excellence in research that leads to finding solutions to local, regional and global issues. The PSR&IC broadly coordinates the research, innovation, publications, and postgraduate training agenda of the University in conformity with its Strategic Plan, 2020-2024. The research and innovation mandate of the University allows staff and students to partner with businesses, government and communities to find solutions to developmental challenges in the country and the region. Postgraduate training and research work together at the university to produce win-win situations: postgraduate students hone their research skills and deepen their knowledge in their area of interest while staff, working as supervisors, also enhance their research interests. Such research outcomes have positive impact on the livelihoods of people.

This report contains research, innovation and other scholarly works which were published in 2022 by staff and students of the various academic Departments, Research Institutes and Research Centers of the university. These include 69 papers published in peer-reviewed journals; 62 presentations at various seminars, conferences, and workshops; 11 other types of reports and 5 patents. It is worth mentioning that, unlike the previous years, the Mechanical Engineering Department outperformed other Departments by publishing 20 peer-reviewed papers in reputable journals and obtaining all 5 patents recorded. I wish to congratulate all the staff students in the various Departments, Centers, and Institutions for these achievements.

In 2022 a total of 50 students successfully completed their studies and obtained various postgraduate qualifications including 1 PhD, 11 MPhil, 11 MSc, 1 MEng, 5 MTech, 1 MCS, 3 MBA, 3 EMBA and 14 PGCSCT. This is an important achievement for postgraduate training at the University. Funding support for research is provided by the University and external partners. The University provides research funds in the form of the Graduate Assistantship Program (GAP) to support the best postgraduate students. In 2022, eighteen postgraduate students (10 male and 8 females) were on this GAP scholarships. The University also provides funds to support research by staff and students and for staff to attend conferences, seminars, workshops both abroad and within the country. In 2022 a total of K850,000 was allocated by the University for this purpose out of which K532,647.61 was disbursed by the Postgraduate Studies, Research and Innovation Committee (PSR&IC) to various staff and students.

The Academic Board approved the establishment of a peer-reviewed journal titled *The Interdisciplinary Journal of the Papua New Guinea University of Technology*. The interim board of this journal was formed, and the first issue of the journal is expected to be published in 2023. In addition to this the University has three existing journals published by different academic Departments, namely *Niugini Agrisaens* published by the Department of Agriculture; the *Melanesian Journal of Geomatics and Land Studies* (available at https://mjgps.org/); and *Journal of Communication and Development Studies* published by the Department of Communication and Development Studies. It is hoped that these in-house journals will encourage all staff and especially the early career academics to publish their works.

Innovations subcommittee of the PSR&IC also advertised an innovation challenge for staff and their students in 2022.
The in-house weekly seminar series organized by the PSR&IC picked up strongly in 2022 after being down in the previous two years due to Covid19. The Seminar series recorded 13 presentations by academics from within PNG and abroad in 2022.

Special thanks are due the Vice Chancellor Professor Ora Renagi and his senior management team for setting the direction and resourcing the Postgraduate School and the PSR&IC; the Pro-VC Academic Professor S Akanda who directly oversees the work of Postgraduate School and the PSR&IC; the Heads and staff of the various Departments who produced the research output, postgraduate training and publications; other sections of the University who enabled all the work done and finally staff of the Postgraduate School for handling all the administrative work.

Professor Gariba Danbaro
Dean of Postgraduate School

Postgraduate Studies, Research and Innovation Committee (PSR&IC)

Responsibilities: The responsibilities of the PSR&IC encompass postgraduate studies, research, and publications. Specific responsibilities of the committee are:

1. To formulate or review the postgraduate admission policy of PNGUoT at least once every three years.
2. To vet appointments of supervisors and thesis examiners of each postgraduate student.
3. To consider and approve examination arrangements of each postgraduate program and the results for each student.
4. To organize an annual postgraduate students' research presentation.
5. To ensure compliance of postgraduate programs with the PNG National Qualifications Framework (NQF).
6. To recommend to the Academic Board names of students who are eligible to graduate with postgraduate qualifications.
7. To formulate or review the research polices of the University at least once every three years.
8. To consider and approve or reject applications for research funding.
9. To consider and approve or reject applications for conference funding.
10. To edit and publish the University's Annual Research Report
11. To consider and approve the objectives of all academic publications produced under the auspices of the university for dissemination beyond the university.
12. To consider and approve the terms of reference of the editorial board for each academic publication of the university.
13. To call for and receive reports from each editorial board for academic publications of the university.
14. To consider and recommend to the Vice Chancellor's Committee for approval an annual maximum amount of funding for each editorial board.

Constitution of the PSR&IC

Membership of the PSR&IC will consist of the following:

Ex Officio Members:
1. Vice Chancellor
2. Deputy Vice Chancellor
3. Pro Vice Chancellor (Academic)
4. Pro Vice Chancellor (Administration)
5. Dean of Postgraduate School
6. Dean of Engineering
7. Chairman, Academic Ethics and Integrity Committee

Appointed Members:
1. One person appointed by the Vice Chancellor who will be Chairperson
2. Two Heads of Department
3. Two Professors
4. One academic staff with a strong background in research from each of the Natural

Sciences, Natural Resources, Engineering, Business Studies and Environment groups.
5. A postgraduate student elected by the postgraduate students.

Membership: Members of the PSR&IC for the period January 1, 2021 to December 31, 2022:

Ex Officio Members:
1. A/Prof Ora Renagi – Vice Chancellor
2. A/Prof Garry Sali – Deputy Vice Chancellor
3. Professor Shamsul Akanda –Pro Vice Chancellor (Academic)
4. Professor Kaul Gena – Pro Vice Chancellor (Administration)
5. Professor Macquin Maino – A/Dean of Postgraduate School
6. Dr Gabriel Arpa – Dean of Engineering
7. Professor Tom Okpul - Chairman, Academic Ethics and Integrity Committee

Memberships:
1. Professor Macquin Maino – Chair
2. Professor Cletus Gonduan
3. Professor Jacob Babarinde
4. Dr Mirzi Betasolo
5. Mr Mathew Kuusa
6. Dr Patrick Michael
7. Dr Dapsy Olatona
8. Dr Wilson Kobal
9. Dr. Rachel Aisoli- Orake
10. PG Student representative…

Executive Officer: Ms Pamela Dubaba , A/Senior Assistant Registrar (Academic)

Executive Summary

The University of Technology is committed to excellence in research as enshrined in its establishment Act.

Both staff and students continued to work collaboratively on carefully selected and impactful research projects in 2022. By doing so, the students refine their research skills, deepen their knowledge in their chosen area of study and receive higher degrees. This improves the chances of our students to succeed in their future careers after graduating. In 2022, the University's research activities resulted in the publication of 69 papers in peer-reviewed journals; 62 presentations at various seminars, conferences, and workshops; 11 other types of reports and 5 patents. This is probably the highest number of patents obtained in a one-year period by the University.

The total number of students studying for various postgraduate degrees was 144 including 88 new students (22 females, 66 males) and 56 continuing students (38 male, 18 female). The new intakes include two foreign students from Nigeria who were awarded the prestigious Commonwealth Scholarship to study for a master's degree in agriculture at the University.

A total of 50 students graduated with various postgraduate qualifications including 1 PhD, 11 MPhil, 11 MSc, 1 MEng, 5 MTech, 1 MCS, 3 MBA, 3 EMBA and 14 PGCSCT. The University continued it support in the forms of the Graduate Assistantship Program (GAP) for 18 postgraduate students (10 male and 8 females). The University also provided a total of K850,000 for staff and student research, and conference attendance out of which K532,647.61 was disbursed by the PSR&IC. to various staff and students.

The interim board of *The Interdisciplinary Journal of the Papua New Guinea University of Technology* met, and the first issue of the journal is expected to be published in 2023. In addition to this the University continued publishing three existing journals of different academic Departments. It is hoped that these in-house journals will continue to encourage all staff, especially the early career academics to publish their works. The Innovations subcommittee of the PSR&IC also advertised an innovation challenge for staff and students in 2022 to submit innovative concepts for consideration and support by the PSR&IC. Also, the weekly seminar series organized by the PSR&IC recorded 13 presentations in 2022 by academics from within PNG and abroad.

Acknowledgements:

1. Vice Chancellor A/Prof Ora Renagi and his senior management team for setting the direction and resourcing the postgraduate school and the PSR&IC.
2. Pro-VC Academic, Professor S Akanda who directly oversees the work of Postgraduate School and the PSR&IC;
3. Heads and staff of the various Departments who produced the research output, postgraduate training and publications;
4. Other sections of the University who enabled all the work done and finally,
5. Staff of the Postgraduate School for handling all the administrative work.

Professor Gariba Danbaro
Dean of Postgraduate School

SUMMARY OF RESEARCH OUTPUT 2022

Name of Department / Institute / Centre	Journal articles	Conference papers & Seminars	Book / Book chapters	Reports / Other publications	Patents	PG students graduated		
						Certificate	Masters	PhD
Agriculture	9	9					5	
Applied Physics	6						8	1
Applied Sciences	2	1	1					
Architecture & Construction Management								
Business Studies	9	8	16	9			6	
Civil Engineering	1	4					7	
Communication & Development Studies	2		1	2		14	1	
Electrical & Communication Engineering	8	3	5				4	
Forestry	2	8					2	
Mathematics and Computer Science	5	10					1	
Mechanical Engineering	20	9	6		5			
Mining Engineering		5						
Surveying & Land Studies	5	5	3				1	
ATCDI								
SPISARD								
SERI								
ERMC								
UBC								
TLMU								
Total	69	62	32	11	5	14	35	1

Departmental Research Reports

DEPARTMENT OF AGRICULTURE

Head of Department: Professor Macquin Maino

Introduction

The Department of Agriculture is one of the 13 Academic Departments in Papua New Guinea University of Technology. Department offers undergraduate and postgraduate degree programs in Agriculture, conducts agricultural research, and disseminates new insights to the community. At undergraduate level, a four year study program- the Bachelor of Science in Agriculture [B.Sc.(Ag)] and a hybrid model Open, and Distance mode taught Bachelor of Agriculture and Rural Development (B.Ag.&R.D) are on offer. Three postgraduate degree programs- Master of Science in Agriculture (MScAg), Master of Philosophy (MPhil), and Doctor of Philosophy (PhD) are also offered by the Department. The MSc in Agriculture 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 2 with Masters and 2 MPhils). In 2022, five students graduated with postgraduate degrees (2 with MPhil and 3 with MSc). The Department of Agriculture is committed in delivering quality teaching, research, outreach activities and post-graduate studies. Department's activities are well guided by the Department's Five-Year Strategic Development Plans (2005 – 2010, 2011 – 2015, 2016-2020, and 2021-2024). Now with the University's Strategic Plan 2020-24, an implementation plan has been prepared to carry forward research activities. 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 PNGUoT. Strong collaborative research exist with PNG National Agricultural Research Institute (NARI), University of South Pacific (USP) in Fiji, Charles Sturt University (CSU) in Australia, National Research Institute (NRI) of Greenwich University (U.K.), South Australian Research and Development Institute (SARDI) in Australia, University of Canberra in 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, the Unitech Biotechnology Centre (UBC) was amalgamated with the Department of Agriculture for 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 agar wood 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

- Economic efficiency of small-scale rice farming
- Technical efficiency of smallholder coffee farming
- Resource use efficiency among small-scale peanut farmers.

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

RESEARCH INTERESTS OF ACADEMIC STAFF MEMBERS

No	Academic staff	Areas of research interest
1	Professor Macquin Maino	Plant pathology, Nematology, Biocontrol agents, Plant physiology
2	Associate Professor Rajashekhar Rao B.K.	Soil Science, Soil quality, Soil fertility, Soil pollution, Agricultural Chemistry
3	Mr Nick Kewa	Agricultural economics, climate change and supply chain management
4	Professor Gariba Danbaro	Animal breeding, Animal management systems, Research methods
5	Professor Tom Okpul	Plant breeding and genetics, Tissue culture, Biotechnology
6	Associate Professor Jayaprakash	Veterinary Science, Animal nutrition, Animal health and diseases
7	Associate Professor Peter Manus	Agricultural economics, Agribusiness management
8	Dr Veronica Bue	Agricultural extension, women in agriculture, rural sociology
9	Associate Professor Patrick Michael	Natural resource management, field crops, agriculture and environment
10	Dr Ronnie Dotaona	Agricultural entomology, Integrated pest management, Bio control agents
11	Dr Gwendolyn Ban	Plant pathology, Bio control agents
12	Mr Spencer Poloma	Crop physiology, Horticulture, Agronomy
13	Dr Janet Pandi	Animal nutrition, feed and nutrition of chickens, smallholder farming systems.
14	Dr Frank Vidinamo	Agricultural engineering, field engineering and appropriate farming implements.
15	Mr William Nano	Agricultural extension, Animal nutrition, Aquaculture, On-farm trainings
16	Mrs Betty Tiko Motoro	Agricultural extension, rural sociology

LIST OF JOURNAL ARTICLES PUBLISHED

Ban, G., Akanda, S. & Maino, M. (2022). Efficacy of *Trichoderma harzianum* against *Fusarium oxysporum* and *Rhizoctonia solani*. *Annals of Tropical Research*, **44**(1): 30-45.

Bafiec, T. J. & Rajashekhar Rao BK. (2022). Biochar, mineral P and their co-application affects chemical fractions of P and mung bean growth in two tropical soils. *Communications in Soil Science and Plant Analysis,*53(6): 664-674.https://doi.org/10.1080/00103624.2022.2028806 (Scopus)

Buyoyu, P. and Maino, M.K. 2022. Cultural and morphological characterization of *Colletotrichum gloeosporioides* causing anthracnose on *Barringtonia edulis*. *Journal of Mycology and Mycological Sciences,* **5**(1): 1-7.

Joel, B. and Michael, P. S. (2022). Nutrient cycling under unmanaged rubber, cocoa and oil palm agro-ecosystems in a sandy soil under humid lowland tropical climatic conditions. *International Journal of Environment* **11**: 46-61.

Lewis L, Hossain M. and Rajashekhar Rao BK, 2022. The planting density of *Acacia mangium* influences the rehabilitation of a Waste Rock Dump in Papua New Guinea. *Arabian Journal of Geosciences* **15**:2 16. https://doi.org/10.1007/s12517-022-09522-4 (Scopus)

Michael, P. S. (2022). Research needs in agriculture and other land uses in response to the green economy: A review. *Journal of Global Agriculture and Ecology* **14**: 97-104.

Rachel Aisoli-Orake, Veronica Bue, Mary Aisi, Imelda Ambelye, Mirzi Betasolo, Tindi Nuru, Dora Kialo, Shamsul Akanda, Sogoing Denano, Lydia Yalambing, Susan Gasson, Elizabeth Spencer, Christine Bruce & Nick Roberts (2022). Creating sustainable networks to enhance women's participation in higher education in Papua New Guinea, *Journal of Higher Education Policy and Management*: 1-13. DOI: 10.1080/1360080X.2022.2037267

Vidinamo', F., Fawzia, S., & Karim, M. A. (2022). Investigation of the Effect of Drying Conditions on Phytochemical Content and Antioxidant Activity in Pineapple (Ananas comosus). *FoodandBioprocessTechnology*, *15*(1),72-81 https://link.springer.com/article/10.1007/s11947-021-02715-x

Vidinamo, F., Fawzia, S., & Karim, M. A. (2021). Effect of drying methods and storage with agro-ecological conditions on phytochemicals and antioxidant activity of fruits: a review. *Critical Reviews in Food Science and Nutrition*, *62*(2), 353-361. https://doi.org/10.1080/10408398.2020.1816891

WORKSHOPS/CONFERENCES/SYMPOSIUMS

Buyoyu, P., Pitiki, M., Famiok, S., Beko, J., Mulung, K., Komolong, M., Maino, M. & Okpul, T. (2022). Investigating eaglewood genotype fungal endophyte interaction in agarwood production to promote promising clonal eaglewood plantation in Papua New Guinea. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August 2022, Rose Kekedo Lecture Theatre, PNG University of Technology, Lae, Papua New Guinea.

Danbaro, G. T. Okpul, & F. Ssemugenyi (2022). Predictive validity of the STAT-P test-preliminary results from PNG University of Technology. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August, 2022 by the Postgraduate, Science, Research and Innovation Committee. Rose-Kekedo Foyer, PNG Univ of Technology, Lae, Papua New Guinea.

Danbaro, G and Mathew, M. (2022). Improving the genetic potential of PNG goats for milk production using the SME business model. A paper presented at the *Ninth Huon Seminar* held on 30-31 August 2022, Rose Kekedo Lecture Theatre, PNG University of Technology, Lae, Papua New Guinea Papua New Guinea University of Technology, Lae, Papua New Guinea.

Inapo, D. Gwendolyn Ban, & Shamsul Akanda. (2022). Dual Culture of 20 *Trichoderma* Isolates Against Three Rice Pathogens. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August 2022, Rose Kekedo Lecture Theatre, PNG University of Technology, Lae, Papua New Guinea.

Peter, T. and Michael, P. S. (2022). Nutrient dynamics in sweet potato mounds following organic matter amendment. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August, 2022 by the Postgraduate, Science, Research and Innovation Committee. Rose-Kekedo Foyer, PNG Univ of Technology, Lae, Papua New Guinea.

Pitiki, M., Maino, M., Buyoyu, P. and Okpul, T. (2022). Isolation, identification and evaluation of prevalent fungal endophytes for agarwood induction in eaglewood tree species in Papua New Guinea. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August 2022, Rose Kekedo Lecture Theatre, PNG University of Technology, Lae, Papua New Guinea.

Poloma, S. Maino, M.K. & Hartemink, A. (2022). Mycorrhiza fungi as a mitigating agent for sustainable climate smart agricultural systems. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August 2022, Rose Kekedo Lecture Theatre, PNG University of Technology, Lae, Papua New Guinea.

Tabitha Parau, Veronica Bue, Peter Manus, William Nano, Betty Tiko, James Fanua (2022). Livelihood Skills Training of Rural Farmers of Papua New Guinea: An Evaluation of Feedback of Farmers in Kuli-Gap and Kapari Villages. A paper presented at the *Ninth Huon Seminar*, held on 30-31 August, 2022 by the Postgraduate, Science, Research and Innovation Committee. Rose-Kekedo Foyer, PNG Univ of Technology, Lae, Papua New Guinea.

Vidinamo. F; Karim. A; Fawzia. S; Alsbua. R (2022). Effect of intermittent microwave convective drying on the phytochemicals in fruits: IDS2022 – 22nd International Drying Symposium, Worcester, Massachusetts, USA, June 26 – June 29, 2022.
Online: *https://doi.org/10.55900/ylfsdtme*

POSTGRADUATE STUDENTS' RESEARCH

Student	Program	Research Title	Funding source	Supervisor
Spencer Poloma	PhD	Effects of mychorrhizal symbiosis on macronutrient absorption, physiological parameters and yield of rice (*Oryza sativa*); Principal Supervisor; PhD (2019-2022).		Prof. M. Maino
Robin WINGWAFI	PhD	Land suitability assessment for commercial rice development in Markham Valley		Dr R Rao

Francis N'DREWEI	PhD	Examining the Effectiveness of Agricultural Extension Approach Implemented by the Manus Provincial Division of Agriculture and Livestock: A Case Study of Lele Bupi Chupeu and Balopa Local Level Government Areas		Dr V Bue & Dr P Manus
Benson Mirou	PhD	Development of e-crop disease app for farmers in Papua New Guinea		Prof. M Maino (Co-supervisor)
Michael Gaoma:		Cultural intelligence and transitional physics education in Papua New Guinea		Maino (Co-supervisor
Paula Kaupa	PhD	Green manure integration as an INM option in sweet potato: Effects on soil properties, crop nutrition and productivity		Dr R Rao
Sinafa Robby	PhD	Characterization of *Leptospira* spp. (Bacteria) in Cattle Population in the Morobe Province		Prof. M Maino (Co-spervisor
Shienel Samuel	MPhil	Investigating the effects of ants (W*asmannia auropunctata & oecophylla smaragdina*) as potential biological control agents against cocoa pod borer (C*onopomorpha cramerella*) in Madang & East Sepik province.		Dr R Dotaona
Shen Sui	MPhil	Maximizing sweet potato yield in the swidden fields along an altitudinal gradient in Papua New Guinea.	PNGUoT	Dr P Michael
Vincent Koddy	MPhil	Concentration of alkaloids, arecoline, arecaidine and guvacine in Areca nuts from Papua New Guinea		Prof. M Maino
Tata Talewika	MPhil	Biological application and assessment of seaweed mediated green-synthesized of silver nanoparticles		Prof. M Maino (Co-supervisor)
Inia Bunsa	MPhil	Investigating Endemic Nature of Abuscular Mycorrhizae Fungi on *Piper aduncum*		Prof. M Maino
John Komek	MSc	Assessing the effects of marketing decisions by contact and non-contact farmers		Ms. B. Tiko
Dollah Inapo	MSc	Biodiversity and phylogeny of Trichoderma isolates in Papua New Guinea		Dr G Ban
Roberta Sio	MSc	Megatherium as a potential biological control agent for coconut rhinoceros beetle in PNG		Dr R Dotaona

Topas Peter	MSc	Soil to Nutrition-the importance of composted mounds for sustainable production of sweet potato in Papua New Guinea		Dr P Michael
Kayman Kiwa	MSc	Resources Use Efficiency of Smallholder Coffee Farmers Within and Outside of CIC-PPAP Funded Warapena Coffee Project in The Kaupena-Nebilyer Districts of Papua New Guinea		Dr P Manus
Levy Kasa	MSc	Agricultural Use of Treated Piggery Sludge (Tps) To Minimize Negative Environmental Impacts Under Humid Lowland Tropical Climatic Conditions		Dr P Michael
Gossie Powae	MSc	The Effect of Afforestation with *Eucalyptus pellita* Biomass Plantation on the soil Carbon, Nitrogen and Phosphorus stocks in Papua New Guinea		Dr R Rao
Monare Mathew	MSc	Morphological characterization and frequency of Kappa casein gene in some local goat populations of Simbu Province, Papua New Guinea		Prof. G Danbaro
Shirleyna Aipa	MSc	Evaluating the importance of organic matter and inorganic fertilizer (NPK) application on growth and bean yield of cocoa produced under lowland agro-climatic conditions in PNG		Dr P Michael
Luke Jeffery	MSc	Agricultural Use of Treated Domestic Seqage Effluent (Tose) Wastewater to Minimize Negative Environmental Impacts Under Lowland Tropical Climatic Conditions		Dr P Michael
Joseph Kondave	MSc	An investigation on the impact of African Swine Fever on the rural pig farmers in two selected districts of Southern Highlands Province of Papua New Guinea.		Dr V Bue
Cybill Poiya	MSc	Assessing the genetic relationships within wild relatives of rice maintained at the Unitech Biotechnology Centre using simple technique repeat marketers (SSR)		Prof. T Okpul
Peter Kerowane	MSc	Value Chain Analysis of bulb onion in Gembogl, Simbu Province , Papua New Guinea		Mr. N Kewa
Miriam Otto	MSc	Developing An Information System for Morobe's Smallholder Cattle		Mr. N Kewa

		Farmers Towards Sustainable Cattle Production		
Timothy Ngembil	MSc	Effects of Climate Change on Food Security: An Investigation into Temperature, Rainfall, and Topographical Paradigm in three Highlands Provinces of Papua New Guinea		Dr P Michael

THIRD YEAR UNDERGRADUATE STUDENTS' RESEARCH PROJECTS

Names	**Topics**	**Supervisor**
Rochelle KONIA	Cocoa Pods by-products as feeds for Tilapia fish - Aquaculture	Mr. W Nano
Kawo WINUNG	Performance of Tomato plants in aquaponic farming using bamboos as growing tubes- Aquaponics	Mr. W Nano
Alice POKON	Performance of pig weaners on different levels of coffee by-products (Coffee pulps) in pig weaner feeds	Mr. W Nano
Jacob ANDREW	Study of Value Chain of Coffee in the Erap -Wantuat District of Morobe Province, Papua New Guinea	Mr. N Kewa
Corrick KONIE	Study of Value Chain of Watermelon in the Wampar District of Morobe Province, Papua New Guinea	Mr. N Kewa
Jordan SAVINGU	Effects of mycorrhiza fungi inoculation on seedling growth of *Elaeis guineensis*	Mr. S Poloma
Robert KASA	Effects of mycorrhiza fungi application on seedling growth of *Coffea* spp. under nursery conditions	Mr. S Poloma
Joyanne INGEL	Screening of sweet potato cultivars against scab disease	Prof. M Maino
Dulcie Delu MATTES	Effect of waste packing paper mulching on soil properties	Dr R Rao
Fredah POE	Effect of waste packing paper mulching on corn growth and yield	Dr R Rao
Archie KENO	The effect of *Trichoderma* on the growth and yield of sweet potato in the field condition.	Dr G Ban
Peter MOTISI	Effect of Trichoderma on the growth and yield of beans in the field condition	Dr G Ban
Barbara MONDO	Effect of *Trichoderma* against root knot nematodes	Dr G Ban
Bernard HAWIGEN	Water loss assessment on the above-ground biomass (leaves) of perennial crops.	Dr P Michael
Cardiff WAFIWA	Water loss assessment on the above-ground biomass (leaves) of annual crops.	Dr P Michael
Nathaniel BARIME	Water loss assessment on the above-ground biomass (leaves) of epiphytes on perennial crops.	Dr P Michael
Joash KORINI	Water loss assessment on the above-ground biomass (leaves) of under growths of perennial crops.	Dr P Michael
Felicity DARLIE	Confirming the identity of accessions *Leersia* species maintained at the UBC	Prof. T Okpul

Maima AULA	Evaluating the potential of agarwood production of eaglewood accession maintained at the Farm	Prof. T Okpul
John KAPAL	Agronomic evaluation of F7 population of rice breeding lines	Prof. T Okpul
Shermyne WALUKA	Study the efficacy of *Trichoderma* on the growth and development of dwarf bean in the field	Prof. S Akanda
Lisahpo WAWAH	Screening the rice varieties/lines against sheath blight disease	Prof. S Akanda
Tina KUPU	Study the effect of *Trichoderma* on the germination and growth of rice seeds	Prof. S Akanda
Albertha KUORO	Phenotypic characterization of indigenous chickens from a Province of PNG	Prof. G Danbaro
Rachael TAHUNIARA	Performance of broiler chickens on novel feeds formulated from locally available feedstuffs	Prof. G Danbaro
Shanty WAIM	Relative Profitability (Gross Margins) of Morobe and Highlands sweet potato marketed at the Lae Urban Market	Dr P Manus
Cassandra YOSI	Relative Profitability (Gross Margins) of taro of various locations within Morobe Province marketed at Lae Urban Market	Dr P Manus
Margaret LOMBU	Incorporation of agri by products in broiler rations.	Dr Jaya Prakash
Vanessa ANDREW	Tannin content in leaves of fodder trees.	Dr Jaya Prakash
Kenson BOB	Nutritional adequacy of student diets (protein and energy)	Dr Jaya Prakash
Fiyonori HAGUNA	From Struggle to Success: An Entrepreneurial Journey of a successful business person in Lae, Morobe Province	Mrs. B. T. Motoro
Giling PAAL	Time Attitude vs Time Management: Perspective of Unemployed Youths on Time Allocation in Tanam village, Morobe Province	Mrs. B. T. Motoro
David APPA	Identification of native leafhoppers	Dr R Dotaona
Stanley DICKSON	Viability of *Metarhizium anisopliae* in oil formulations	Dr R Dotaona
Junias SOGRA	Determination of natural enemies of Fall Army Worm (*Spodoptera frugiperda*)	Dr R Dotaona
Christina KUNDI	Dietary patterns of households at Madang Block peri-urban settlement.	Dr V Bue

INTERNAL RESEARCH COLLABORATIONS

Collaborative student and staff research supported by the PRS&IC
Rao & student (2022). The Postgraduate Studies, Research & Innovations Committee (PRS&IC) of the PNG University of Technology granted K 20,000 for the student research project entitled “Green Manure Integration as an INM Option in Sweet potato: Effects on Soil Properties, Crop Nutrition and Productivity”

Prof. Maino & Team (2022). Award of Unitech Research Funds: (a) K57,988.40, for collaborative research on betel nut. Participating Departments are: Agriculture, Mechanical, Applied Sciences, and Communication and Development Studies, and (b) Total K22,000.00 for PG students' research (I am the Principal supervisor).
Dr P Michael (2022) Obtained K 74,000 research funds from the PRS&IC to support several student and staff research projects.

EXTERNAL RESEARCH COLLABORATORS

Gariba Danbaro[1] and Robyn Alders[2] (2022). Poultry development survey: baseline data from Papua New Guinea and near neighbours. [1]PNG University of Technology, Department of Agriculture. [2] Development Policy Centre, Australian National University, Canberra, Australia

Rao (2022). Co-investigator/team member with CSIRO in the ACIAR funded project (SLAM/2019/106) entitled "Better Soil and Land Information for Improving PNG's Agricultural Production and Integrated Land Use Planning – Building A Revitalized PNGRIS2"

Dr P Michael (2022) obtained K 150,000 from external sources to support his research.

NUMBER OF PAPERS REVIEWED FOR JOURNALS/ CONFERENCES/ SEMINARS

Dr R Rao	16
Professor G Danbaro	1

DEPARTMENT OF APPLIED PHYSICS

Head of Department: Dr. Gabriel Anduwan

The Department of Applied Physics is relatively small compared to other academic departments, but it serves many students just like other service departments. The Department used to have two courses: the Bachelor of Science in Applied Physics with Electronics and Instrumentation (BSAP) and the Bachelor of Science in Radiation Therapy (BSRT). However, the BSRT program is temporarily shelved until the Health Department submits further needs of graduates for the country in the coming years. While running the BSAP program, Applied Physics provides service courses to 10 other academic departments of the 13 departments in this University. Four years ago, a Bachelor of Engineering in Biomedical Engineering (BEBE) was introduced as a new program. The program initially started with only fifteen (15) students in 2020. This year 2023, the first batch of students doing the Biomedical Engineering program are now in their fourth year, with seven students making it to the final year from the initial fifteen.

The Applied Physics course with Electronics and Instrumentation emphasizes the principles of application to Physics. The students are well equipped with analytical skills and all the applications to Physics principles. The Applied Physics graduates are working all over the country and also overseas. They are employed in any specialty related to Physics with electronics and instrumentation. Some work in the telecommunication industry, Airline industry, education, tertiary institutions, mining industry, and PNG Power, with many employed in manufacturing plants in process control and instrumentation. Many past graduates have accumulated skills and knowledge and are now in private consultancy work, creating more job opportunities and industrial training pathways for our undergraduates. The feedback from our past graduates' performance in the industry is very encouraging.

The new Biomedical Engineering graduates will find employment in the Health Department. As soon as they graduate, the Health Department will employ them to work in all the general hospitals across the country. Their job is to become specialists in different types of equipment used in the hospital. The equipment must be in good running condition for diagnosis, treatment, or monitoring the sick patients under medical supervision.

The Department of Applied Physics has four Postgraduate programs; research-based Doctor of Philosophy (PhD), Master of Philosophy (MPhil), and course-based Master of Science (MSc) in Electronics and Instrumentations, and Master of Technology (MTech) in Exploration Geophysics

There is enormous interest among the students in the Department’s Post Graduate Program. In 2021, one (1) student graduated with a Doctorate’s degree (PhD) who is a staff member, four(4) in MSc, with two staff members and four (4) in Exploration Geophysics. The Department is proud of all the graduands. This year 2022, the Department has two continuing PhD students and six (6) Master’s students. The Department is committed to further strengthening the PG programs and research with the anticipated appointment of the Dept. Research Coordinator.

Research Areas of the Academic Staff

No.	Name of the Academic Staff	Area of Research
1	Prof Manoj Mukhopadhyay	Applied Geophysics: Geophysical Modeling, Earthquake Seismology, Crustal Geophysics
2.	A/Prof Felix Pereira	Astrophysics, Atmospheric physics, Radiation physics and Electronics.
3.	A/Prof Dapsy Olatona	Energy and spectroscopy
4.	A/Prof.Velusamy Senthikumar	Energy nanomaterials, 2-D materials, Solar cells, and Oxide resistive memories
5.	Dr. Gabriel Anduwan	Energy applications, Geophysics, Nanotechnology, Environmental Physics, Physics Education, Condense Matter, and other applications of Physics using Microcontrollers and Electronics.
7.	Dr. Ali Mohamad	Applied Geophysics in Oil, Gas, and minerals
9.	Mr. Suame Ampana	Applied Geophysics and Non-Destructive Test (NDT)
10.	Dr. David Kolkoma	Medical Physics, Radiation Physics
11.	Mr. Michael Gaoma	Education Physics
12.	Mr. Sylvester Tirones	Microcontrollers and Microprocessor applications
13.	Mr. Kenson Tonny	Microcontroller based projects, Smart Hybrid Renewable Energy Systems, Data Acquisitions and smart monitoring mechanisms for Renewable Energy Systems and Aircraft Tracking Systems in PNG.

A. Research Publications (Journal)

1. Mukhopadhyay, M., Basab, M., Saad, M., Krishna, N. B. & Elkhedr, I. (2022). Regional significance of crustal and sub-crustal rheological heterogeneities beneath the Harrat Lunayyir and their continuity into the neighboring harrats, Western Saudi Arabia. *Journal of African Earth Science*, *186,*104432.
2. Kolkoma, D., Pereira, F., & Panakal, J. J. (2022). Assessment of radiological exposures in the vicinity of gold mining area of Wau-Bulolo in Papua New Guinea, *Int. J. of Radiation Research.*
3. Kolkoma, D., Pereira, F., & Panakal, J. J., & Michael, K. (2022). Assessment of radioactive elements in the Ramu-Nickel and Yandera mining sites of Papua New Guinea related to Radiation pollution of the environment, *Pollution Research*, 41(2), 440-444.

4. Pereira, F. B., Anduwan, G. & Girish, T. E. (2022). On the association of predominant polarity of north-south component of IMF in the GSE system near 1 AU with solar polar magnetic fields during 1967-2020. *New Astronomy, 92,* 101723.
5. Randa, N. & Pereira, F. (2022). GSM based Automatic Control of Fire fighting system using Microcontroller in Papua New Guinea, *International J. of Innovative Researches in Sciences and Engineering Studies, 2* (5), 5-10.
6. Sorekine, G., Anduwana.G.,Waimbo. M. N., Osora, H., Senthilkumar, V., Kim, S., Kim,Y.S. & Charles. J. (2022). Photocatalytic studies of copper oxide nanostructures for the degradation of methylene blue under visible light, *Journal of Molecular Structure, 1248,* 131487

B. Conference

C. Post Graduate Projects

1. Michael Gaoma (PhD) - Cultural Intelligence and Transitional Physics Education in Papua New Guinea
2. Helen Osora Herivi (PhD) - Synthesis and Characterization of Metal Oxide with Graphene Nanostructures for Pseudocapacitor Electrode Applications

D. Undergraduate Projects

1. Design & Installation of Hybrid Photovoltaic System [Solar Electric System] in the Applied Physics Department.
2. Geophysical methods for gold exploration – geological perspective in PNG.
3. Applications of nuclear science in crime investigations in PNG
4. Feasible chemical and geographical exploration methods of alluvial copper and gold in Ok Tedi.
5. Feasibility studies into a possible wind energy farm in Bulumuri Village, Talasea Village, WNBP
6. Feasibility of developing a mini geothermal plant for Matupit Village, Rabaul District, ENBP.
7. Microcontroller based Agriculture nursing-monitoring system.
8. An in-depth analysis of the proper commissioning techniques of PV Arrays and the design of a Solar Power plant implementing proper techniques.
9. Design and Construction of Unitech Camera Main Control Center.
10. Photovoltaic – Hydropower Hybrid Plant Kuruti Village, Manus
11. Microcontroller based drone for Arial Surveillance
12. Automatic control of greenhouse environment using micro-controllers for better agriculture crops.

DEPARTMENT OF APPLIED SCIENCES

Head of Department: Dr. Lydia R. Yalambing

Introduction

The Department offers two (2) degree programs: a Bachelor of Science in Food Technology and Bachelor of Science in Applied Chemistry. The Department also offers Master of Philosophy and Doctor of Philosophy programs.

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

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

In recent years, we have seen an increase in intakes in our postgraduate MPhil program and also in our engagements in community, church and industry related partnership programs.

The focus of most of our community, as well as industry partnership research projects, have been in the translation of science and technology (in the areas of Food Technology & Applied Chemistry) into products, technologies, and or outcomes that transform the lives of everyday Papua New Guineans. To use what is available to develop and provide better, affordable and accessible alternatives for communities.

Broad Research Interest Areas of the Department:

(a) **Chemistry:** Environment, material science, water and organic chemistry related research.

(b) **Food Technology:** Food processing, clean energy, quality control and nutrition related research.

Research Interest Areas of academic staff members of the Department

Applied Chemistry Section

No.	Name	Research interests
1	Dr David Timi	Organic chemistry, phytochemistry
2	Dr. Srikanth Bathula	Chemical Speciation and Bioavailability, Environmental studies, Geomorphological impact assessment on groundwater quality, Coastal Ground-waters–A Geo-hydro Chemical Exploration, photocatalytic activity and degradation, Synthesis and characterization of nano-materials. Investigation of Oil samples at seawater sources.
3	Dr. Sivakumar Balakrishnan	My research interest falls on five main themes – Metal-Organic Frameworks (MOFs), Porous silicon, Carbon materials, Ceramics and Phosphors. All of these materials find applications in a variety of fields. I am mainly interested in exploring the composite materials made out of these materials. For example, one of the projects that I am investigating is the anchoring of MOFs on to porous and crystalline silicon. It is envisaged that this will create new materials with added properties from their individual starting materials.

4	Mr. Justin Narimbi	Analytical chemistry, environmental chemistry, instrumental methods for analysis, Water quality assessment and monitoring, Laboratory quality management.

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, Food Product Development Processes.
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	Mrs. Sogoing Denano	Food safety and food security; compliance studies.
4	Mr. Nigel Kiaka	Industrial solid and liquid waste management
5	Mrs. Rag Gubag-Sipou	Food microbiology, microbial quality of food and water, medicinal studies of indigenous plants.

Research Output: Peer Reviewed Journals

(a) Kotra, K.K., **Bathula, S**., Sami, E. (2022). Delineation of Groundwater Salinity Zones in Shefa and Malampa Provinces, Vanuatu. *Nature Environment and Pollution Technology*, *21*(2), 803–812.

(b) Rachel Aisoli-Orake, Veronica Bue, Mary Aisi, Imelda Ambelye, Mirzi Betasolo, Tindi Nuru, Dora Kialo, Shamsul Akanda, Sogoing Denano, Lydia Yalambing, Susan Gasson, Elizabeth Spencer, Christine Bruce & Nick Roberts (2022). Creating sustainable networks to enhance women's participation in higher education in Papua New Guinea. *Journal of Higher Education Policy and Management, 44* (2), 208-220, DOI: 10.1080/1360080X.2022.2037267

Conference paper

"Impact of leachate on Bore Wells along the perimeter of Papua New Guinea (PNG) University of Technology (UNITEC) due to Open Dump site." John Ape and Associate Professor Dr Srikanth Bathula at the 9th HUON seminar themed "EMBRACING SCIENCE, ENGINEERING AND SUSTAINABLE TECHNOLOGY (SEST) TO MITIGATE POVERTY IN PNG" held on 30th -31st August 2022, Papua New Guinea University of Technology, Lae, PNG (Best paper award**)**.

Books published/Editing books/ Journals

Book title: Advancements in Artificial Intelligence, Blockchain Technology, and IoT in Higher Education- Mitigating the Impact of Covid-19

Editors: Subhendu Kumar Pani, PhD, Kamalakanta Muduli, PhD, Sujoy Kumar Jana, PhD, Srikanth Bathula, PhD, Golam Sarwar Khan, PhD. published on Aug 2022.

Publisher: Apple Academic Press, Exclusive publishing with CRC Press, a Taylor & Francis Group, Florida USA. Hard ISBN: 9781774910924.

Post Graduate projects (2022)

No.	Student	Degree	Topic	Principal Supervisor
1	Justin Narimbi	PhD	Synthesis and applications of novel zeolite imidazolate framework (ZIF) hybrid materials.	Dr. S. Balakrishnan
2	Sogoing Denano	PhD	Ecological risk assessment of selected rivers in Papua New Guinea: A case study in relation to heavy metals contamination, severity of sediment perturbation, and food safety.	Dr. Timi & Professor Okpul
3	Nigel.K.Kiaka	MPhil	Designing a Suitable Drying System for Higher Altitude Conditions: Using Gembolg District, Chimbu Province as a Model.	Mr Reilly Nigo
4	Ben Paul	MPhil	A study into how Histamine (scombrotoxin) Formation is Controlled in Tuna onboard Purse Seiner's in Papua New Guinea. Research work has been completed and thesis submitted.	Mr. Reilly Nigo
5	Salvina Ku	MPhil	Analytical Capillary Electrophoresis for Environmental applications in Papua New Guinea. Thesis submitted for examination.	Dr. Modey then Dr. Timi
6	Ruthia Kisi	MPhil	Quality Evaluation of selected commodity products from PNG using ICP-OES & Capillary Electrophoresis.	Dr W. Modey then Dr. Balakrishnan
7	Nadia Tiaga	MPhil	Fermentation and Quality Studies of Cocoa	Mrs Rag G. Sipou
8	Dilkay Bau	MPhil	Determination of Phytochemicals (β-Carotene, total phenolic compounds, flavonoids and alkaloids) in raw, boiled and fried sweet potatoes from the Unitech farm and selected varieties from the Lae main market. Thesis submitted for examination.	Dr L. Yalambing
9	Esther D. Tuweyo	MPhil	The determination of optimum methane generation from the co-digestion coffee pulp and treated chicken manure – a BMP analysis.	Dr S. Bathula
10	John Ape		Impact of Leachate on Bore wells along the perimeter boundary of PNG University of Technology due to open Dumpsite.	Dr. S. Bathula

11	Tata Telawika	MPhil	Characterization and biological Application of Silver Nanoparticles synthesized via sea weed.	Dr. D. Timi
12	Stephanie Anis	MPhil	Chemical and biological activities of the five (5) plant species of Xanthostemon (MYRTACEAE) found in PNG.	Dr. D. Timi

Completed Undergraduate (Final Year Students) Research Projects (2022)

Chemistry Section

No.	**Student Name**	**Supervisor**	**Project Title**
1	Aipit Kelly	Dr. Bathula	Effects of Acids & Bases on the Tensile Strength of Fibres like nylon, wool, and cotton.
2	Apingi Pias	Dr. Balakrishnan	Preparation of Imperata cylindrica (Cogon grass) leaf powder and its adsorbent properties for methylene blue.
3	Bal Benjamin	Dr. Timi	Assessment of the antioxidant and micro-nutrient analysis of young leaves of *Ficus damaropsis.*
4	Bani Jacob	Dr. Bathula	Dosage of Bleaching Powder Required for Sterilization of Different Samples of Water.
5	Bire Sebathy	Dr. Timi	Determination of the content of Pb & Cd from the leaves of *Ficus damaropsis.*
6	Boma Brian	Dr. Balakrishnan	Preparation and adsorbent studies of *Imperata cylindrica (*Cogon grass) leaf materials using crystal violet as a cationic dye.
7	Buzorra Valentina	Dr. Timi	Assessment of the antioxidant and micro-nutrient analysis of the fruits of *Ficus copiosa.*
8	Gamane Moses	Dr. Balakrishnan	Synthesis and characterisation of Europium doped strontium aluminate phosphors by solid state method.
9	Iparam Justin	Dr. Timi	Assessment of the antioxidant and micro-nutrient analysis of the young leaves of *Ficus copiosa.*
10	Kavora Ellie-Trish	Dr. Bathula	A quality assessment of different lubricant oils in Lae, Papua New Guinea.
11	Kimin Simon	Dr. Timi	Synthesis and microbiological assessment of the phytosynthesized silver nanoparticles from aqueous extract of *Ficus damaropsis*.
12	Mavo Jarren	Dr. Bathula	A quality assessment of different river water sources for drinking in Lae, Papua New Guinea.
13	Moka Simon	Dr. Balakrishnan	Synthesis and characterisation of rare earth elements doped strontium aluminate phosphors using solid state method.
14	Mutumut Issac	Dr. Bathula	A quality assessment of different river water sources for drinking in Lae, Papua New Guinea.

15	None Joshua	Dr. Timi	Synergistic study on biosynthesized silver nanoparticles via *Euphorbia geniculata.*
16	Pokel Ian-Josh	Dr. Bathula	A quality assessment of different edible oils in Lae, Papua New Guinea.
17	Rowen Peter	Dr. Balakrishnan	Functionalization of silicon materials for the synthesis of metal organic frame works (MOFs).
18	Tomokita Samantha	Dr. Timi	Determination of the concentration of Pb & Cd from the young leaves and fruits of *Ficus copiosa.*
19	Wariambu Christopher	Dr. Balakrishnan	Fabrication of a dye-sensitized solar cell using the dye extracted from native plants.

Food Technology Section

Completed Undergraduate (Final Year) Research Projects, 2022

No.	Student	Project Tile	Supervisor
1	Kendy Maria	Comparative Studies on Antibiotic Resistance of *E.Coli* isolated from locally produced and imported poultry.	Mrs Rag Gubag- Sipou
2	Bengesifu Loes	Chicken Feed Development studies from Cocoa Pod Husks.	Mr Reilly Nigo
3	Bagli Lavinia	Iron content of Rice after washing and cooking of different brands of iron fortified rice sold in Lae.	Dr Lydia Yalambing
4	James Mickey	Compliance Studies: Impediments on Food Trade in PNG Due to Labelling	Mrs Sogoing Denano
5	Pominis Paul	Characterizing a system for Drying Onion Flakes for Industrial Applications.	Mr Nigel Kiaka
6	Salia Ryan	The Microbial Quality of Bottled water.	Mrs Rag Gubag-Sipou
7	Umo Roseanne	Chicken and Duck Feed Development from Brewery Wastes.	Mr Reilly Nigo
8	Hagwai Delphine	Survey on processed foods sold in supermarkets in Lae that are fortified with micronutrients.	Dr Lydia Yalambing
9	Bapai Lawrencia	Rheological Charactering the Tapioca Starch.	Mr K.N.Kiaka
10	Lomotaku Benedicta	Energy Studies using Cocoa Pod Wastes	Mr Reilly Nigo
11	Boting Bob	Design, Construction and Commissioning a Prototype Viscometer	Mr K.N.Kiaka
12	Miki Fidelma	Product Development from Cocoa Pod Wastes	Mr Reilly Nigo
13	Indi Julian	Survey on consumption of selected processed foods (flavoured cracker biscuits & carbonated drinks) on Unitech Campus.	Dr Lydia Yalambing
14	Beuve Othniel	Survey on complementary foods given to infants and feeding practices: Case study on Bumayong Settlement.	Dr Lydia Yalambing

Research projects with External Stakeholders:

1. **NFA–Unitech. Accreditation of the NFTMC Laboratory**

A revised MOU was signed with Unitech through the Department of Applied Sciences in November, 2022 to further strengthen the rich partnership between Unitech and National

Fisheries Authority. NFTMC subscribes to the UK Government operated Ferra Science Ltd for annual proficiency testing, in both microbiology (various organisms) and histamin analysis. NFTMC has performed exceptionally well among 70-80 participants on average worldwide in 2022, this demonstrates the competency of NFTMC in terms of its methods and technical skills.

2. **Food Safety Courses / Training for Industries**

This is a program running in three stages annually. Conducted by the senior Food Technology staff of the Department. 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. Enrolment numbers have increased in the recent years.

3. **Design, Construction and Commissioning of Solar Combination Dryers – Partnership with FPDA and Kabwum District – Mr. Reilly Nigo**

This research work started as model student project work and then developed further into trial field work in Gembogl, Chimbu Province through FPDA since 2019. Working model has now been adopted for **bulb onion** in Chimbu (Gembogl District), Western Highlands (Ogelbeng, and Morobe (Markham District). Applied research work and field trial work on **coffee drying** has been successfully done in Tipsit Village in partnership Kabwum District Administration, Morobe Province in December, 2022.

4. **Biogas Projects – Lutheran Church Partnership – Mr. Reilly Nigo**

This research work started as model student project work and then developed further into trial field work in partnership with Lutheran Church (Lutheran Church of Hope Parish, East Taraka). A nine (9) cubic meter facility was commissioned in April, 2022.

5. **Chicken Feed Development Using Brewery Waste - Partnership SP Brewery – Mr. Reilly Nigo.**

This project started in 2022. Preliminary results have shown that brewery waste can be used as a chicken feed. This project will be further investigated for feeds for other domesticated animals.

6. **Dr. David Timi is a collaborating partner in a PIURN (Pacific Islands University Research Network) project - Chemical and biological activities of the five plant species of *Xanthostemon* (MYRTACEAE) found in PNG.**

This project is to do with chemotaxonomy, biological and insecticidal studies of the plant species of *Xanthostemon* (MYRTACEAE) within the pacific region. The collaborating institutions in the region include University of New Caledonia (funding institution), James Cook University in Australia and the PNG University of Technology. The Department of Applied Sciences was asked to take the lead possibly with support from the sister science departments (Forestry & Agriculture). The same work done on plant species of *Xanthostemon* here is also done in the other two institutions also of the *Xanthostemon* plant species within their respective countries. This study evolved from a couple of global issues. First is the concern of the development of resistance of many pathogens to conventional antibiotic drugs. Secondly, the resistance of agricultural pests (weeds & insects) to pesticides and many synthetic chemical agents have been banned or have restricted uses due to environmental concerns.

7. **Dialogue with Research, Science & Technology on building research capacity on Natural Product Research & Product Development. Dr. David Timi**

The project concept is to do prospecting for biomolecules that may have potential applications in cosmetics, agricultural, medicinal and other relevant uses. Natural sources of the molecules such as the plants and the microbes (bacteria & fungi) will be explored via appropriate bioassay techniques and information generated will be documented. Subsequent studies in view of end products development will be based on the results of relevant initial screening techniques. It is anticipated that post graduate research students are engaged to do these researches. As such it is hoped that the Department of Applied Sciences research capacity is improved by adding additional laboratory space, equipment & instruments. This type of research work will need collaborative effort from sister science disciplines such as the Forestry and the Agriculture Departments.

8. **Dr. Bathula is a Co-investigator, collaboration project, University South Pacific** Theme (SRT): Enhancing USP's Emalus Campus building in Learning and Teaching Research and consultancy (ongoing project).

9. **Dr. Bathula is a Co-Investigator**, collaboration project, Impact Assessment of Monaro Volcano Eruptions on Water Quality in Ambae Island along Side with Building the Capacity of National Water Quality Monitoring in Vanuatu (ongoing project).

DEPARTMENT OF ARCHITECTURE AND CONSTRUCTION MANAGEMENT

Head of Department: Professor Cletus K. Gonduan, PhD

Introduction

Several pieces of research were undertaken in the subjects: AR491, AR492, and AR591 under the *Design Research Agenda*. Many architecture and urban design development scenarios in the 4th and 5th year of the Architecture undergraduate program under supervision and co-supervision were given by staff who had both research and professional expertise in many development scenarios in the fields of architecture, building and Urban Planning/ Development, and Urban Design.
Similarly, the 5th-year Bachelor in Building students also conducted their research in the subject AR 591 Research Projects (Special Study).
Research undertaking for the current 5-year Bachelor Program in Architecture is introduced in the first semester of the 4th year and is conducted over three semesters into the first semester of the 5th year program. The Bachelor in Building Program has only one semester in the 5th year because the 4th year students are taking a year out in the Industry. Because of these arrangement, research interests and topics are either chosen every semester and/or, - topics are selected in the 1st semester of the 4th year and are conducted in the three semester segments into the 1st semester of the 5th year. A Design Thesis outcome follows this in the 2nd semester of the 5th and final year for Architecture Students. This is an undergraduate degree prerequisite set by the Commonwealth Association of Architects (CAA) Accreditation Requirement in which the current 5-year undergraduate architecture program was designed and accredited from 1997 – 2010.

Design Research

Design Research is a 'way of enquiring on producing knowledge; this means it is a way of researching.' It is asserted that Architectural Design is to Architecture what Research is to Science, and the 'process of architectural design is close to the process of knowledge creation in the sciences'.
On this note, design research is often a prerequisite to any design outcome; it enables architects in practice to conduct every design project in making an 'informative' investigation into a new and/or retrofitting design project. This research looks into many design issues, variables, constraints, physical, social, cultural, behavioral, geotechnical, lateral and horizontal forces and superstructure consideration, material science, economic, ecological consideration, climate change impact and building design expectations, energy rating, green energy rating and other 'built environment "issues" in which the building will be subjected to in the building use life-span.
Well researched and published documents are then captured in a Research Report (DESIGN BRIEF), which gives credibility and adds value to the end product (the Building Types and Scales). All the above is addressed and captured in the DESIGN RESEARCH PROCESS over two semesters. A detailed Design Brief is developed and documented in AR591 in the third semester. This is then utilized in the final ***Design Thesis Production*** by each student under close supervision and advice by Thesis Supervisors meeting all expectations captured in the - ***Final Assessment Rubrics*** *that captures the knowledgebase that was required and addressed in the Design Thesis.*

Undergraduate Research Undertake in 2022

Staff and Student	**Research undertaken & Subject Code**	**Design Thesis 2022**
	*Research was conducted over three Semesters in AR 491, AR492 and AR 591 to Documentation of Thesis in **AR502 Design Thesis**.*	*All completed Design Thesis are held as record and are published the dated Departmental undergraduate Design Thesis Publication Series. **The Architectural Concept – Digital Thesis Publications 2022**.*
Supervising Staff	**ARCHITECTURE PROGRAM**	
Professor Gonduan	The following research and publication were carried out by final year students in both the Architecture and Building undergraduate programs.	
Students		
Anthony Smith	*The Marine Police Head Quarters and Operation Base - Voco Point Lae* ***The Architectural Concept – Digital Thesis Publications 2022***	Design Thesis - Completed
Dage Daisie	*The New Ireland Provincial Library - Kavieng* ***The Architectural Concept – Digital Thesis Publications 2022***	Design Thesis - Completed
Eliga Julia	*The New University of Technology Administration Building – PNGUOT Lae* ***The Architectural Concept – Digital Thesis Publications 2022***	Design Thesis - Completed
Fufurefa Chrioni	*The Eastern Highlands Provincial Government Head Quarters, Goroka EHP.* ***The Architectural Concept – Digital Thesis Publications 2022***	Design Thesis - Completed
Kila Kupana	*The Kupiano District LLG Head Quarters – Kupiani Central Province* ***The Architectural Concept – Digital Thesis Publications 2022***	Design Thesis - Completed
Raphael Vincent	*The Simbu Provincial Assembly Building and Head Quarters – Kundiawa Simbu Province* . ***The Architectural Concept – Digital Thesis Publications 2022***	Design Thesis - Completed
Wemin Abraham	*High Technology Centre – National Capital District – Port Moresby.*	Design Thesis - Completed

	The Architectural Concept – Digital Thesis Publications 2022	
Supervising Staff	**BUILDING PROGRAM**	
Dr. J. Walliah	*Research was conducted during the 4th Year Industrial Training Period Semesters 1 & 2 and documented in AR 591 as Research Report under Supervision in the 5th and final year of studies.*	Completed Research Reports are cataloged and kept in the Departmental Research Report Collection: ***The Building Concept – Building Research Report Publications 2022***
Jeremiah APISAI	Conceptualizing a Proactive Approach in Managing Papua New Guinea University of Technology Residential Accommodation	Research Project -Completed
Sairus ROBERT	Factors causing the regular maintenance of residential buildings in Papua New Guinea University of Technology-Taraka Campus: Lae, PNG. Understanding Cost of Prefabricated Residential Buildings in Papua New Guinea (PNG)	Research Project -Completed
Stanley RIKIS	Research Project -Completed Blaise minio understanding the students accomodation	Research Project -Completed
Blaise MINIO	Understanding the students accomodation living satisfaction in Papua New Guinea Universiy of Technology	Research Project -Completed
Kauge DAMBE	Factors motivating construction workers' performance on a construction site in Lae, PNG	Research Project -Completed
Solomon WILBERT	The effect of Tradesmen Shortage on the Construction Projects in Lae City, Papua New Guinea	Research Project -Completed
Caleb FUNUMARI	Effectiveness of Utilizing Sustainable Building Materials in Lae, Morobe Province, Papua New Guinea	Research Project Completed
Amanda KIAP	Effect of Communication Barriers on Project Success in Small Local Contractors in Lae, Morobe Province, Papua New Guinea	Research Project -Completed

Alba Peter	The Impact of Construction Project Workmanship on the Building Project Delivery in Lae, Papua New Guinea	Research Project -Completed
Bobby ROBERT	Understanding the impact of construction activities on the environment of Lae city.	Research Project -Completed
NEWMAN KERUA	Identifying the effective cost-saving approach of dormitory maintenance (Case study – PNG University of Technology - Lae – Male student accommodation)	Research Project -Completed
Willie LALO	Issues Causing Delay of Building Projects in Papua New Guinea University of Technology.	Research Project -Completed
Joel KERUA	Factors affecting cost overuns on construction projects in Papua New Guinea	Research Project -Completed
Kenneth JEFF	The Impact of Departments Workshop Redevelopment to Enhance Learning at the Papua New Guinea University of Technology	Research Project -Completed
Allan KUORO	Improving educational buildings accessibility for person living with disability at the Papua New Guinea University of Technology.	Research Project -Completed
Malipin PORAIKALI	The Effects of Motivation in Local Medium Sized Construction Companies in Enga Province	Research Project -Completed
Alpha PAMUNDA	The impacts of Covid-19 on Angau Memorial redevelopment project, Lae, Papua New Guinea	Research Project -Completed
Georgina PETER	The causes of delays of fully funded public construction projects in Papua New Guinea (case study – Imbongu district, Southern Highlands Province)	Research Project -Completed

DEPARTMENT OF BUSINESS STUDIES

Head of Department: Mr Mathew Kuusa

1 Introduction

The Department of Business Studies (DBS) is the largest Department among the thirteen academic departments of the Papua New Guinea University of Technology (PNGUOT), with approximately 700 undergraduate and postgraduate students, including Ph.D. and M. Phil students, EMBA, and MBA students each year. The DBS is a multidisciplinary department with a proven track record of producing national and Pacific regional leaders who have been instrumental in leading the private and public sectors for many years.

The DBS undergraduate programs consist of Bachelor of Business in Accounting (BBAC), Applied Economics (BBAE), Information Technology (BBIT), and Management (BBMA). The courses are designed to equip students to integrate the knowledge, skills, and values in their four years of study with actual business practices. The DBS also offers postgraduate programs, including Ph.D. 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 Masters in Business Administration (EMBA) program. In addition, the DBS is developing comprehensive postgraduate programs, including CPA-combined MBA, Master in IT, Accounting and Economics, and Ph.D. programs in Accounting and Management, which will be rolled out soon. All the programs of DBS are designed to drive PNGUoT's strategic visions and the government's development efforts, as well as push for regional and global competitiveness, innovation, and entrepreneurship in an increasingly complex business environment.

The DBS comprises national and international academics. They are dedicated, motivated, and committed to ensuring that quality standards are maintained with a focus on continuous innovation, entrepreneurship, and digital technology-centered teaching and learning through active participation in relevant industries and supporting memberships with professional associations. Research has been the cornerstone of the Department's commitment and is the driving force in producing quality graduates. This has cultivated a competitive research environment that complies with national and international research standards.

The DBS currently has the Research Centre of Big Data Analytics and Intelligent Systems (BAIS) (founded in 2015) and the Centre of Innovation and Entrepreneurship (CIE) (founded in 2019). Both centres provide the platform for research collaboration among national and international colleagues in the field of big data, big data analytics, AI, business intelligence, intelligent systems, innovation, and entrepreneurship. BAIS circulated the ITCS-BAIS Vol 7, Issues 1-4 to its members and beyond to share the state-of-the-art big data analytics, data science, AI, and intelligent systems in 2022. BAIS has its presence at https://www.researchgate.net/lab/Zhaohao-Sun-Lab. In 2022, BAIS published 4 Preprints on big data, AI, big data analytics, business intelligence, and intelligent systems at https://www.researchgate.net/profile/Zhaohao-Sun/publications, a few of which have been indexed by Google Scholar. BAIS has drawn increasing attention in international academia.

The DBS is working on building a PNG–China Centre of Business Studies, a PNG-Australia Centre of Governance and Policy Development, and a Student Centre of Digital Innovation.

The DBS's commitment to our students is evident in providing excellent learning opportunities aided by state-of-the-art ICT technology and support infrastructure. The Department strives for excellence in teaching/learning, research, consultancy, and services to the community combined with innovation and interaction technological expertise necessary for progress. Our faculty is fully committed and engages in research and development, focusing on understanding the dynamics and innovations that shape the volatile business environment.

The DBS collaborates closely with many overseas universities, including Federation University, Charles Sturt University, and James Cook University of Australia, Handong University of Korea, Hebei University of Science and Technology of China.

Research across the four main disciplines of the DBS, viz. Economics, Management, Information Technology, and Accounting is highly encouraged. The following research activities were undertaken by academic staff members in the Department of Business Studies during the 2022 Academic year: The report demonstrates that the number of peer-reviewed publications has increased generally. The report includes the publications of journal articles, books, book chapters, conference papers, and preprints. Many of them have been indexed by SCOPUS or ERA or ISI (SCI) or Google Scholar. Encouraging the academic staff's research passion and increasing the outcome of quality research considering SCOPUS, ERA, and SCI (WoS) is still a significant and lasting challenge for the DBS. Academic staff's research performance is an essential index for international or national accreditation of undergraduate and postgraduate programs, not only for teaching at universities.

2 Research of DBS

This Section consists of

2.1 Priority Areas of Research for Business Studies
2.2 Current ongoing Research Topics and Areas
2.3 Research Interests of DBS Staff

2.1 Priority Areas of Research for Business Studies

The priority research areas for the Department of Business Studies (DBS) are listed below. Topics are focused on all four Sections provided by individuals within the Section.

1. Agricultural Economics, as one of the subjects, needs to be given importance in the DBS curriculum as such.
2. Equally important is the development of the Economics and Financing of the Agro- based industries.
3. Developing the skill base of the informal workers, predominantly women in rural areas, through an on-line / off-line rather in a blended mode.
4. Developing Good Infrastructure: How the absence of it is a barrier for development?
5. Examining Women entrepreneurship more through co-operatives set up by augmenting the development through the Self-Help groups with seed money coming from the National Banks.
6. Gender Violence and Relations in the Development Process: An Eye Opener
7. ICT-enabled education and services: How to strengthen this at the UNITECH and PNG as a whole?
8. Financial Literacy and Financial Inclusion: The Way Forward

9. The Socio-economic status of the Working Population in the UNITECH settlement area
10. Human Capital and National Development
11. Marketing Management
12. Human Behaviour Management
13. Leadership Management
14. Sustainable practices for Small Business Management (SME)
15. Chain Management
16. Green Marketing
17. Green HRM
18. Carbon Emission and its impact on Cost of Capital on Mining industries in Papua New Guinea
19. Smart Beta Strategies as a driver/tool for reducing investment risks and performance on different investment portfolios
20. Passive and Active Stock Analysis
21. Black Market Economy
22. Tax as a catalyst to drive Papua New Guinea Economy- A Case study on Formal & Informal Sector
23. Resources Curse Nation – Papua New Guinea
24. Income Inequality in Papua New Guinea
25. Poverty in Papua New Guinea
26. Economic Development in Papua New Guinea
27. Big Data Analytics and Intelligent Systems
28. Big Data Analytics for SME Enterprise Services
29. Big Data Driven Socioeconomic Development
30. cloud computing, IOT, NOT & network security.
31. ICT (Mobile Devices, E-Commerce, Web, Cloud Computing, etc.) for SME Enterprise Services
32. Business analytics intelligence: Foundations and Applications

2.2 Current ongoing Research Topics and Areas

DBS academic staff members are undertaking the following research projects (Scholar name, research project).

1. Adimuthu, R., A Study on Quality of Work-Life (QWL) and its Influence on Job Satisfaction., Organizational Commitment and Overall Organizational Performance in the Premier Universities in PNG.
2. Adimuthu, R., A Comparative Study on Factors Influencing Sustainable Change Management Practices in Private and Public Sector Organizations in PNG
3. Adimuthu, R., Emotional Intelligence and its Factorial Influence on Effective Leadership in Improving Organizational Performance in Private Sector Organizations in PNG.
4. Adimuthu, R., A Study on the Factorial Influence on Sustainable Small Business Enterprises (SMEs) Practices in PNG
5. Bomoteng, B., Financing in Tertiary Education in PNG
6. Bomoteng, B., Managerial Accounting for Socio-Economic Development in PNG
7. Cosmas, I. and Sun, Z: cloud computing, IOT, NOT & network security.

8. Gipe, G., Key Measures, and Trends in Economic Development in Papua New Guinea
9. Gipe, G., Key Opportunities, Challengers and Enablers for Economic Development in PNG
10. Kuusa, M., The Impact of Tax Evasion on Revenue Collection in PNG.
11. Naro, R., Digitisation of PNG's Informal Economy: Table Markets and SMEs;
12. Naro, R., Preservation of Cultural Inheritance Through Digital Rights Management (DRM): Distributed Ledger Technology (DTL) Smart Contracts.
13. Naro, R., Feasibility Analysis of Policy Draft Via Datafication: PNG Context (Public Sector).
14. Sun, Z and Pambel, F., Big data driven Cybersecurity for securing citizen and society in PNG.
15. Viswanadham, N. Startup seed capital formation sources and its viability in the PNG Economy.
16. Viswanadham N., Does SMEs in PNG adopt IFRS and cash management models.
17. Viswanadham N., Tax policy and incentives towards Rural SME business a critical study.
18. Viswanadham N., Impact of management accounting practices on the manufacturing industry in PNG: A survey study.
19. Viswanadham, N., Kuusa, M., Root cause analysis of rural entrepreneurial finance policy failures.
20. Viswanadham, N, and Kuusa, M., Tax policies and Incentives towards rural business improvementViswanadham, N., Kuusa, K., & Bomoteng, B., Examine the importance of personal financial planning and financial literacy training towards improved personal savings in PNG
21. Yamarak, L., Acceptance, Perspectives, and Attitudes toward COVID-19 Vaccines in Papua New Guinea.
22. Yamarak, L., Strengthening Capacities to Investigate and Prosecute Trafficking Offences and Improve Protection and Direct Assistance for Victims of Trafficking.
23. Yamarak, L., "Pacific Perspectives on the World" project, which aimed "to learn from a cross- section of Pacific islanders about their perspectives on the world and their place in it and how other countries (notably Australia) can best contribute to their future." A DBS scholar is a lead researcher here at PNG University of Technology. This is research sponsored by Western Sydney University, with all the universities in PNG.
24. Yamarak, L., A Mining Perspective and a Case in Point of Porgera Mining Review on Project Appraisal of the One Hectare Model Nuclear Family Hybrid Cocoa Projects of the Yekora People in Morobe Sub-District, Huon District, 2022-2027

These ongoing research projects will lead to corresponding research outputs for DBS in 2023.

2.3 Research Interests of DBS Staff

The following table lists the current research interests of DBS Staff.

DBS Academic Staff Name	Research Interests
Abraham, Lulu Bokutoai	Education and Labour Economics, Fiscal Policy, Governance, Development Economics
Adimuthu, Ramasamy	Human Resource Development and Organisational Behaviour Management, Leadership Management, Management of SMEs and Change Management
Ambelye, John A.	Supply Chain challenges of Fresh food marketing in PNG, Manufacturing in PNG - supply chain challenges, Labour Productivity of Factory workers in Lae, PNG, Billboard advertising in PNG: effective ness and challenges.
Bomoteng, Bapa	Financing in Tertiary Education, Accounting in Government, Managerial Accounting and Decision Making.
Cosmas, Ian	Cyber Security, Artificial Intelligence, Cloud Computing
Geetha Rani Prakasam	Development Economics, Economics and Financing of Education, Digital Marketing; Gender Economics, Education and Development
Gipe, Gomi J	Economic Development in PNG, Development Economics, GDP and National Public Expenditure and their Impacts on Poverty in PNG, Income and Expenditure and their Impacts on Weight, Height and Body Mass Index (BMI)
Konafo, Ken	Small and Medium Enterprises, Online Marketing, Fresh Produce Marketing
Kuusa, Matthew	Black Economy, Accounting and Auditing Standards, Differential Reporting, Accounting Education, Training Needs of Accountants
Mali, Anna	Intangible assets, Managerial Accounting, Intelligent and Agile Risk Management, Aligning Technology, and Business Strategic Investments
Naro, Rodney	Cyber Security, Artificial Intelligence, Cloud Computing, network engineering and management
Pambel, Francisca & Sun, Zhaohao	Big data driven Cybersecurity for securing citizen and society in PNG
Pinjik, Paul	Organisational ICT Security Policy, Cyber Security
Prabhakar, Akhilesh Chandra	Sustainable and Inclusive Economic Development, Regional Economic Cooperation (Investment, Trade and Technology), Agricultural and Rural Development, Social Entrepreneurship Development, Macroeconomic

	Policy and Economic Development Related Issues and Challenges.
Sun, Zhaohao	Business Analytics and Big Data Analytics, Cyber Security, Data Science, Artificial Intelligence, Cloud Computing
Tiki, Samson	Forensic Accounting and Investigation, Anti-money Laundering and Regulation, Financial Inclusion and Sustainability, Financial Forensic and Business Intelligence
Vishwanadham, Nadiminti	Normalisation of FS, Managerial accounting, Behavioural Finance, SMEs taxation, Strategic Management
Yamarak, Londari	Population Growth and its impacts on Economics Development in PNG, Covid19 and Gender Inequality: Economics and social impacts. Impacts of gender discrimination on gender development and poverty in PNG, Mining Impacts in PNG, 2023 National Elections.

3 Research Publications of DBS

In 2022, the DBS published 3 books, 9 peer-reviewed (refereed) journal articles, 13 peer-reviewed book chapters, 8 peer-reviewed international conference proceedings papers, and 4 preprints.

3.1 Journal Articles Publications

[1]. Charles, S. R., & Viswanadham, N. (2022). Factors Affecting Consumer Health Care Services Delivery in Private Health Facilities: A Case of Kamanga Medics Hospital-Mwanza, International Journal of Engineering, Business And Management (IJEBM), 6 (2), 155-164, 10.22161/ijebm.6.2.13.

[2]. Geetha, R. P., & Jegan, A. (2022). Determinants of Aggregate Demand for and Supply of Higher Education in India, (co-authored), Modern Economy, 13, 1450-1470. https://doi.org/10.4236/me.2022.1311078.

[3]. Geetha, R. P. (2022). Provision and Financing of Higher Education across States in India: Does it Converge? Journal of Educational Planning and Administration, 36(2), 93-115. ISSN 0971-3859.

[4]. Daniel, E. M., & Viswanadham, N. (2022). Impact of Soft Drinks Advertisement on Consumers' buying Behavior, International Journal of Engineering, Business And Management(IJEBM), 6 (2), 144-154 , 10.22161/ijebm.6.2.12.

[5]. Pauline, E., & Viswanadham N, (2022). Effect of credit bureau and appraisal methods on performance of commercial banks in Mwanza region. International Journal of Engineering, Business and Management (IJEBM) ISSN: 2456-8678 [6(2)]. https://aipublications.com/uploads/issue_files/3IJEBM-MAR202210-Effectof.pdf.

[6]. Strang, K., & Sun, Z. (2022). ERP Staff versus AI Recruiters using Employment Real-Time Big Data, Discover Artificial Intelligence, Springer, 2(21) https://doi.org/10.1007/s44163-022-00037-1.

[7]. Sun, Z. (2022). Problem-based Computing and Analytics, International Journal of Future Computer and Communication (Singapore) 11 (3), 52-60. doi: 10.18178/ijfcc.2022.11.3.588.

[8]. Sun, Z. (2022). A mathematical theory of big data. Journal of Computer Science Research (Singapore) 4(2), 13-23. DOI: https://doi.org/10.30564/jcsr.v4i2.4646.

[9]. Victor, S. M., & Viswanadham, N. (2022). The Influence of Personal Factors on Consumer Purchasing Decisions of Selected Durable Goods in Mwanza city, Direct Journal of Management and Strategic Studies, 3(4), 70-77. ISSN: 2787-009X.

3.2 Book and book chapter publications

[1]. Adimuthu, R., Muduli, K., Ray, M., Singh, S., & Ahmad, T. S. T. (2022). Exploring the role of Industry 4.0 techniques for building a promising circular economy concept: manufacturing industry perspective. In Machine Learning Adoption in Blockchain-Based Intelligent Manufacturing (pp. 111-124). CRC Press.

[2]. Huo, Y., & Sun, Z. (2019). China's Socioeconomic Transformation: A Perspective of Grassroots, Lambert Academic Publishing (https://www.lap-publishing.com/), 192 pages, ISBN 978-620-0-27684-1 has been translated into Spanish, Italian, German, French and Portuguese Edition, For detail, see https://www.amazon.com/s?k=Zhaohao+Sun&i=stripbooks&dc&crid=E9K7O9DR7TQL&sprefix=zhaohao+sun%2Cstripbooks%2C57&ref=a9_asc_1.

[3]. Narongou, D., & Sun, Z. (2022). Big data analytics for smart airport management, in Sun Z & Wu Z (2022) Foundations and Applications of Intelligent Business Analytics (pp. 216-237). IGI-Global.

[4]. Narongou, D., & Sun, Z. (2022). Enhancing Airport Business Services Using Big Data Analytics, in Sun Z, Driving Socioeconomic Development with Big Data (pp. 104-127). IGI-Global.

[5]. Rath, K. C., Muduli, K., Das, R. P., Ramasamy, A., & Mohammed, A. (2022). Disruptive Technology-Enabled Circular Economy for Improving the Sustainability of the Supply Chain: A Case of an Emerging Economy. In Handbook of Research on Supply Chain Resiliency, Efficiency, and Visibility in the Post-Pandemic Era (pp. 335-351). IGI Global.

[6]. Saruma, A., & Viswanadham, N. (2022). The contribution of Promotional Strategies on product success: A case of Food products company limited. ISBN: 9781032322667, Taylor and Francis Group, UK, B, Chapter 14. https://www.taylorfrancis.com/chapters/edit/10.4324/9781003313663-14/contributions-promotional-strategies-product-success-case-jambo-food-products-company-limited-anitha-sarumal-viswanadham

[7]. Strang, K. D., & Sun, Z. (2022). Managerial Controversies in Artificial Intelligence and Big Data Analytics. In book: Research Anthology on Big Data Analytics, Architectures, and Applications (pp. 1745-1764). IGI-Global. DOI: 10.4018/978-1-6684-3662-2.ch085.

[8]. Stranieri, A., & Sun, Z. (2022). A Process-Oriented Framework for Regulating Artificial Intelligence Systems. in Sun Z & Wu Z (2022) Foundations and Applications of Intelligent Business Analytics (pp. 96-112). IGI-Global.

[9]. Sun, Z. (2022). A Service-Oriented Foundation for Big Data, In book: Research Anthology on Big Data Analytics, Architectures, and Applications (pp.869-887). IGI-Global. DOI: 10.4018/978-1-6684-3662-2.ch040.

[10]. Sun, Z. (2022). Big Data Driving Socio-economic Development: an interdisciplinary Approach. in Sun Z, Driving Socioeconomic Development with Big Data: Theories, Technologies, and Applications (pp.1-21). IGI-Global.

[11]. Sun, Z. (2022). Driving Socioeconomic Development with Big Data: Theories, Technologies, and Applications, IGI-Global. 401 pages.

[12]. Sun, Z. (2022). Preface, in Sun, Z., Driving Socioeconomic Development with Big Data: Theories, Technologies, and Applications (pp. xvii-xxv). IGI-Global.

[13]. Sun, Z., Pambel, F., & Wu, Z. (2022). The Elements of Intelligent Business Analytics: Principles, Techniques, and Tools, in Sun, Z., & Wu, Z. Handbook of Research on Foundations and Applications of Intelligent Business Analytics (pp. 1-20). IGI-Global.

[14]. Sun, Z., & Wu, Z. (2022). Handbook of Research on Foundations and Applications of Intelligent Business Analytics. IGI-Global. pp. 425 pages

[15]. Sun, Z., & Wu, Z. (2022). Preface, In Sun Z & Wu Z (2022) Foundations and Applications of Intelligent Business Analytics (pp. xvi-xxiv). IGI-Global.

[16]. Viswanadham, N., & Singh, A. (2022). Influence of digital issues on cloud based higher education quality, chapter 14. ISBN 9781032066134, Taylor and Francis Group UK. https://www.taylorfrancis.com/chapters/edit/10.1201/9781003203070-16/influence-digital-issues-cloud-based-higher-education-quality-viswanadham-aarti-singh.

3.3 Conference paper publications

[1]. Baptiste, L., Connor, A., & Yamarak, L. (2022). PNG Voices – Listening to Australia's closest neighbour – capacity building and development the Papua New Guinean way. ACFID National Conference 2022. ACFID National Conference 2022: Concurrent Session 2.16 - PNG Voices – Listening to Australia's (joyn-us.app)

[2]. Baptiste, L., Dom, L., & Yamarak, L. (2022). PNG Voices: perspective on Australia and the world: 2022 UPNG Update: PNG Update 2022 | Development Policy Centre (anu.edu.au).

[3]. Baptiste, L., Yamarak, L., and Sarvasy, H. (2022). PNG Voices: Listening to Australia's Closest Neighbour: Papua New Guinean Perspectives on Australia and the World. PNG Voices: Listening to Australia's Closest Neighbour - YouTube.

[4]. Kuusa, M., & Viswanadham, N. (2022) Tax policy and its Impact on Financial Inclusion in PNG. Presented at 9th Huon Seminar, August, PNG university of Technology, Lae.

[5]. Narongou, D., & Sun, Z. (2022) Driving Sustainable Airport Business with Big Data Analytics Services: A Multichannel Approach. The 6th International Conference on Big Data Research (ICBDR 2022), Aug. 10-12 (pp. 48-54). Harbin, China, ACM Proceedings.

[6]. Sun, Z., Strang, K. D., & Wu, Z. (2022) Driving Digital Services with Big Data Analytics. The 6th International Conference on Big Data Research (ICBDR 2022), Aug. 10-12 (pp. 42-27). Harbin, China, ACM Proceedings.

[7]. Yamarak, L. (2022). An investigation of the impacts of COVID-19 on livelihoods, food security and poverty in urban squatter settlements: a case in Point of Port Moresby and Lae City: PNG Update 2022 | Development Policy Centre (anu.edu.au).

[8]. Yamarak, L. (2022). Perceptions, acceptances, and attitudes towards COVID-19 vaccines: a case in point of Papua New Guinea: PNG Update 2022 | Development Policy Centre (anu.edu.au).

2.5. Working papers (Preprints) publications

4 working papers (preprints) have been published by DBS scholars. all of them were published at https://www.researchgate.net/profile/Zhaohao_Sun/publications (accessed 6 March 2022). all of them have been indexed by Google Scholar. Each of these has received a number of Reads by researchers worldwide. This is a new form of contribution to academia and industries of ICT and beyond globally (see the (m Reads) below, as of 6 March 2022).

[1]. Sun, Z. (2022). Hierarchy of Data and Intelligence: A Meta Approach, PNG UoT BAIS 7(1), 1-8.

[2]. Sun, Z. (2022). Problem Driven Computing: A Strategic Approach, PNG UoT BAIS 7(2), 1-9.

[3]. Sun, Z. (2022). A Research Methodology for Big Data Intelligence, PNG UoT BAIS 7(3), 1-8.

[4]. Sun, Z. (2022). Big Data, analytics intelligence, and Data Science, PNG UoT BAIS 7(4), 1-7.

3.4 Invited presentations.

1. Baptiste, L., Yamarak, L., Sarvasy, H., Dom, L. Z., Dono, I., Gipe, G. J., ... & Yakam, L. T. (2022). PNG Voices: Listening to Australia's Closest Neighbour: Papua New Guinean Perspectives on Australia and the World. PNG voices: listening to Australia's closest neighbour (apo.org.au). MVPs 2022.
2. Narongou, D. (2022). Driving Sustainable Airport Business with Big Data Analytics Services: A Multichannel Approach, for the 6th International Conference on Big Data Research (ICBDR 2022), Harbin, China, Aug. 10-12, 2022.
3. Geetha, P. (2022). "Digital Marketing in Papua New Guinea: Challenges and Prospects" at the PNGUoT Research Seminar on 11.10.2022 at the RK Foyer at the UNITECH, Lae.
4. Geetha, P. (2022). Served as a Chairperson for the last Plenary Session titled as Sustainable Technology, in the 9th Huon Seminar presented by Gina Koczberski, Senior Research Fellow Human Geography and George Curry, Professor of Research, Human Geography, School of Built Environment, Curtin University, Perth, Western Australia, Australia.
5. Geetha P. (2022). "Well-being in Lae City: Exploring its Relationship with Economic Factors" during 30-31st August 2022 in the 9th Huon Seminar at the Papua New Guinea University of Technology, Lae.
6. Geetha, P. (2022). "Digital Marketing in India" at the PNG University of Technology Research Seminar on 29.03.2022 at the RK Foyer at the UNITECH, Lae,
7. Geetha, P. (2022). "Education and Life Skills: Indian and International Perspectives" Conducted a one-day training and capacity building of the Senior Administrators of the University of Technology on the theme on 16.05.2022 at the RK Foyer at the UNITECH, Lae,
8. Geetha, P. (2022). an invited Guest Speaker on the International Women's Day, 8th March 2022, at the PNG University of Technology at the Duncan Hall, at the UNITECH, Lae.
9. Sun, Z. (2022). Driving Digital Services with Big Data Analytics for the 6th International Conference on Big Data Research (ICBDR 2022), Harbin, China, Aug. 10-12, 2022.

4 Research Grants Received

1. Sun, Z., 2022-2023 Research Project: Big data Analytics-Driven Socio-Economic Development in PNG, National Science and Technology Secretariat (PNG STS). PNG STS granted another K50,000.00 to PNG UoT.
2. Geetha, P. (2022). How digital marketing works in Papua New Guinea?
3. Geetha, P. (2022). The ICT Journey, the Enabler of E-commerce in PNG

4. Geetha, P. (2022). Digital Marketing in Papua New Guinea: Challenges and Prospects

5 HDR Student' Achievements and Supervisions

5.1 HDR Students

Mr. Bapa Bomoteng, A Ph.D. Student. His principal supervisor is Dr Viswanadham, N.
Mr. Desmond Narongou and Mr. Philip Fukatine, M.Phil. students. Their principal supervisor is Prof. Zhaohao Sun. Their applications for studying M. Phil. program in IT were approved by the Academic Board Meeting of UNITECH in November 2021.

6 Seminar Presentations

1. Geetha, P. (2022). did a series of DBS seminar presentations in the first semester of 2021 on the STATA statistical package. No other seminar presentations were organized by DBS in 2021 because of the pandemic of COVID-19.

7 National and International Outreach

2. Prof Sun, Z. collaborated with Professor Andrew Stranieri of Federation University Australia and Prof Zhiyou Wu of China and Prof Kenneth Trang of USA and developed several research papers on intelligent analytics and AI in 2022. A few of them have been published in 2022.
3. Prof Sun, Z. has been working on the Editorial Board of following International Journals.
   - Managing editor of PNG UoT interdisciplinary Journal.
   - Editor of Journal of New Mathematics and Natural Computation (http://www.worldscientific.com/worldscinet/nmnc). (SCOPUS, WoS indexed)
   - Editorial Review Board of Journal of Computer Information Systems (SCOPUS, WoS (i.e. SCI) indexed)
   - Associate Editor of Journal of Intelligent and Fuzzy Systems (SCOPUS, WoS indexed)
   - Associate Editor of International Journal of Systems and Service-Oriented Engineering (IJSSOE). (DBLP, ACM indexed)
   - Associate Editor of International Journal of Business Intelligence Research (http://www.igi-global.com/journal/international-journal-business-intelligence-research/1168).
   - Associate Editor of International Journal of Risk and Contingency Management (IJRCM).
4. As a member of PC, Prof Sun, Z. has been actively engaged in organizing international conferences including ICBDSC 2022 (Tokyo, Japan), ICE-B 2022, ICAART 2022, ACSW (and HIKM) 2022, ITS 2022, CARMA 2022, Spain etc. He has reviewed a number of papers for each of them.
5. Prof Sun, Z. was invited by CRC press (India and Australia) to review books: 1) Evolutionary techniques in Data Analytics & Cloud-based Applications and 2) Accounting Data Analytics and Business Intelligence. He provided the constructive comments to the Press and the authors.
6. Prof Sun, Z. provided following Services on the Editorial Board of International Journals: Journal of New Mathematics and Natural Computation (http://www.worldscientific.com/worldscinet/nmnc). (SCOPUS, WoS indexed), Journal of Computer Information Systems (SCOPUS, WoS (i.e. SCI) indexed, Journal

of Intelligent and Fuzzy Systems (SCOPUS, WoS indexed), International Journal of Systems and Service-Oriented Engineering (IJSSOE). (DBLP, ACM indexed), International Journal of Business Intelligence Research (http://www.igi-global.com/journal/international-journal-business-intelligence-research/1168)., International Journal of Risk and Contingency Management (IJRCM). He has reviewed papers for journals: JIFS (IoS), JSSOE & IBDR (IGI), JCIS (Tayler & Francis) Patterns (Elsevier) based on the invitation from the editors.

7.

8 Memberships of Professional Associations.

Prof Sun, Z. is a senior member of ACS, Australia, a member of IEEE, Member of ACM, A distinguished Member of AIS.

Mr Cosmas, I. is a member of IEEE.

DEPARTMENT OF CIVIL ENGINEERING

Head of Department: Dr. Revanuru Subramanyam

Introduction

The Civil Engineering Department offers a four-year undergraduate degree (UG) program, a two-year postgraduate program either by coursework or research, and PhD program within the campus. The UG program in the year 2022 was its final year of the accreditation process to the Washington Accord accrediting body through Engineers Australia. The postgraduate programs offered by course work in the Department are Master of Engineering in Civil Engineering and Master of Science in Solid Waste & Resource Management. The Department contains well-equipped laboratories and modernizing with the latest equipment and software.

The Department had 8 full-time academic staff (3 with PhDs, 2 doing part-time PhD, 3 with Master's Degree, and 2 doing MPhil) and 4 part-time faculties. There were 2 part-time PhD students, 3 MSc students in Solid Waste & Resource Management degrees, and 202 (46 in year 1, 59 in year 2, 45 in year 3, 52 in year 4) undergraduate students.

A. Area of Specialization of Department of Civil Engineering Academic Staff

Name	Position	Area of specialization
Dr Revanuru Subramanyam	Associate Professor	Environmental Engineering
Dr Mirzi Betasolo	Senior Lecturer	Environmental Engineering Structural Engineering Transportation Engineering Geotechnical Engineering Water Resources Engineering
Dr Alak Kumar Patra	Senior Lecturer	Environmental Engineering Structural Engineering Transportation Engineering
Mr Murray Konzang	Lecturer 2	Transportation Engineering Geotechnical Engineering
Ms Stephanie Konts	Lecturer 1	Water Resources Engineering
Mr Roboam Pebuar	Lecturer 1	Water Resources Engineering
Ms Grace Wantepe	Technical Instructor	Structural Engineering Water Resources Engineering

B. The PNGUoT Department of Civil Engineering's priority research areas:

- **Environmental Engineering**
  - Solid Waste Management
  - Water & Wastewater Testing and Treatment
  - Sediment Analysis to know Pollution Status of Rivers

- ❖ Design of water/sewage treatment systems
- ❖ Design of air pollution control systems
- ❖ Anaerobic Treatment
- ❖ Environmental Impact Assessment
- ❖ Recycling, waste to material resource
- ❖ Environment friendly structures

➢ **Structural Engineering**

- ❖ Investigation on composite and advanced composite materials
- ❖ Investigation on conventional and higher grades of steel, concrete, cement and timbers etc.
- ❖ Lightweight structures
- ❖ Structural damages due to earthquake.
- ❖ Earthquake resistance of structures and their components
- ❖ Structural Stability under thermo-mechanical loadings.
- ❖ Design of integrated buildings

➢ **Transportation Engineering**

- ❖ Traffic surveys & Design of roads
- ❖ Econometrics
- ❖ Bridge Assessment & Engineering

➢ **Geotechnical Engineering**

- ❖ Engineering properties of soil, slope stability, etc.
- ❖ Geosynthetic material

➢ **Water Resources Engineering**

- ❖ Aquifer stability, drinking water sustainability
- ❖ Impact of waves on structures
- ❖ Renewable energy

C. List of Journal Publications in Indexed journals.

1. Rachel Aisoli-Orake, Veronica Bue, Mary Aisi, Imelda Ambelye, **Mirzi Betasolo**, Tindi Nuru, Dora Kialo, Shamsul Akanda, Sogoing Denamo, Lydia Yalambing, Susan Gasson, Elizabeth Spencer, Christine Bruce & Nick Roberts (2022). Creating Sustainable networks to enhance women participation in higher education in Papua New Guinea. *Published online* 13 February 2022 https://doi.org/10.1080/1360080X.2022.2037267

D. List of Conferences

D.1 Paper Presented

2. Alex U'uto, Seko Peter, Alkie Joseph Itama, Bartsheba Ilau, Amato Isaro, Alex Nona, Bill Lata, & Mirzi Llego Betasolo (2022). Impact Assessment of Greening Civil Framework through project management. Book of Abstracts, 9th Huon Seminar. Theme: Embracing Science, Engineering and Sustainable Technology (SEST) to Mitigate Poverty in PNG. HS92022-HS-53. P 71. ISBN: 9980-56-026-6

3. Roboam Pebuar, & Mirzi Betasolo (2022). Design, analysis, optimization (DAO) of sustainable technology free energy pump (vacuum) for urban and rural use. *Book of Abstracts, 9th Huon Seminar. Theme: Embracing Science, Engineering and Sustainable Technology (SEST) to Mitigate Poverty in PNG. HS92022-HS-07*. P 44. ISBN: 9980-56-026-6
4. Zwever M Unatah, Deshaun Sephara, Ismael Zale, Gavoso Hasu, & Mirzi Betasolo (2022). Application of greening engineering framework (GEF) element one (PNG University of Technology Vision and Mission) to Assess 12/17 Sustainable Development Goals affecting pollution: A case of University Mess. *Book of Abstracts, 9th Huon Seminar. Theme: Embracing Science, Engineering and Sustainable Technology (SEST) to Mitigate Poverty in PNG. HS92022-HS-48*. P 67. ISBN: 9980-56-026-6

E. List of PhD students and their research topics.

Name of Student	Research Title	Supervisor
Mr. Chris Kobal PhD/2	Failure Modes in Wood Structures with Coconut Timber	Prof. Nicholas Lambrache & Dr. Mirzi Betasolo
Mr. Murray Konzang PhD/2	Optimization of Road Infrastructure in Momase Region (as an economic zone) by Econometrics Modelling	Dr. Mirzi Betasolo & Dr. Subruto

F. List of Postgraduate students and their research topics.

Name	Supervisor	Program	Research Title
Roboam Pebuar	Dr Mirzi Betasolo (Principal supervisor) Prof Nicholas Lambrache (co-supervisor)	MPhil/1	Analysis and Modelling Methodology Applied to the Design and Reliability Assessment of Structures in Coastal Engineering
Stephanie Konts	Dr Mirzi Betasolo	MPhil/1	Assessing the challenge on water supply and modelling for flexibility in existing and new water supply system: Case Study in Lae City, Papua New Guinea
Bomai Kobil	Dr Revanuru Subramanyam	MScWRM/2	Phytorenediation potential of native terrestial plants at Hidden Valley Mine Site, Morobe Province of Papua New Guinea

G. Final Year Undergraduate Research Projects.

Fourth-year BECV students undertake research work for partial fulfillment of the Bachelor's degree program in 2022 as is shown in Table below:

GROUP NO.	STUDENT NAME	TOPICS	SUPERVISORS
1	Thomas Ivarature Nathalie Korokoro	Econometrics studies for transport infrastructures in PNG	M Konzang
2	Jovey Nuknuk Nehemiah Kambong Robin Pawa Mathew Yuka	Survey and design of Hawi Water Supply in Kotte LLG, Finschhafen District, Morobe Province	M Konzang
3	Tauna Vele Kingsley Bala Ezekiel Torombe Jonah Lotepu	Survey and design of Hawi Creek Mini Hydro Power in Kotte LLG, Finschhafen District, Morobe Province	M Konzang
4	Janal Numapo Jesmah Kepou	Planning, design and development of Yalu Township	M Konzang
5	Stephanie Nomi James Woruzawa	Bumbu Road Expansion Studies in Lae City	M Konzang

	Faith Mirinu		
6	Annagrace Anis Julianne Gunarang	Design of water Supply System – Kupulga Rural WaSH project.	G. Wantepe
7	Belden Hombilemba Hesron Malio, Zachariah Timbi Brian Pung	Rural economy and transportation studies of Erap/Boana Road in Morobe Province – An Econometric Study	M Konzang
8	John Kawagle Peter Goma Yawa Kimin Junior Mann	Design of Tent City to Bumayong Road Upgrade and Seal	M Konzang
9	Brian Wala Blake Giyomwanauri	Optimum Design of Highrise Building in Seismic Risk Areas	Mr. Kobal
10	Richard Sauka Brendan Belden Herbert Nepa	Manufacturing of quality hallow bricks using locally available materials in Lae City	Dr. Subramanyam
11	Pricilla Ripa	Industrial waste management for Malahang Industrial Centre in Lae City	Dr. Subramanyam
12	Daniel Kapiri	Design of a 21m Span Single Lane Bailey Truss Bridge for Mai River, Wau/Bulolo Morobe Province	M Konzang

	Moi Raho John Kanamba		
13	Dennis Mombu Joshua Marus Nathaniel Eko	The causes of defects on rigid pavement in Lae City	M Konzang
14	Steven Isingi Newman Rimbao Jeff Thomas Bruno Danny	Optimisation of traffic management scheme of CBD Top Town, Lae City	M Konzang
15	Shepard Embo Tommy Kirilyo	Evaluation and improvement of public transport system in Lae City	M Konzang
16	Michael Gewepe Tonpi Tuwai	Design and analysis for pedestrian footbridge across DPI street crossing in Goroka Town, EHP	M Konzang
17	Chris Mana Luke Pitakoe Lloyd Lee	Design of Shore and bed protection structures using alternate material and methods of testing at Busama coastline	Dr. Betasolo
18	Ismael Koro Clement Lole	Tolukuma Mine access road pre-feasibility study and design, Nomina to Hafe, Kairuku District, Central Province	M Konzang

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Head of Department: Mr. George Wrondimi

Introduction

As concerns *teaching activities*, the Department offers a 4-year professional program that has two sections: A service-course sequence in English for Academic Purposes (EAP) for students across all disciplines of the University; and a professional Communication for Development (C4D) degree program designed to train liaison and community development and public relations officers for resource development companies, government departments, and non-government organizations. It also 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 master's degree in communication studies (MCS) program. This program has coursework and a dissertation component, where the students write a research paper on an appropriate topic in their final semester of the second year. In addition, a Master of Arts in Organizational Leadership is periodically offered in cooperation with Development Associates International (DAI), The Christian Leadership Training College of Papua New Guinea (CLTC), and the Pioneers of Australia.[1] Furthermore, the PhD and MPhil programs continue, with one graduate to date and one each currently enrolled.

As concerns *research activities*, the Department blends three broad academic strands (Language and Communication Studies, Sociology, and Communication for Development). Through its staff members, research is conducted 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

In Linguistics and Culture, the 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 interests 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, etc., as well as democracy and human rights, and HIV/AIDS.

[1] Now in suspension because of funding issues, currently undergoing revisioning with an eye to make its sustainable.

Both empirical (quantitative) or qualitative approaches to relevant topics are employed by our academics, with trans-disciplinary innovations (such as action research) encouraged. In addition, the Department publishes an international peer-reviewed organ, the *JCDS: Journal of Communication and Development Studies* under the editorship of Professor Gilder, 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 Interests**
Prof Dr *habil*. Dr Eric Gilder	Professor, Editor-in-Chief, *JCDS*	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 Garry Sali	Associate Professor	Sociology of crime and deviance, prison systems, crime and development, and law and order problems in PNG
Dr Steven Winduo (August-November, 2022)	Associate Professor	Writing, literary and cultural studies, Postcolonial literary criticism, ethnobotany, ethnoecology, and indigenous knowledge systems in Oceania, especially in Papua New Guinea
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
Michael Winuan	Lecturer II	English for Academic Purposes, Farming and community/national development
George Wrondimi	Lecturer II	Social work; social policy and planning; social mapping; community development
Imelda Ambelye	Lecturer I	Education and community empowerment (women and youth), natural resources (mining and other extractive industries) in PNG
Joshua Frank Kuri	Lecturer I	Language development and practices via bilingual education; practices and effects of communication across developing societies, Disaster and Risk Management, and Workplace Safety and Risk Management
Nagiob Jesse	Lecturer I	Engineering & Sustainable Development Practices, Research Methods & Skills, Workplace/Business Communication, Development Studies, Communication for Development. Socioeconomic Development Research, Strategic Planning, Implementation, Monitoring & Evaluation

Lucy Maino	Lecturer I	Participatory Development Communication (PDC) for engaging stakeholders (individuals, groups, and institutions) in socio-economic change processes, Participatory Social Mapping for community development, environment and agricultural innovation, and English for Academic Purposes(EAP)
Sheryl S. Makara (on study leave)	Lecturer I	Emotional intelligence and leadership, critical thinking, communication in crime and sociology with relations to development, community development and participation
Ruth Moka	Lecturer I	English for Academic Purposes, community development, Secondary education in PNG
Wilma Molus (on study leave)	Lecturer I	Sociology of children, sociology of deviance and crime
Adrian Sangundi	Lecturer I	English for Academic Purposes, collegiate debate
Joel Sefo	Lecturer I	English for Academic Purposes, student pedagogy
Starza Paul	Lecturer I	Journalism theory and practice; national development

Ongoing Community Partnership Projects:

Beginning in January 2020, the CDS Department at PNGUoT began a cooperation with the Wesleyan Bible College (WBC) in Mt Hagen, focusing on developing the (English-Language) Academic Writing Skills of theological instructors at WBC and partner theological schools, including Christian Union Bible College (CUBC), Christian Leaders Training College (CLTC) and others. Professor Eric Gilder, Dr Aisoli-Orake, and Ruth Moka have been involved in this program from the beginning, which started as a conversation of missionary Cheri and Don Floyd asking for specialist expertise in developing the program. The Department is engaged and committed to continuing this project as part of its community outreach and development mission, and trusts that sound; applicable action research can be generated by it. In 2022, Professor Gilder had given academic writing advice to Father Newton Ekoda, as he completed his Master's degree in theology at the Christian Leadership Training College, Mt. Hagen.

In May 2021, the CDS Department participated in a ground-breaking ceremony in Hamara Village at Kokoda (Oro Province) to establish a Community Resource Centre. This new partnership is another community outreach project of the Department jointly with the Agriculture Department at PNGUoT. It enables our final-year students to do their practical field attachments there to learn about the people's social/cultural activities and their general way of life, as well as enabling each student to give something back to the community, obtained by performing various activities for the village. These include: Engaging in participatory social mapping, resource and environment mapping, and performing a community needs analysis for

development efforts (all done under the close supervision of the subject coordinators in consultation with the village leaders and elders), among other activities.

Peer-Reviewed Publications:

Edited Book:

Florea, S., **Gilder, E.**, Florea, D. & Grunwald, R. (Eds.) (2022). *Representations of otherness in Romanian philological studies*. Berlin: Peter Lang, International Academic Publishers, 228 p.

Journal Publications:

Aisoli-Orake, R., Bue, V., Aisi, M., Ambelye, I., Betasolo, M., Nuru, T., Kialo, D., Akanda, S. Denano, S., Yalambing, L., Gasson, S., Spencer, E., Bruce, C. & Roberts, N. (2022). Creating sustainable networks to enhance women's participation in higher education in Papua New Guinea. *Journal of Higher Education Policy and Management* 44 (2): 208-20.

Avram, S. & Gilder, E. (2022). Is the pursuit of well-being and happiness possible in organizations under stress using the hybrid communication format? 2022, *Language, Culture and Change*, Vol. 3 "Communication vs Hybridization", (Editura Universităţii „Alexandru Ioan Cuza" din Iaşi): 9-20.

Scholarly Presentations:

Gilder, E. (2022). Special Guest Speech for "European Transforming Education Conference 'The Fostering of the Youth Transversal Skills in the new EU and in view of the UN SDG 2030 vision', 10th Anniversary of the International Honorary Chair "Jean Bart" (CIO-SUERD). Bucharest, Romania (online participation), 9 November.

Gilder, E. (2022). Invited Valedictory Speech for ICAIR conference, Sangam University, Bhilwara (Raj.), India (online participation), 8 October.

Post Graduate Certificate in Student-Centered Teaching (PGCSCT) 2022

Taught at the TLMU Center under the supervision of Prof Eric Gilder, the PGCSCT consisted of the following modules, offered to registered staff members at the University as an after-hours instructional course to nominated academic staff of the University: CD 511: LMS and Flipped Classroom (Dr Shoeb Ahmed Syed); CD 512: Project/Problem-Based Learning (Ms Dora Kialo); and, CD 513: International Trends in Higher Education Teaching and Learning (Ms Ruth Moka). Twelve (12) enrollees completed all subject requirements for the course and will thus obtain a PG Certificate in April 2023:

Last Name	**First Name**
Ame	Daniel
Dotaona	Ronnie
Helebi	Peter

Kelvin	David
Kifas	Vincent
Laki	Jim
Mali	Anna
Moripi	Leeroy
Peter	Seko
Sigil	Jeniffer
Sosanika	Gibson
Yaro	Jack

Postgraduate Research Supervision/Examining

External

Year	PhD Candidate	Research Title	Commission Member	Institution
2022	Ingrid RADU (Graduand)	The Kaleidoscope of Fantasy - A Multifocalised Perspective on the Fantastic Genre in the 21st Century	Prof Eric Gilder	Universitatea „Aurel Vlaicu" in Arad (Romania)
2022	Scott EASTMAN (Year IV)	Standardized Methodology for Implementing Applied Critical Geopolitical Discourse Analysis to Improve Forecast Accuracy	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2022	Ecaterina Lia ILIȘ (Year III)	An Overview of Critical Discourse Analysis: Conceptualization, Methods and Instruments	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2022	Iulia Sărbătoare STĂICUȚ (Year II)	Disseminating Extremism in Online Radicalization Discourse (2016 - 2021)	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2022	Nassir MORADI (Year III)	An Investigation of Metadiscourse Markers in "Suggestions for Further Research " of Ph.D Dissertations written in Applied Linguistics by Iranian and Romanian Doctoral postgraduates.	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2022	Daniela Matei (Șora) (Year I)	The three faces of Britain. A discourse analysis of Britain's National Identity: Pro –Brexit, Anti-Brexit Native-Born Nationals and Expatriate Muslims.	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)

Internal

CDS Department Postgraduate Supervision

Candidate	Program	Year	Supervisor(s)	Research Topic
Lucy MAINO (Began studies August 2022)	PhD	1	Dr Bue AG/A/Prof Winduo	Impacts of Integrated Development Approaches on the Livelihood of Rural People: A Case Study in the Oro Province of Papua New Guinea.
David GELA	PhD	3	Prof Gilder/Dr Aisoli-Orake	Effective Organizational Communication is a Tool to Drive Efficient Services: A Case Study

(Withdrew form studies Sept. 2022)				of Simbu Province in Papua New Guinea.
Michael AGUM (Began studies August 2022)	MPhil	1	Prof Gilder/Dr Aisoli-Orake	Evaluating the Current Practice of Social Mapping in Papua New Guinea.
Stephanie TRINGIN	MPhil	1	A/Prof Garry Sali/Dr Francis Essacu (UNRE)	Assessing the Process for Internal Accreditation of Academic Programs at PNG University of Natural Resources & Environment
Desley ALU	MCS	2 (late)	Dr Aisoli-Orake, Prof Gilder	The Impact of Morobe Provincial Education Department and The Teachers in Morobe Province of Papua New Guinea.
James YAWING	MCS	2 (late)	Ms Ambelye/ Dr Aisoli-Orake	Effects of High Illiteracy Rate of School-aged Children in the Rural Areas of Mumeng LLG, Bulolo District, Morobe Province, 2021: A Case Study.
Derrol BUGEN	MCS	2	Ms Ambelye/ Dr Aisoli-Orake	Assessing the Efficacy of Theoretical and Logical Frameworks Used in NGOs BCI Programs in Papua New Guinea
Bethelle KASIR	MCS	2	Prof Gilder/ Dr Aisoli-Orake	Challenges to Military Capabilities of the PNGDF Engineer Battalion, 2022. A Strategic Communication Approach.
Noah KILIP	MCS	2	A/Prof Sali/ Prof Gilder	A Study on White-Collar Crime as a Challenge towards Morobe Provincial Government Development Strategies: The Case of Governor's Office in 2020.
Linneth A. MANE	MCS	1	Dr Aisoli-Orake/ Ms Ambelye	The Challenges in Teaching English as a Second Language in Papua New Guinea (PNG): A Case study of Upper Secondary Schools Teachers in the National Capital District (NCD).
Elias MOKA	MCS	1	A/Prof Winduo/Dr Aisoli-Orake	Communication Strategies for Entrepreneurial Self-Reliance Projects in Papua New Guinea Educational Institutions: A Case Study for Educational Institutions in Lae, Morobe Province.
Tania PETER	MCS	1	Prof Gilder/Dr Aisoli-Orake	Assessing the key required competencies of public relation communication

				practitioners in PNG today: A survey of PR professionals employed by UN-accredited NGO's in Port Moresby.

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 MPhil and PhD scholars both the principal supervisor and co-supervisor are responsible but the former directs the research project.

Undergraduate Supervision

CD 423: Dissertation – Communication & Development

	Name	Supervisor	Dissertation Title
1.	**BENENG,** Brendon	Mr Jesse	An Assessment into Ahi Local Level Government Ward Development Planning committee's Capacity.
2.	**DOROGARI,** Tasma	Mrs Maino	Evaluating Sides Effects of Inadequate Protein on the growth of the adult Population in Ward 14 of Kokoda LLG, Sohe District in Oro Province.
3.	**ESROM,** Bianca	Mr Wrondimi	The Impact of Gender- Based Violence on Women's Economic Empowerment in Dauli Community, Hela Province.
4.	**FRANCIS,** Aitan Issau	Mr Yaro	Community Awareness on Coffee Berry Borer Pest: A Survey of local farmers in Sukapass village, Goroka, Eastern Highlands Province.
5.	**JING,** Valentine	Mrs Maino	The Challenges of Cocoa Production: A Case Study in Ward – 14 of Kokoda LLG (Hamara).
6.	**KALATE,** Naomi	Mr Sefo	The Negative Impacts caused due to the Lack of Education for Youths at Uni-Block Community.
7.	**KAVO,** Moses	Mrs Maino	The Effects of Development on Law and Order Stability: A Case Study of Hamara Village, Oro Province Papua New Guinea.
8.	**KAWAGE,** Otto	Mr Paul	Underlying Factors Affecting Eight (8) Students in Rural School from Continuing into High Schools: A Case Study of Hamara Primary School in Ward 14 of Kododa LLG, Oro Province.
9.	**KOTTSON,** Natasha	Mr Jesse	The Effects of Customary Land Tenure on Peri Urbanization Leads to High Challenges in Development Issues such as Lack of Clean Water and Sanitation: A Case Study of Bumbi Peri- Urban Suburb, Lae.
10.	**LUPISA,** Raymond	Mr Milba	Marriage is the Ultimate Foundation for as Strong, Stable and a Healthy Society: A Perspective of Wabag Urban – Ward 4 Council.
11.	**NANGOI,** Trisha	Ms Ambelye	Early Childhood Education is Paramount for Child Development. A Case Study of Wagang village, Lae Morobe Province.

12.	**NINJI,** Gabriella	Mr Wrondimi	Impact of the Internet on the Academic Performance, Social and Spiritual Values of Students. Impact of the Internet on the Academic Performance, Social and Spiritual Values of Students.
13.	**NIR,** Jemimah	Mr Sefo	The Effects of Settling Customary Land Dispute using the Land Dispute Settlement Act of 1975. A Comparative Case Study between Lae City and Mendi, Southern Highlands Province.
14.	**NIRU,** Joyce	Mr Milba	Economic Empowerment for Women And Girls In Papua New Guinea: An insight from Women's Economic Activity in Ward Six (6), Lae Urban (LLG)- Lae District, Morobe Province.
15.	**OLALAI,** Joy	Mr Winuan	Influence of Local PNG Music on the West New Britain Province. A Case Study on: Hoskins Secondary School and Poinini Catholic Agriculture and Technical Secondary School.
16.	**ORORI,** Melva	Mr Kuri	Factors Contributing to Youths in Hamara Village to Neglect Formal Education: A Case Study of Hamara Village in Ward 14. Kokoda LLG.
17.	**OSWYN,** Israel	Mr Yaro	Female Participation in the Extractive Industries: A Research Case Study on Assessing the Equal Participation in the Extractive Industries.
18.	**PA'AK,** Moses	Mrs Maino	Impediments to the Access to Primary Healthcare Services in Rural Areas: A Case Study of Hamara Ward 14, Kokoda LLG Sohe District in Oro Province.
19.	**PEMA,** Terence	Mr Sangundi	Investigation into Election Related Issues Affecting People's Livelihood in Lae District: A Case Study of Lae in 2022 National General Election.
20.	**RONNIE,** Mary	Mr Paul	The Causes and Effects of University Student's Academic Performance In Papua New Guinea.
21.	**SANGUNDI,** Libert	Mrs Moka	Assessing The Impacts Of Gambling on the Livelihood of People Living at 9- Mile Settlement in Port Moresby.
22.	**SILAS,** Mirriam	Mr Jesse	An Assessment of Student's Performance in Communication Skills. A Case Study of the Papua New Guinea University of Technology.
23.	**TANABI,** Asley	Dr Aisoli-Orake	How Mental Health Issues Can Affect Social Life & Academic Performance.
24.	**TOIARA,** Carolyne	Mrs Moka	The Effects of Clustered Housing on People's Health: A Case Study of Rapindik settlement.
25.	**TUMUN,** Georgina	Ms Ambelye	A Comparative Analysis of Polygamous Marriage in Traditional and Modern Society In PNG – A Case Study of Minj, Jiwaka Province.

26.	**WAFI,** Israel	Mr Sangundi	A Survey to identify and communicate the negative health effects of lack of exercise and how it affects the job performance of the Unitech Academic Staff, 2022.
27.	**WARTUPUA,** Liman	Professor Gilder	A Qualitative Descriptive Analysis of Kokopo Local Level Government Civil Servants' work Experiences with Ward Development Committees in reference to their Educational Level and Key Skills Competencies.

DEPARTMENT OF ELECTRICAL AND COMMUNICATION ENGINEERING

Head of Department: Dr Joseph Fisher

Introduction

Electrical and Communications Engineering is an engineering and technology-oriented field with many disciplines, such as power systems engineering, electronics, communications engineering, electromagnetics, control systems engineering, and computer engineering. It is a broad subject area and covers many other sub-disciplines, such as electric machines, power electronics, antennas and propagations, instrumentation and process control, mechatronics and robotics, industrial electronics, biomedical engineering, consumer electronics, sensors and measurements, and computer networking. The Electrical Communications Engineering Department offers undergraduate programs leading to a Bachelor Degree (Honors) in Electrical and postgraduate degree programs leading to a Master of Philosophy (MPhil) and the newly approved Master of Science (M.Sc.) in Communications Engineering. The Department also offers PhD program in Communications and Power Engineering.

The courses in Communications Engineering aim to deepen the theoretical knowledge, skills, and design concept to equip graduates in their professional work involving analysis, systems implementation, operation, production, and maintenance of various technologies. These technologies cover computer networking and routing, cellular services that include the Global System for Mobile (GSM) communications, Code Division Multiple Access (CDMA) protocols applied in 2G 3G, 4G, wireless communication, and the Long-Term Evolution (LTE). The LTE is a standard high-speed wireless communication technology that modern cellular devices such as 4G and 5G use in data transmissions. Further, the students study other technologies, such as radar and sonar, which are detection systems that use radio waves to determine the range, angle, or velocity of objects in the air or water. For example, radar systems are used to detect aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and geographical terrain mapping. The students also study computer networking and integration with intelligent electronic devices that drive the Internet of Things (IoT).

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 electrical equipment. An electrical grid delivers electricity from power stations to the load centers. The electrical grid is going through a drastic transformation into what is known as Smart Grids. The shift in traditional power systems grids to integrate renewable distributed generations significantly reduces carbon dioxide emissions and provides a secure and resilient power supply. The development of smart grid systems allows for two-way communications between the electric utility and its customers. The sensing along the transmission lines makes the grid more efficient, robust, and resilient to disruptions.

The Department of Electrical Engineering offers both undergraduate and postgraduate courses. The undergraduate courses cover mathematics and physics in addition to the core curriculum in either power engineering or communication engineering and other required electives. The program enables students to specialize in one of the following areas: Communication 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 numerous topics, building prototypes, undertaking simulation models, and presenting their work at the end of the academic year. The research projects are designed to trigger students' engineering curiosity and find new methodologies to foster innovative design

that employ the synergistic effect between design and innovation as the key to promoting engineering ingenuity.
Further, the ECE Department has a thriving postgraduate program comprising Masters of Philosophy by research, Master of Science in Communications Engineering by course work, and the PhD programs. The Department is proud to have two postgraduate students who are the recipients of the GAP scholarships awarded by the university through the Postgraduate School. Four candidates are enrolled in the PhD programs, and six students are undertaking Master's degrees. Four candidates have graduated with MPhil Degrees.

One of the key priority areas is the implementation and sustainability of staffing. The Electrical Engineering Department plans to have about 70% of the full academic carder to be filled by national staff members. The Department is focused on the next 10 years to have 90 % of national PhD degree holders who can work together, giving significant research leadership nationally and globally.
1.1 Further, the ECE Department is embarking on establishing a Computer Engineering program. The Department has advertised for Professors in Computer Engineering to assist in developing the courses and also recruit graduate students to supervise for Masters and PhD programs in 2024. The course will empower graduates with the knowledge and skills to find better solutions to challenges in the design, construction, and maintenance of software and hardware components of computing and computer-controlled devices, equipment, and systems. The outcome of this course is to develop, prototype, and test microchips, circuits, processors, conductors, and any other component used in computer devices or systems (e.g., supercomputers, smartphones, laptops, servers, IoT gadgets, Artificial Intelligence applications, etc.).
The ECE Department is diversifying its program to enroll students in its Diploma Courses under the Electrical Engineering Alternate Pathway Program (EEAPP). The program commenced in 2021 with over 100 students in Year 1 and Year 2 pursuing industry-based certifications under Cisco Academy. The Department will include the certified courses of Huawei Academy and City & Guilds (London). The EE-APP is an avenue for Gr. 12 school leavers who do not make it to Tertiary Institutions to pursue studies to reduce the unemployment rate. The Diploma course will also become a bridging program into the Degree courses in Power, Communications, and Computer Engineering. All academies have been assigned separate computer laboratory facilities. Cisco Academy is now in operation, while Huawei Academy will come into operation in July 2023. The ECE Department is currently working on the next academy to establish a City & Guilds Centre in the country through the PNG University of Technology City & Guild Centre. PNG University of Technology will have the right to operate as a centre for City and Guilds programs.

Our 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.

Our Values

In pursuit of our vision, we will be guided by the following values:

- Providing equal opportunity for education to students in Electrical and Communication Engineering through academic merit and character
- Developing and maintaining a partnership with industries, professional groups, and other educational and research institutions at both national and international levels
- Encouraging a climate of transparency, fairness, and cooperation among the staff members and the students.
- Practicing sustainable use of resources

- Fostering an ethical workplace environment.

Expected Staff Profile

We expect a reduced workload to enable quality teaching outputs. Given the vast number of enrolments, we require more staff. Staff must also undertake further training and qualifications to enhance knowledge and skills. The staff members are expected to be:

- academically qualified to deliver quality knowledge and skills
- respectable professionals in their specialized research areas
- reflective practitioners
- active team members
- more approachable
- humane and empathetic

Expected Graduate Profile

The Department of Electrical & Communication Engineering expects to produce graduates who will be competitive in labour markets. The ECE graduates are expected to be:

- knowledgeable and skilled in electrical and communication engineering
- technologically competent
- scientifically and numerically literate
- more creative through innovations and inventions
- useful to society in creating employment
- critical and analytical thinkers in solving problems
- life-long learners
- ethical and responsible members of the community

Academic Priorities

The major **academic priorities** are:

1. Integrate Research with Teaching and Learning
2. Connecting the academics with the community for its service
3. Make teaching and learning processes compatible with the industry
4. Recruitment and retainment of the best talents nationally and internationally academic staff
5. **Staff research area are tabulated below**.

Professor Paul Hoole	Artificial Intelligence in engineering systems, Sensors including antennas, Lightning engineering, electromagnetic signals in safety and security systems, 5G/6G wireless technology for smart cities.
Dr Ashish kr. Luhach	Soft Computing, Networks, Sustainable Computing, and Cyber Physical systems.
Dr Joseph Fisher	Interactions of Lightning with Aircraft and Structures, Power System Analysis, Power Electronics and Machines, Wind Energy Design, Photovoltaic Systems Design, Micro/Mini-Hydro Electric Power Design, Transmission/Distribution Line Design, Energy Audit, and Energy Efficiency Technologies

Mr Sammy Aiau	Control Systems Engineering, Industrial Process Control, Electrical Power Systems, Renewable Energy (hydro, solar & wind), Smart Grids Energy Management, Virtual (Smart) Instrumentation Systems
Mr Herman Kunsei	Adaptive Array Antenna Systems for 5G and 6G Networks, Electromagnetic Health Hazards, Propagation Measurements for Wireless Systems, Computer Network Security, Reliability in Networks, and Data Security
Mr Gibson Kupale	Technical & non-technical losses in Power Systems, Power System Protections, Renewable energy systems, and Distributed Renewable Energy Generation. System Reliability & Security, and Field Excitation & Governor Control
Mr David Chen	Big Data Processing, Compiler Design, Internet of Things, Wireless Networking and Signal Processing, Hardware Design, Data and Network Security, Business Process Modelling, Knowledge Management, and e-Learning.
Mr Joshua Yuanko	Optimization and Auto Scheduling Algorithms, Power Flow Control and Automatic Topology Reconfiguration, Power Systems Static and Dynamic Reliability, Grid Connected PV Plant Design and Modelling, Instrumentation and Microcontroller electronics.

Postgraduate Research Areas

The major research areas undertaken at the postgraduate level include the following:

(i) Electric Power Systems,
(ii) Renewable Electric Energy Sources, and
(iii) Advanced Wireless Technology.

Progress of Postgraduate Research

Researcher's Name	Degree	Research Title	Status
Mr. David Chen	PhD	Robotic Arm on Open Source Platforms	In progress
Mr. Sammy Aiau	PhD	Renewable Energy Sources for Morobe Province and Future National Smart Grid for PNG	In progress
Mr Gibson Kupale	PhD	Challenges in PNG Electricity Network Security and Reliability Trends	In progress
Mr. Herman Kunsei	PhD	Using Perception ANN with Different Triggering Functions for Linear and Non-linear Array Arrangements	In progress
Mr Sylvester Tyrones	MPhil	Design of Microcontrollers Based Smart Battery Management System Enhancement for Off-grid Remote Homes	Graduated
Charlie Urame	MPhil	Design and Implementation of Hybrid Pico-hydro – Photovoltaic Solar Power Plant in Massy-Gahuku LLG.	In progress
Mr Mathew Pua	MPhil	Rural District Electrifications with PV/Diesel Integrated System.	Graduated
Mr Issiah Koldai	MPhil	Design of Renewable Energy Based Micro-grid for Rural Electrification: A case study on Salamua LLG Centre.	Graduated
Mr. Wilson Kepa	MPhil	Design of GSM Based Remote Distribution Transformer Condition Monitoring System	Graduated

Ms Serah Mako	MPhil	Analysis of Signal Strength and Bandwidth for Enhancement of Quality of Service in PNG University of Technology	In progress
Ms Jacqueline Tantapua	MPhil	Interference Mitigation in Wireless Networks Co-ordinated MultiPoint Transmission Techniques (CoMP)	In progress
Ms Olive Antonio	MPhil	Wireless IoT Application in Healthcare in PNG	In progress
Mr Benjamin Tigom	M. E. Comm, Eng	High Speed Digital Signal Processing Applications	In progress
Mr Ernest Pokau	MPhil	Dual System UAV and the payload is the Image Processing system using the Cellular Network	In progress

List of Final Year Undergraduate Research Topics undertaken in 2022.

Project Leader	Project Team Members	Project Title	Undergraduate Students
Professor P Hoole	Mr Herman Kunsei	Signal Canceller and Interference free landing for Aircraft in 5G Wireless Communication Environment	Nelma KOKO for smart antenna on aircraft radar Benjamin AMAKUA for smart antenna on land 5G systems
Professor P Hoole	Dr Joseph Fisher Mr Herman Kunsei	Lightning Flash surges and protection of the PNG Power Grid and Telecommunication Installations	Samantha MELYE for lightning surges on power lines Mercier MOREA for lightning surges on telecommunications installations
Professor P Hoole	Mr Charlie Urame	DC Microgrid: The Voltage-Time Stability and Power Demand-Supply Response of a Pico Hydroelectric-Photovoltaic Renewable Energy Electric Power Generation	Nathan YASI Electronic Systems Modelling Blesseth NETE Apparatus/generator model for simulation studies and design
Professor P Hoole	Dr Joseph Fisher	Aircraft CFC body and power cables thinly coated or interference with communication systems.	Francisco SIWA
Mr David Chen		Design and develop a centralized identity server for user authentication and authorization based on the OAuth and OpenID standards	Emmanuel TUPIGO Patricia APENG Jacob TOMON
Mr David Chen		Smart class attendance registration using AI methods	Jofru KIOPA
Mr David Chen		GPS Truck Tracker via Android Mobile Phone	Dian IPU Chris KABAURU
Mr David Chen		Smart class attendance registration using AI methods	Jofru KIOPA
Mr Gibson Kupale		Designing transmission line HV/LV and calculating line losses for Gatop to Kalalo, Kabwum district	Eloi SEI McDuell Arsao
Mr Gibson Kupale		Challenges in PNG Electricity Network Reliability and Security	Bonny JAMES
Mr Matthew Pua		Induction Motor Fault Diagnosis using PLC & SCADA	Richard POMU Albin YAKOP Peniel IJAPE

Mr Sammy Aiau		Evaluation of the Potential of Large Scale Photovoltaic Power Generation for Rural Electrification in Papua New Guinea	Joseph Jnr YEOU Millen TOPIE Elvis NERI
Mr Joshua Yuanko		Model and Implement Prototype of Industrial Instrumentation and Process Control Network for EE312 Laboratory	Collen ROFUNDUO Joseph KEREGI Alex VARTIR Hinscliff SAULAI
Mr James Dugumari	Mr Lolong Bonner	Simple Quality-Controlled Portable Drying System for Rural Farmers	Isreal MALANGTON Juncii MARK
Dr. Joseph Fisher		Grid Power Distribution expansion to Rural Areas Through Existing Road Networks	Courtney REUPANA Derek GIBSON
Dr. Joseph Fisher		Transmission Line Network Design for Interconnection of Ramu Grid and POM Grid via Southern Highlands and Gulf	Ricky EMBO Justin BETO Joel PALUS
Ms Rani Maeoaka		Design a Suitable Power Converter Assembly for a Grid Connected to a 9MW Solar Power Station.	Jacob PILGA Brian GERRY
Mr. Wilson Kepa		Design and Implementation of Battery Based Off-grid Micro-hydro Power System	Benson SIMON Ashley TABOGANI

List of Publications

Journals

Ajij, M., Pratihar, S., Luhach, A. K., & Roy, D. S. (2022). A Quasistraight Line Routing Protocol for Square Grid-Based Wireless Sensor Networks. *Wireless Communications and Mobile Computing*, *2022*.

Arora, S., Batra, I., Malik, A., Luhach, A. K., Alnumay, W. S., & Chatterjee, P. (2023). Seed: secure and energy efficient data-collection method for IoT network. *Multimedia Tools and Applications*, *82*(2), 3139-3153.

Chanda, S., Luhach, A. K., Alnumay, W., Sengupta, I., & Roy, D. S. (2022). A lightweight device-level Public Key Infrastructure with DRAM based Physical Unclonable Function (PUF) for secure cyber physical systems. *Computer Communications*, *190*, 87-98.

Choudhury, S., Luhach, A. K., Alnumay, W., Pradhan, B., & Roy, D. S. (2022). A neuro evolutionary scheme for improved IoT energy efficiency in smart cities. *Computers and Electrical Engineering*, *104*, 108443.

Mohanraj, G., Mohanraj, V., Marimuthu, M., Sathiyamoorthi, V., Luhach, A. K., & Kumar, S. (2022). Epidemic Prediction using Machine Learning and Deep Learning Models on COVID-19 Data. *JOURNAL OF EXPERIMENTAL & THEORETICAL ARTIFICIAL INTELLIGENCE*.

Pirapaharan, K., Ajithkumar, N., Sarujan, K., Fernando, X., & Hoole, P. R. (2022). Smart, Fast, and Low Memory Beam-Steering Antenna Configurations for 5G and Future Wireless Systems. *Electronics*, *11*(17), 2658.

Reddy, K. H. K., Luhach, A. K., Kumar, V. V., Pratihar, S., Kumar, D., & Roy, D. S. (2022). Towards energy efficient Smart city services: A software defined resource management scheme for data centers. *Sustainable Computing: Informatics and Systems*, *35*, 100776.

Sankar, S., Ramasubbareddy, S., Luhach, A. K., alnumay, W. S., & Chatterjee, P. (2022). NCCLA: new caledonian crow learning algorithm-based cluster head selection for Internet of Things in smart cities. *Journal of Ambient Intelligence and Humanized Computing*, *13*(10), 4651-4661.

Book Chapter

Fisher, J., Hoole, P. R., Pirapaharan, K., & Hoole, S. R. (2022). Lightning Electrodynamics: Electric Power Systems and Aircraft. *Lightning Engineering: Physics, Computer-based Test-bed, Protection of Ground and Airborne Systems*, 233-288.

Pirapaharan, K., Hoole, P. R. P., Kunsei, H., Senthilkumar, K. S., & Hoole, S. R. H. (2022). A New Smart Antenna for 5/6G Wireless Systems: Narrow 360 Steerable Beam With No Reflectors. In *Smart Antennas and Electromagnetic Signal Processing in Advanced Wireless Technology* (pp. 147-165). River Publishers.

Hoole, P. R., Fisher, J., & Hoole, S. U. R. (2022). Thunderstorms and Pre-lightning Electrostatics. In *Lightning Engineering: Physics, Computer-based Test-bed, Protection of Ground and Airborne Systems* (pp. 51-83). Cham: Springer International Publishing.

Book

Hoole, P. R. (2022). *Smart Antennas and Electromagnetic Signal Processing in Advanced Wireless Technology*. CRC Press.

Singal, A., Kumar, S., Singh, S., & Luhach, A. K. (Eds.). (2022). Wireless Communication with Artificial Intelligence: Emerging Trends and Applications. CRC Press

Conference Paper

Lambrache, N., Chen, D., Fisher, J., Olaru, L., & Ndrelan, B. (2022). Control of 5 Degrees of Freedom Robotic Arm on Arduino Mega Platform. *Proceedings of the 5th European International Conference on Industrial Engineering and Operational Management*,' Rome, Italy, July 26th -28th, 2022.

Lambrache, N., Chen, D., Fisher, J., Olaru., L, & Ndrelan, B. (2022). 'Forward and Inverse of a Robot Arm on Arduino Platform,' *Proceedings of the 5th European International Conference on Industrial Engineering and Operational Management*,' Rome, Italy, July 26th -28th, 2022.

Pua, M., Luhach, A., & Fisher, J. (2022). Analysis of Micro-Grids with Diverse Distributed Energy Resources using Genetic Algorithm. *International Conference on Evolutionary Manufacturing, Design, and Operational Practices for Sustainability (ICEMDOPS-2022)* India, 15th -17th December 2022.

DEPARTMENT OF FORESTRY

Head of Department: Dr. Cossey Yosi

Introduction

The Department of Forestry (DoF) at the PNG University of Technology (PNGUT) sits on the land of the Ahi People, and they are recognized. The DoF is the only institution in the South Pacific region that offers training courses in tropical forestry at the professional level. The University's DoF has integrated degree and diploma curricula offered at the Taraka and Bulolo campuses, respectively. The Bulolo University Campus (BUC) houses the *three-year* course leading to Diploma in Forestry (DF), and the Taraka campus houses the *four-year* course leading to the Bachelor of Science in Forestry (BScF). The Bachelor of Forest Management in Forestry (BFM) is now taking place at the Bulolo campus in semester one of 2023 with no more intake of students for the diploma program.

The Mission Statement of the DoF is *"Recognizing the capacity of forests to generate large number of jobs for a given level of investment, the DoF at PNGUT was established to produce professionals, both men and women, with technical production skills and expertise needed to manage PNG's 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 DoF aims to provide high-quality academic and administrative support services not only for undergraduates but with an increasing focus on training postgraduate students too. Our postgraduate program continues and further develops research skills that our undergraduate students begin learning through the third-year courses (especially 'Experimental Design'), culminating in the fourth-year (Final Year Research Project).

Our overall educational challenge in forestry is to produce professionals, both men, and women, with the necessary technical skills. The ability to solve problems is the paramount objective among these. One, in particular, is to develop a problem-solving capacity that our department's research activities fundamentally fit into our educational mission. Therefore, to achieve this goal, the DoF requires that the faculty themselves are well versed in research and able to apply that knowledge through active research projects and programs.

The National General Election (NGE) around the Lae district in June slightly interrupted the University's 2022 academic year, but the academic year ended very well. The DoF Five-Year Strategic Plan guides the progress of research activities at the DoF in the 2022 academic year. This plan is our first departmental articulation of the strategies and mechanisms by which we hope to enhance our department's research activity component. The plan also points out some significant constraints in attaining our objectives. These constraints are to succeed at the university level. With the uncertainties due to Covid-19, the DoF still recognizes the University's overall PNGUT Vision statement: "*To* Grow *World Class Technocrats for the Real World by 2024 and beyond."* This is in line with the implementation of the University's Strategic Plan 2020-2024. The DoF will continue to implement its academic and research activities at the departmental level, thereby contributing to the University's overall Strategic Plan in 2022 and beyond.

FOREST/FORESTRY RESEARCH THEMES

The DoF has so far recognized the multi-faceted value of Papua New Guinea's forests and, over the years, has slotted this into its academic and research programs. Sustainable forestry in PNG requires a cross-disciplinary approach, which means blending aspects of the economy, social features, environmental services, and climate change. Accordingly, the DoF has established its Research Development Plan and Post Graduate Study Program around a number of specific research themes. These are as follows:

- Ecosystem and Environmental Services.
- Sustainable Forest Management.
- Forest Biology, Ecology, and 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 Products and Industries/Utilization.
- Forest Engineering.
- Forest Policy, Economics, and Forest Product Marketing.
- Appropriate Technology.
- Remote Sensing and Geographic Information Systems.
- Biomass Energy.

The DoF has 19 academic staff in its capacity to deliver lectures and carry out research in the academic year 2022 (Table 1). However, one staff member from the Bulolo campus has resigned, while two staff members from the Taraka campus are on long-term study leave in the country and overseas.

SUMMARY OF FACULTY MEMBERS 2022

In 2022, Forestry Department had 19 Academic Staff (Table 1).

Table 1: Academic Staff at Forestry Department (Taraka Campus and BUC)

Name	Position	Research Interests
Dr. Cossey Yosi	HoD and Senior Lecturer	Tropical Forests Dynamics; Natural Forests Management; Forest Policy, Law and Legality; Natural Forest Silviculture; Forest Sampling; Payment for Forest Ecosystem Services; Climate Change and REDD+; Social and Community Forestry; Forest Certification; Environmental Impact Studies.
Mr. Peter Edwin (still on study-leave in country)	Lecturer 2	Wood Science and Technology; Forest Management.
Mr. Haron Jeremiah	DHoD & Lecturer 2	Forest Economics and Marketing.
Mr. Diaiti Zure (still on study-leave overseas)	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.
Mr. Leonard Wana	Lecturer 1	Forest Inventory and Geographic Information Systems.
Mr. Billy Bau	Lecturer 2 Curator – Herbarium	Plant Botany; Herbarium Curation; Plant Taxonomy; Botanical Collection with Ecological and Biodiversity studies.

Mr. Eko Maiguo*	Principal Bulolo University College & Lecturer 2	Silviculture and Forest Management.
Mr. Louis Veisami*	Lecturer 1	Forest Mensuration and Inventory.
Mr. Benson Gusamo*	Lecturer 2	Wood Science and Technology, Forest Products and Industries, Non-timber Forest Products, Bio-energy, Forest Protection, Timber Business and SMEs.
Mr. Bazakie Baput*	Lecturer 1	Community Forestry, Agro forestry and Forest Ecology.
Mr. Olo Gebia*	Lecturer 1	Forest Ecology and Plant Biology; Forest Biodiversity.
Mr. Tombo Warra* (on study leave in country)	Technical Instructor 1	Plant Eco-physiology and Conservation Ecology.
Mr. John Beko*	Lecturer 1	Silviculture and Plant Propagation.
Miss Pricilla Menin*	Technical Instructor 1	Community Forestry, Communities Response on Forest Plantation and Projects.
Mr. Leonard Hansutan*	Technical Instructor 1	Phytoremediation - Plant/soil and Toxic Chemical Relationship.

ON-GOING RESEARCH PROGRAMS IN THE DEPARTMENT - 2022

The DoF has several ongoing research activities (Table 2). The status indicates whether the research activity was active as of 2022 or is an ongoing research study. The ongoing research studies are mainly those that are done on a long-term basis. Most of which are collaborative research projects and are being funded by external agencies. Postgraduate research projects are undertaken by DoF staff members on study leave.

The DoF and the Insect Farming and Trading Agency (IFTA) had a collaboration with the Japanese Broadcasting Corporation (NHK) in Bulolo, Morobe Province. The NHK was filming PNG's selected insect species. The outcome of this work will be broadcasted on the NHK Television channel in early 2023 in Japan.

Figure 1. The members of the Japanese Broadcasting Corporation setting up video camera in the field.

Table 1. On-going Research Programs in the Forestry Department – 2022.

GENERAL THEME	RESEARCH PROJECT / TOPICS	PRINCIPAL INVESTIGATOR	2022 STATUS
1. Ecosystem and Environmental Services	1. 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	Completed, paper presented in Huon Seminar in August 2022.
2. Sustainable Forest Management	1. Estimating Exploitations Factors associated with Annual Allowable Cut (AAC) in timber concessions in PNG.	C. Yosi	First component completed. Final report submitted to ACIAR in 2022. Second component funded by Unitech Research Fund and study is in progress

3. Forest Biology, Ecology & Biodiversity	1. New Guinea species of Ficus in section Malvanthera (Moraceae). 2. Investigating Dynamics and Characterization of Biodiversity, Ecology, and Soil physical attributes within the natural green break forests of Bulolo Plantation, Morobe Province in PNG. 3. Fern Species Richness and Diversity in the Forest Ecosystems of Papua New Guinea. 4. Seed Conservation of trees in Papua New Guinea Tropical Rainforests	B. Bau O. Gebia, S. Aguadi and M. Karikara G. Sosanika G. Sosanika	Paper presented in the 2021 ASBS Virtual Conference. Manuscript prepared for submission to Australian Systematic Botany Society. Work still in progress. Preliminary results presented in BUC internal Seminar. Paper published: See this link *https://online.ucpress.edu/cse/article-abstract/6/1/1696511/168658/Fern-Species-Richness-and-Diversity-in-the-Forest?redirectedFrom=fulltext* Online database established in 2018. Work still in progress.
7. Silviculture, including Reforestation and Plantation Management.	1. Validating model developed to estimate volume from weight of Klinkii logs in Bulolo pine plantations.	L. Veisami & E. Maiguo	Work still in progress
	1. Evaluating treatability of 28 plantation and secondary forest wood species of Papua New Guinea. "A Comparative Evaluation of Combustion Characteristics of *Araucaria cunninghamii*, *Intsia bijuga*	B. Gusamo & K. Towalis	Paper published: See this link *https://www.mdpi.com/1999-4907/13/4/563/pdf*

	and *Pometia pinnata* for Bio-Energy Source"		

POSTGRADUATE RESEARCH PROJECTS IN 2022

The DoF had on record five (5) postgraduate research studies being undertaken in 2022. There are two PhD research projects and three MPhil research projects in the postgraduate program. One of the MPhil research projects is now at the final stages of thesis submission, with an extension given to the student (Table 3). Students in collaboration with the New Guinea Binatang Research Center (BRC), undertook most of these studies.

Toward the end of 2022, three of the postgraduate students, two MPhil students and one PhD student did their proposal presentations to the DoF, and its industry stakeholders in a department-organized postgraduate seminar. Only one PhD postgraduate research proposal was not presented due to the unavailability of the concerned student.

As usual, the fourth-year student projects were very diverse in 2022 in terms of their research topics. The topics ranged from the forestry research themes of the DoF. There were 27 student project presentations on the various topics of research (Table 4). The academic staff members from the Taraka and Bulolo campuses jointly supervised these projects and their presentations took place at the Taraka campus at the end of the second semester in 2022.

Table 2. Postgraduate Research Projects in 2022.

NO.	STUDENT NAME	PG CODE	THESIS / RESEARCH TOPIC	PRINCIPAL SUPERVISOR	EXTERNAL SUPERVISOR	2022 STATUS
1	Nathan WAMPE	MPhil 2	Causes and motivation of Anthropogenic Grassland Fires in the Ramu-Markham valleys	Dr. Cossey Yosi	TBC	No progress report submitted in 2022.
2	Ben RULI	MPhil/2	Interlinkages between logging, forest conservation, health, well-being, and livelihoods in PNG and tropical forests globally.	Dr. Cossey Yosi	Dr. Jo Middleton and Prof. Vojtech Novotny	Research study extended and continuing into 2023
3	Cassey UVAU	MPhil/2	Plant- Caterpillar Interactions in a primary lowland forest of New Guinea.	Dr. Cossey Yosi	Prof. Vojtech Novotny	Study continuing
4	June MANDAWALI	MPhil/2	The social and cultural influences on Sustainable Forest Management in indigenous forest communities in Papua New Guinea.	Dr. Cossey Yosi	TBC	Study continuing
5	Hayden WAGIA	PhD/2	The effect of 20-years El Nino extreme on the dynamics of lowland tropical rainforest in Papua New Guinea.	Late Dr. M. Peki and now Dr. C. Yosi		Study incomplete but upgraded to PhD and continuing.
6	Russel TARUTIA	PhD/1	Deep Learning (AI) and Drones: A New Approach to Monitoring Forest Health on Plantations in PNG.	Dr. Cossey Yosi	Dr. Sailesh Samanta	Study suspended

UNDERGRADUATE RESEARCH PROJECTS IN 2022

Table 3. Final Year Student Research Projects.

No.	Student Name	Title	Principal Supervisor	External Supervisor(s)
1	Lawrence Seken	Diversity of termites infesting *Araucaria cunninghamii* in Bulolo Forestry plantation, Morobe Province, Papua New Guinea.	Mr. B. Bau	Mr. B. Gusamo
2	Rolf Pahren	Effects of neem leaf solution on rust and powdery impacts to *Araucaria* seedlings.	Mr. B. Bau	Mr. B. Gusamo
3	Clyde Nuga	Evaluation of anti-termite activity of three natural plant extracts in treated Hoop Pine and Bamboo Woods.	Mr. B. Gusamo	TBC
4	Jacklyn Wanpa	Induction of callus on leaves of Agarwood (*Aquilaria* and *Gyrinops*) tree species.	Mr. H. Jeremiah	Prof. T. Okpul and Mr. A. Lata
5	Mamellie Elivap	Nodulation in non-leguminous plants.	Mr. G. Sosanika	Mr. B. Bau
6	Rebecca Seni	The cost analysis of chemical and non-chemical termite control measures undertaken in *Araucaria cunninghamii* plantation in Bulolo, Papua New Guinea.	Mr. B. Bau	Mr. G. Sosanika
7	Rebekah Ngalaulatu	Evaluation on the growth performance of 23 indigenous/native tree species and their potential for plantation in Papua New Guinea.	Mr. L. Moripi	Mr. A. Lata
8	Shamillar Matae	Provenance variance in growth of seven-year-old Teak (*Tectona grandis*) in Situm, Morobe Province, Papua New Guinea.	Mr. H. Jeremiah	Mr. A. Lata
9	Denita Boiliu	Progeny variance in growth of six-year-old Teak (*Tectona grandis*) in Situm, Morobe Province, Papua New Guinea.	Mr. H. Jeremiah	Mr. A. Lata
10	Gene Nogini	Testing the rooting ability of *Cynometra katikii* Verdc. stem cuttings with different rooting hormones and rooting media types.	Mr. H. Jeremiah	Mr. A. Lata
11	Kimberly Kontpi	The effects of rooting hormone on adventitious root development in *Eucalyptus pellita*.	Mr. H. Jeremiah	Mr. A. Lata

12	Jamie Roger	Effect of rooting hormones on the survival and rooting of six selected *Eucalyptus pellita* clones.	Mr. H. Jeremiah	Mr. A. Lata
13	Denzel Krau	Suitability study for Balsa (*Ochroma pyramidale*) in East Sepik Province.	Mr. H. Jeremiah	Mr. A. Lata
14	Ereaki Erewiong	Investigating, poor stocking compartments of Bulolo Wau plantation establishment in Morobe Province, Papua New Guinea.	Mr. L. Veisami	Mr. L. Wana
15	Arananda Sau	Fire risk susceptibility mapping of Bulolo Forestry plantation using GIS and remote sensing.	Mr. L. Wana	Mr. R. Tarutia
16	Agnes Budilele	Assessing the effects of wood ash and vegetable peelings on soil macronutrients.	Mr. L. Moripi	Mr. B. Gusamo
17	Samantha Piel	Betelnut (*Areca catechu*) husks as a potting mix to use in nurseries in PNG.	Mr. K. Towalis	Mr. H. Jeremiah
18	Velma-ha Gisawa	Applying general allometric equations for wet tropical forests to assess the potential for carbon sequestration in Bootless Bay, Central Province.	Mr. B. Baput	Mr. H. Jeremiah
19	Tuhu Essineth	Carbon content in different vegetation.	Mr. L. Moripi	Mr. E. Maiguo
20	Israel Misirari	The application of remote sensing and geographic information system to detect land cover and land use change within a 30-year period in Situm, Morobe Province.	Mr. L. Wana	Mr. R. Tarutia
21	Sandline Renagi	Policy making for mangrove rehabilitation and conservation in Papua New Guinea.	Dr. C. Yosi	TBC
22	Shon On	Investigating the McAdam's National Park potential of regeneration for indigenous Klinkii (*Araucaria hunstenii*) and Hoop pines (*Araucaria cunninghamii*).	Mr. O. Gebia	TBC
23	Maxwell Buka	Surface finish of Malas (*Homalium foetidum*) after planning.	Mr. L. Veisami	Mr. B. Gusamo
24	Alwin Joseph	Utilization of sawdust to produce wood gas biofuel.	Mr. B. Gusamo	TBC
25	Jordan Ogia	An evaluation of forest certification status among logging companies in PNG.	Dr. C. Yosi	TBC

26	Erwin Kundam	Carbon trade in PNG: A review on existing carbon offset projects.	Dr. C. Yosi	TBC
27	Kosi Pikin	Investigating the potential for payments of forest ecosystem services (FES) to enhance conservation and address climate change in the Situm Community in Morobe Province.	Mr. B. Baput	Dr. C. Yosi

ON-GOING RESEARCH COLLABORATION WITH EXTERNAL PARTNERS

An ongoing research collaboration between the academic staff of the DoF with some external research partners also took place in 2022. This collaborative research project was with the Australian Center for International Agricultural Research (ACIAR) Alumni Research Support Facility (ARSF) through a research grant awarded to Dr. Cossey Yosi. The details of this internationally supported research project in 2022 are hereby reported (Table 5).

Table 4. Research collaboration with external and internal partners.

RESEARCH PROJECT TITLE	SPECIFIC RESEARCH TOPIC / PRINCIPAL INVESTIGATOR	COLLABORATION PARTNERS	FUNDER / SPONSOR	2022 STATUS
1. Sustainable levels of timber harvesting in PNG.	Estimating Exploitation Factors associated with Annual Allowable Cut (AAC) in Timber Concessions in PNG. Dr. Cossey Yosi – Principal Investigator	Professor Rodney Keenan, University of Melbourne, Australia.	ACIAR Alumni Research Support Facility (ARSF)	First component completed. Final report submitted to ACIAR in 2022. Second component funded by Unitech Research Fund and study is in progress.

PUBLICATIONS IN JOURNALS / PUBLISHED PROJECT REPORTS - 2022

There was only one paper published from the DoF in 2022. This was in the form of Abstract publication as part of the proceedings of the 9th Huon Seminar in August 2022.

The full paper was presented at the Seminar. The details of the paper are shown in Table 6.

Journal:

Benson, K. Gusamo. & Koniel A. Towalis. (2022). A Comparative Evaluation of Combustion Characteristics of *Araucaria cunninghamii*, *Intsia bijuga* and *Pometia pinnata* for Bio-Energy Source. *Forests, 13*, 563. https://doi.org/10.3390/f13040563

Gibson Lainza Sosanika, Bernard Sule, Kaigube Fazang, Peter Homot, Graham Kaina, Robert Kiapranis, Kipiro Damas, Abe Hitofumi, Ruth Turia, Riccardo Testolin, Fabio Attore, Vojtech Novotny, Paul Dargusch, & Daniele Cicuzza. (2022). Fern Species Richness and Diversity in the Forest Ecosystems of Papua New Guinea: A Case Study Along an Elevational Gradient. *Case Studies in the Environment, 6* (1): 1696511. https://doi.org/10.1525/cse.2022.1696511

Table 5. Department of Forestry (DoF) publication details in 2022.

Staff Name	Manuscript Details / Title / Status
1. Dr. Cossey Yosi	1. Yosi, C. 2021. Estimating CO_2 sequestration from permanent sample plots: an investigation to inform the potential of payment for environmental services (PES) for Papua New Guinean communities. Abstract published in the 9th Huon Seminar Proceedings, August 2022

SEMINAR /WORKSHOP AND CONFERENCE

FORESTRY DEPARTMENT SEMINARS HELD IN 2022

The DoF had two series of seminars in 2022. Dr. Cossey Yosi delivered one seminar on 24/08/2022 at the Department in preparation for the 9th Huon Seminar, and three postgraduate students of the DoF delivered the other seminar on 07/09/2022. The details of the research seminars held at the Department are listed (Table 8).

Table 8. Department of Forestry Seminar conducted in 2022.

DATE	PRESENTERS NAME	ORGANIZATION	PRESENTATION TITLE	SUPERVISOR	2022 STATUS
24/08/2022	Dr. Cossey Yosi	Forestry Department, PNG Unitech	Estimating CO2 sequestration from permanent sample plots: an investigation to inform the potential of payment for environmental services (PES) for Papua New Guinea communities.	Principal Investigator (Dr. Cossey Yosi)	Seminar delivered
07/09/2022	Russel TARUTIA	Forestry Department, PNG Unitech	Drones and Machine Learning: An Approach to Forest Plantation Health Monitoring in PNG.	Dr. Cossey Yosi	Seminar delivered
07/09/2022	Casey UVAU	Forestry Department, PNG Unitech	Plant - Caterpillar Interactions in a primary lowland forest of New Guinea	Dr. Cossey Yosi	Seminar delivered
07/09/2022	June MANDAWALI	Forestry Department, PNG Unitech	The social and cultural influences on Sustainable Forest Management in indigenous forest communities in Papua New Guinea	Dr. Cossey Yosi	Seminar delivered

STAFF SEMINAR PRESENTATIONS OUTSIDE OF THE DEPARTMENT OF FORESTRY.

There were no seminar presentations undertaken outside of the DoF in 2022, even though there was ongoing research work by academic staff members. However, a few staff members had opportunities to attend, participate, and present papers online in workshops and conferences via zoom meetings organized outside the university. The details of the online meeting attendance and participation by the Forestry Department staff in 2022 are outlined below.

Presentation of Research Papers.

1. **Research Paper presentation:**

Dr. Cossey Yosi Presented a research paper in the ninth Huon Seminar, held from 30/08/2022 to 31/08/2022. Paper titled: 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.

2. **Workshop, Seminar and Conference Attendance:**

Workshop attendance outside of the Department of Forestry.

1. Mr. Haron Jeremiah (academic) and Ms. Christine Pokana (technical staff) participated in a training course as one of USAIDs requirements. The Project and Financial Management Course took two weeks at Goroka, with all costs met by USAID. The training was led by USAID and Cardno International Development in February 2022.

This was part of the IFTA grant proposal application, which got the project proposal to the final stages. The IFTA of the DoF reached the screening phase until it reached the "Grantee Pre-Award Certification" process. Unfortunately, IFTA was unsuccessful in passing that phase due to the membership of the University's Board which are Government officials, which the donor saw as a "Conflict of Interest" and the grant application did not proceed further.

2. Dr. Cossey Yosi participated in a Department of Open and Distance Learning (DODL) workshop at Lamana Hotel in Port Moresby from the 27/09/2022 to 29/09/2022. The workshop was about **"Repositioning Adult Learning Praxis to appropriate 21st Century Open and Distance Learning."**

3. Mr. G. Sosanika attended a Seed Conservation (Seedbank Development) Workshop in Kew in, England, from 10/10/2022 to 23/10/2022. The Royal Botanic Gardens Kew in the United Kingdom funded the trip and the workshop.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Head of Department: Dr. Mohsen Aghaeiboorkheili

Introduction

The Department of Mathematics and Computer Science is one of the largest Departments of Papua New Guinea University of Technology, with 23 academics and six support staff. The Mission of the Department of Mathematics and Computer Science is to produce quality research and graduates in Computer Science and Applied Mathematics and give suitable Service Courses in Mathematics and Computing to all other Departments at the University. In addition, the aim is to produce graduates in Computer Science and Applied Mathematics of a high standard and comparable with similar graduates from other Universities in the Pacific Region and who can provide the development, critical evaluation, and application in their field for Papua New Guinea and the Pacific.

This Department focuses on training graduates in Computer Science/IT and Applied Mathematics and is located within the Taraka campus. The Department offers two four-year degree programs leading to either a Bachelor of Science in Computer Science Degree or a Bachelor of Science in Applied Mathematics. The Mathematics Program – Bachelor of Science in Applied Mathematics (BSAM) was started only this year (2022).

The world is accelerating with cutting-edge and innovative technologies, with the Internet proving to be of greater importance in everyday life – making information accessible instantly on media, such as smartphones, enabling us to access emails and social networks anywhere. To keep pace with technological development, the Department is committed to producing quality Computer Science and Applied Mathematics graduates at the national and international levels to be part of the broader community in designing and developing systems in the Tech industry. Our graduates are at par with other graduates from around the country and the Pacific because we train them to be the best they can be in whatever roles they may perform upon completing their studies.

Education is the University's principal mission. The Mathematics & Computer Science Department aims to provide high-quality academic and administrative support services not only for undergraduates but with an increasing focus on training postgraduate students. Our postgraduate programs will continue strengthening and developing research skills that our undergraduate students learn through Year 4 (Final Year Research Project).

All in all, the educational challenge in Mathematics & Computer Science is to produce professionals, both men and women, with the necessary technical skills, up-skilling its students to have the ability to analyze and solve problems. With this Department's interest in developing its problem-solving capacity, the Department's research activities fit into its education mission statement: producing professionals who can best critically analyze and evaluate to solve problems that need solving. To achieve the Department's aim, the Department staff themselves are not only are they well-vested in research, but they apply that knowledge through active participation in research projects and programs.

PRIORITY RESEARCH AREAS OF THE MCS DEPARTMENT

The Department of Mathematics and Computer Science priority research areas are as follows:

1-Numerical Analysis and Scientific Computing.

Many practical problems in science and engineering cannot be entirely solved analytically. Research in the area of numerical analysis and scientific computation is concerned with

developing and analyzing numerical algorithms, implementing these algorithms on modern computer architectures, and using numerical methods in conjunction with mathematical modeling to solve large-scale practical problems.
Key research includes: PDEs, ODEs, boundary value problems, integral equations

2-Theoretical mathematics
Theoretical mathematics is the study of abstract mathematical structures which form the basic framework for the rest of the mathematical sciences. In large part, theoretical mathematics is inspired by intellectual curiosity. Theoretical mathematics provides the tools for scientific discoveries in the future, often in unexpected ways.
Key research includes: Discrete Mathematics, Analysis, Geometry and Topology, Number Theory

3-Curriculum Management System (CMS)
In its broadest sense, a Curriculum Management System (CMS) is an automated system that supports the entire curriculum process from planning to implementation to assessment.
Key research includes: Curriculum Design, Curriculum Mapping, Curriculum Collaboration, Curriculum Publishing.

4-Software Engineering
Software engineering is the application of engineering concepts to software development. Its main goal is the creation, improvement, and maintenance of software. Software engineering considers engineering aspects, like the hardware and software environment when working on a program.
Key research includes: Data mining semantic-web-mining, distributed computing, Database, Distributed system, Data warehousing, Green computing, GUI-graphical-user-interface, and Mobile computing.

5-Statistical Science
The central purpose of Statistical Science is to convey the richness, breadth, and unity of the field by presenting the full range of contemporary statistical thought at a moderate technical level, accessible to the wider community of practitioners, researchers, and students of statistics and probability.
Key research includes: inter alia, the disciplines variously known as Statistics(and all sub-disciplines such as Biostatistics, Biometrics, and Econometrics), Operations Research, Management Science, Quantitative Methods, Decision Science, and Analytics and for the application of the Statistical Sciences in all areas of human endeavor.

6-IoT
Since digital devices such as computers are vulnerable to attack by criminals, digital forensics is increasing in importance. Understanding digital forensic procedures will help capture vital information that can be used to prosecute a suspect that compromises a digital device or network.
The diversity of this group is reflected in its research interests, which range over such areas as numerical analysis of partial differential equations, adaptive methods for scientific computing, and simulation of stochastic reaction diffusion systems.
Key research includes: Intersection of IoT, Bigdata, Computer Networks, Network Management, Human Computer Interaction, Computer Organization, machine learning, and social science.

SUMMARY OF FACULTY MEMBERS 2022

NO.	Name	Position	Research Interests
1	Dr. Mohsen Aghaeiboorkheili	HOD & Senior Lecturer	Numerical Methods, PDE, Boundary Value Problems.
2	Dr. Samuel Dunstan	Lecturer II	Numerical Analysis and Scientific Computing
3	Dr. Sumit Banerjee	Associate Professor	
4	Dr. Mohit Saxena	Associate Professor	Differential Geometry/General Theory of Relativity/String Theory
5	Dr. Arun Kumar Singh	Associate Professor	IoT, Bigdata, Computer Network, Network Management, Human Computer Interaction, Computer Organization, machine learning and social science.
6	Dr. Chris Wilkins	Senior Lecturer	Programming Languages, Statistics, Probability Models.
7	Benson Mirou	Senior Lecturer	Software Engineering, Computer Networks, e-Agriculture.
8	John Lanta	Lecturer	Differential Equations, Statistical Modelling, Topological groups and rings.
9	Yaling Tapo	Lecturer	Computer Networks, Data Science
10	Lenz Nerit	Lecturer	Software Engineering, Reverse Engineering, Artificial Intelligence.
11	Peter Helebi	Lecturer	Big Data and Analytics, Machine Learning, Predictive Modelling, Data Science, Artificial Intelligence.
12	Raymond Kuna	Lecturer	Mathematical Modelling, Differential Equations, Topological groups and rings.
13	Doris Benig	Lecturer	Statistical Modelling, Probability Methods.
14	Sankwi Abuzo	Lecturer (TI)	Internet Programming, Online Examination Systems.
15	Bobby Angopa	Temporary Full Time	Applied Statistics.

		(STI)	
16	Nicholas Puy	Lecturer (STI)	Image Processing, Machine Learning, Deep Learning, Data Science. Internet of Things (IoT)
17	Joel Tahie	Lecturer (STI)	Discrete Mathematical Structures, Graph Theory, Differential Equations.
18	Vincent Mbuge	Temporary Permanent Lecturer 1	Artificial Intelligence & Statistics.
19	Boaz Andrew	Lecturer	Statistics & Probability, Boolean Algebra, Algebraic Systems applied in Informatics.
20	Issac Angra	Part-Time Tutor	Linerisation of Nonlinear Systems using Numberical Approximation Techniques, Mathematical Modelling, Differential Equations, Complex Analysis.
21	Luke Kolalio	Temporary Full Time – Technical Instructor	Cyber Security, Computer Networking, Database, AI.
22	Malcolm Dopaim	Temporary Full Time – Technical Instructor	Data & Statistical Analysis using wavelength techniques, Differential Equations.
23	Samson Tom	Part-Time Tutor	Ordinary Differential Equations (ODE) with initial Conditions, Boundary Value Problems.
24	Alois Wemin	Part-Time Tutor	Differential Equations, Topological Groups, Semi-Groups.
25	Elis John	Part-Time Tutor	Internet Programming, Database.
26	Gordon Pogla	Part-Time Tutor	Cyber Security, Internet Programming.
27	Jean Vava	Part-Time Tutor	ODE and PDE

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POSTGRADUATE RESEARCH PROJECTS IN 2022

This year (2022), the Department has on record thirteen (10) postgraduate research studies undertaken here at this University either as an ongoing program, in the final stages of thesis submission, corrections being carried out, or candidates awaiting graduation (Table 2). All of the studies are undertaken by students from within the Department (Mathematics and Computer Science) of this University. In addition, these researchers have undertaken PhD, MSc, MPhil levels. Of these 10 postgraduate students, three (3) undertaking PhD, one (1) MSc, six (6) MPhil levels .

Table 2: Postgraduate Research Projects - 2022

#	STUDENT NAME	PROGRAM	THESIS / RESEARCH TOPIC	PRINCIPAL SUPERVISOR	2020 STATUS
1.	Benson Mirou	PhD 4	e-Agriculture	Dr. Maino	Study in progress
2.	John Lanta	PhD 2	Bohr compactification of Alternative and Jordan rings	Prof. Ursul	Study in progress
3.	Vincent Mbuge	Mphil/1	Simulation of qeueing Theory	Dr. Wilkins	Study in progress
4.	Issac Angra	MPhil/2	Differential Equations.		On hold
5.	Raymond Kuna	PhD 1	Economic Modelling with Fractional PDEs	Dr. Mohsen	On hold
6.	Luke Kolalio	MPhil/2	Cyber Security – How to detect intrusion in a network.	Dr. Ashish Kumar Luhach	Study in progress
7.	Alois Wemin	MPhil/2	Topological Ring	Dr. Mohsen	Applied but Yet to register
8.	Gordon Pogla	MPhil/2	Cyber Security in FinTech	Dr. Ashish Kumar Luhach	Applied but Yet to register
9.	Sankwi Abuzo	MPhil/2	Designing a suitable online proctoring system for PNG University of Technology	Dr. Wilkins	Study in progress
10.	Bobby Angopa	MSc/2	Applied Statistics: Use of time series methods to determine a model to forecast Immigration rates into the capital city of PNG, Port Moresby.	Mr. Wamil	Yet to register

UNDERGRADUATE RESEARCH PROJECTS IN 2022

Table 3: Final Year Student Research Projects

No.	Student Name	Title	Principal Supervisor(s)
1	Esther Ameta	Implementation of English/Tok-Pisin translator.	Sankwi Abuzo
2	Noah Waima	Implementing a database system for the constitution of Papua New Guinea.	Sankwi Abuzo
3	Samuel Kenjau	Offline virtual assistant.	Sankwi Abuzo
4	Emmanuel Keslep	Balus Bus – A web-based app that facilitate airport transport assistance for passenger within Lae city.	Luke Kolalio
5	Joe Goma	Interactive Learning Management System.	Raymond Kuna
6	Glenmore Arava	Online Car Registration System (MVIL).	Yaling Tapo
7	Steward Kalan	Water Monitoring System Sensors.	Yaling Tapo
8	Rayven Wanmut	Western Province scholarship student Database System.	Yaling Tapo
9	Kuasmapa Noel	Packet Detection System	Yaling Tapo
10	Victor Daniaba	Wifi Infrastructure	Dr. Chris Wilkins
11	John Warisa	Speech Transcriptor	Dr. Chris Wilkins
12	Max Todol	Student Notice System	Dr. Chris Wilkins
13	Wendy Athlon	VPN on Public Network	Dr. Chris Wilkins

14	Paul Nimiago	Secure Data Transfer over Internet using Image Steganography.	Benson Mirou
15	Raphael Arpa	Implementation of Dual Stack (IPv4 and IPv6) on a local server in MCS department.	Benson Mirou
16	Carlos FaiParik	Automated Pay as you go Service.	Benson Mirou
17	Dulcie Sangin	Biometric Authentication System using Finger-Print technology for an online payment gateway.	Benson Mirou
18	Ramanga Harinke	UOT Maintenance Management System.	Peter Helibi
19	Simon Kunai	Software defined Security	Peter Helibi
20	Billy Rua	Crime Detection and Analysis using Machine Learning.	Peter Helibi
21	Garry Yasa	Online Application for Insurance services.	Peter Helibi
22	Yasmine Tabogani	Use of Machine Learning to monitor and detect when students are using anonymous proxy servers and VPNs to by-pass Wi-Fi restrictions.	John Lanta
23	John Kiaga	Crypto Currency	Dr. Chris Wilkins
24	Yrannittiah Pangu	Plagiarism	Prof. Ursul

PUBLICATIONS IN JOURNALS / PUBLISHED PROJECT REPORTS - 2022

Our Academic staff in the Department have been involved in publishing scientific articles in 2022. The details of these publications are contained in Table 4 and Table 5, respectively.

Table 4: Mathematics & Computer Science Department List of Publication in 2021

STAFF NAME	PUBLICATION DETAILS
Dr. Mohsen Aghaeiboorkheili	Jena, Swarnalata., Satya Ranjan Mishra., **Mohsen Aghaeiboorkheili**, Pradyumna Kumar Pattnaik, & Kamalakanta Muduli. (2022). Impact of Newtonian heating on the conducting Casson fluid flow past a stretching cylinder. *Journal of Interdisciplinary Mathematics,* 1-16.
	Aghaeiboorkheili, Mohsen, & John Giuna Kawagle. (2022). The History of the Derivation of Euler's Number. *Journal of Applied Mathematics and Physics. 10* (9), 2780-2795
	Aghaeiboorkheili, Mohsen. (2022). Analyzing Performance of Students at Engineering Mathematics Course in Different Departments. *International Journal of Mechanical Engineering,* 7 (5), 641-649.
Prof. Dr. Ursul Mihail & John Lanta	**Ursul, Mihail, & John Lanta**. (2022). Criteria of closedness of nilradicals in zero dimensional locally compact rings. *Carpathian Journal of Mathematics,* 38 (1), 223-230.
Dr. Sumit Kumar Banerjee	**Banerjee Sumit Kumar**, 2022 "Analysis of signal processing embedded with Fourier Transform" *9th Huon seminar, PNGUOT*, pp. 41.

SEMINAR /WORKSHOP AND CONFERENCE

MATHEMATICS & COMPUTER SCIENCE DEPARTMENT SEMINARS HELD IN 2022

The details of the seminar presented by the Mathematics & Computer Science Department's staff this year, 2022 are provided in Table five (5) below;

Table 5: Mathematics & Computer Science Department Seminar Conducted in 2022

SEMESTER	DATE	VENUE	TIME	PRESENTER	TOPIC
1	06-April-2022	MCS203	2-3pm	Dr Mohsen Aghaeiboorkheili	A more effective use of Google Classroom
1	13-April-2022	MCS203	2-3pm	Mr Lenz Nerit	tSMAS Learning Management System
1	27-April-2022	MCS203	2-3pm	Dr Sumit Banerjee	Statistical quality control and its application
1	04-May-2022	MCS203	2-3pm	Dr Chris Wilkins	Concocting Engineering Mathematics Applications
1	25-May-2022	MCS203	2-3pm	Dr Samuel Dunstan	Linear Algebra: application in the anisotropy tensor
2	03-August-2022	MCS203	2-3pm	Dr Sumit Banerjee	Analysis of signal processing embedded with Fourier Transform
2	14-September-2022	MCS203	2-3pm	Mr Boaz Andrews	Use of Minitab in multiple linear regression
2	21-September-2022	MCS203	2-3pm	Dr Arun Kumar Singh	IoT (Internet of things) and its application
2	28-September-2022	MCS203	2-3pm	Mr Sankwi Abuzo	Progressive report on the research: Designing a suitable online proctoring system for PNG University of Technology
2	30-September-2022	MCS203	2-3pm	Mr John Lanta	Bohr compactification of alternative and Jordan rings

Table 5: Mathematics & Computer Science Department Seminar Conducted in 2022

SEMESTER	DATE	VENUE	TIME	PRESENTER	TOPIC
1	06-April-2022	MCS203	2-3pm	Dr Mohsen Aghaeiboorkheili	A more effective use of Google Classroom
1	13-April-2022	MCS203	2-3pm	Mr Lenz Nerit	tSMAS Learning Management System
1	27-April-2022	MCS203	2-3pm	Dr Sumit Banerjee	Statistical quality control and its application
1	04-May-2022	MCS203	2-3pm	Dr Chris Wilkins	Concocting Engineering Mathematics Applications
1	25-May-2022	MCS203	2-3pm	Dr Samuel Dunstan	Linear Algebra: application in the anisotropy tensor
2	03-August-2022	MCS203	2-3pm	Dr Sumit Banerjee	Analysis of signal processing embedded with Fourier Transform
2	14-September-2022	MCS203	2-3pm	Mr Boaz Andrews	Use of Minitab in multiple linear regression
2	21-September-2022	MCS203	2-3pm	Dr Arun Kumar Singh	IoT (Internet of things) and its application
2	28-September-2022	MCS203	2-3pm	Mr Sankwi Abuzo	Progressive report on the research: Designing a suitable online proctoring system for PNG University of Technology
2	30-September-2022	MCS203	2-3pm	Mr John Lanta	Bohr compactification of alternative and Jordan rings

DEPARTMENT OF MECHANICAL ENGINEERING

Head of Department: Dr. Shoeb Ahmed Syed, Ph.D.

Introduction

The Department of Mechanical Engineering considers engineering research to be vital as it leads to an expansion of knowledge and discoveries of new products and services. Moreover, it is research that leads to breakthroughs in engineering and technology. Research and experimental development comprise creative work undertaken systematically to increase knowledge, including knowledge of man, culture, and society, and using this knowledge to devise new applications.

Engineering research is the systematic investigation and study of materials and sources to establish facts and reach new conclusions, shaping people's understanding of the world around them. Research involves testing hypotheses and predictions using testable data and a complete package 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. *Computer-Aided Design and Engineering Modeling*
iii. *Energy and Environment*
iv. *Control Engineering and Mechatronics*
v. *Materials Characterization*
vi. *Engineering Education and Management*

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

Research Seminars

Departmental staff and postgraduate students are encouraged to present seminars regularly and as often as possible. In addition, the research coordinator is encouraged to schedule regular research seminars based 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 Dr. Nicholas Lambrache	3D Computer-Aided Design, Engineering Modeling, Robotics, Mechatronics, Materials Science, Experimental Engineering.
Dr. Kamala K. Muduli, Ph.D.	Operations Management, Decision sciences, Supply Chain Management, Sustainable Development, Health Care, Waste Management, and Ergonomics.

Dr. Ghulam Arshed, Ph.D.	Numerical Analysis, Fluid Dynamics, Heat Transfer
Dr. Aezeden Mohammed, Ph.D.	Corrosion Engineering, Machine Design, Non-Destructive Technologies, Biomedical Engineering
Dr. Shoeb Ahmed Syed, Ph.D.	Numerical Modeling, Computational Fluid Dynamics and Heat Transfer, Combustion, Fluid-Structure Interaction, Turbulence, 2 or 4 Stroke Reciprocating Engines, Renewable Energy
Dr. Jack Khallahle, PhD	Advanced Computational Fluid Dynamics and Multiphase Flow, Turbulence Modelling of 2D/3D Flow Domain for Two-Phase Flow, Oil/Gas Mixture Transport Pipeline CFD Modelling and Design in Horizontal and Inclined Pipes, Thermodynamics, Thermal Power Plants and Systems.
Dr. Steve Ales Korokan, PhD	Friction Stir Welding (FSW) Al-Al and Al-high Temperature Alloys; Smart Materials and other Alloys, Design, and Manufacturing; Production of Fiber-reinforced Polymer Composites, Renewable Energy - Geothermal, Bio, Wind, and Solar - and Energy Policy
Mr. Brian N'Drelan	Renewable energy – Solar, Tidal, and Wind. Failure of Components and Systems in Alluvial Mining Engineering, Experimental Engineering, and Operations Management.

Undergraduate Research Projects

The following are final-year Mechanical Engineering Student's projects offered in 2022 as part of their partial fulfillment of the Bachelor's Degree in Mechanical Engineering:

No.	Suggested Description	Suggested by Lecturer	Number of Students
1	Corrosion Modelling for Oil and Gas Pipelines	Dr Aezeden Mohamed	1
2	Waste Plastic Pyrolysis	Dr. Shoeb Ahmed Syed	1
3	Biodiesel Production Using Waste Cooking Oil from Papua New Guinea University of Technology Mess	Dr. Steve Ales	2
4	Tailing Treatment and Design of Deep-Sea Tailing Placement Facilities at Wafi-Golpu Gold and Copper Mine In	Brian N'Drelan	2

	Morobe Province Papua New Guinea		
5	Converting Plastic into Fuel	Dr Aezeden Mohamed	3
6	Design of a Bio-Waste Digester at PNG University of technology	Dr. Shoeb Ahmed Syed	2
7	Implementation of FMEA of Fire Hydrant in PNG University of Technology Campus	Dr. Romeo Fono Tamo	1
12	Reconnection of Urr Water Supply to Kundiawa Town, Kundiawa-Gembogl District, Simbu Province	Dr Arshed	2
13	Design of Solar-Powered Water Purification System for Use in Villages in PNG	Dr Arshed	2
14	Development of a Smart Warehouse Inventory Management Framework	Dr Kamalakanta Muduli	2
15	Design of Mini-Hydro Project at PNG	Dr Mohamed	3
16	Micro-Hydro Power Scheme	Dr Wahid	2
17	Analyzing Causes of Bearing Failure in The Mining Industry, in High Brine Tropical Environment	Dr Mohamed	2
18	Designing a Parabolic Solar Cooker for Practical Household Usage in Alukuni and Keapara in the Central Province	Dr. Shoeb Ahmed Syed	2
19	Design of Natural Vegetable and Fruits Storage for Market in PNG	Dr Mohamed	4
20	Design, Evaluation and Fabrication of Flat Rotating Die Household Pellet Mill for PNG University of Technology Agriculture Farm	Dr. Shoeb Ahmed Syed	2
21	Simple Affordable Water Pump	Dr. Romeo Fono Tamo	1

22	Design of Proper Water Lifting Technology	Dr Mohamed	4
23	Mitigation of Corrosion on Mild Steel Structure near a Stagnate Pool of Water from Air Condition	Dr. Romeo Fono Tamo	2
24	Design, Analysis and Costing of the API650 Welded Vertical Storage Tank in Loloho, Arawa	Dr. Arshed	2
25	Solar-Powered Water Purification System for Rural Application.	Dr. Mohamed	3
26	Water Supply for Coastal Villages Affected by High-Tides and Lack of Fresh Water Sources	Brian James N'Drelan	2
27	Municipal Waste Management and Unitech Campus as an Experimental Site	Brian James N'Drelan	1
28	Design and Fabrication of a Safe and Less Hazardous Flue Gas/ Smoke Incinerator for the PNG Unitech Campus	Brian James N'Drelan	1
29	Robotic Arm with 5 Degrees of Freedom on Arduino Platform	Professor Dr Nicholas Lambrache	6
30	Production of Biodiesel from Used Cooking Oil	Dr. Steve Ales	3
31	Design of Solar-Powered Cooler	Dr. Mohamed	3
32	Fatigue Failure of Airplane Fuselage Material	Dr. Mohamed	1
33	Designing of Coconut De-Husking Machine	Dr. Mohamed	1
34	Design and Analysis of Single Cylinder Double Acting Paddle Operated Reciprocating Pump	Dr. Mohamed	1

Postgraduate Students Research

Postgraduate Students' Research Projects:

No	Research Projects	Status	PG Student
1	Failure of Components and Systems in Alluvial Mining Engineering	Continuing, External Examiners Review	Brian N'Drelan, PhD
2	Waste and Cost Reduction Pathway for Enhanced Overall Equipment Efficiency	Continuing	Granville Embia
3	To be Decided	Continuing	Kialakun Galgal
4	To be Decided	Continuing	Paul Kuri
5	To be Decided	Continuing	Guambo Mondo
6	To be Decided	Continuing	John Kamit

Journal Publications

1. Behera, R. K., Samal, B. P., Panigrahi, S. C., Parida, P. K., Muduli, K., Muhammad, N., Das, N. & Abd Rahim, S. Z. (2022). Erosion wear characteristics of novel ammc produced using powder metallurgy. *Archives of Metallurgy and Materials*, *67*(3), 1027-1032.
2. Behera, R. K., Samal, B. P., Panigrahi, S. C., Das, S. R., Mohamed, A., Muduli, K., & Das, R. (2022). Experimental analysis on machinability aspects of sintered aluminium metal matrix (Al+ Si+ Mg+ Cu+ SiC) composite-a novel product produced by powder metallurgy method. *International Journal of Materials Engineering Innovation*, *13*(1), 1-22.
3. Jena, S., Mishra, S. R., Aghaeiboorkheili, M., Pattnaik, P. K., & Muduli, K. (2022). Impact of Newtonian heating on the conducting Casson fluid flow past a stretching cylinder. *Journal of Interdisciplinary Mathematics*, *25*(8), 2401-2416.
4. Joshi, S., Sharma, M., Das, R. P., Rosak-Szyrocka, J., Żywiołek, J., Muduli, K., & Prasad, M. (2022). Modeling Conceptual Framework for Implementing Barriers of AI in Public Healthcare for Improving Operational Excellence: Experiences from Developing Countries. *Sustainability*, *14*(18), 11698.
5. Joshi, S., Sharma, M., Das, R. P., Muduli, K., Raut, R., Narkhede, B. E., Shee H. & Misra, A. (2022). Assessing the effectiveness of humanitarian activities against COVID-19 disruption: the role of blockchain-enabled digital humanitarian network (BT-DHN). *Sustainability*, *14*(3), 1904.
6. Kamila, N. K., Frnda, J., Pani, S. K., Das, R., Islam, S. M., Bharti, P. K., & Muduli, K. (2022). Machine learning model design for high-performance cloud computing & load balancing resiliency: An innovative approach. *Journal of King Saud University-Computer and Information Sciences*, *34*(10), 9991-10009.

7. Kamat, A., Shanker, S., Barve, A., Muduli, K., Mangla, S. K., & Luthra, S. (2022). Uncovering interrelationships between barriers to unmanned aerial vehicles in humanitarian logistics. *Operations Management Research*, *15*(3-4), 1134-1160
8. Kumar, S., Raut, R. D., Narwane, V. S., Narkhede, B. E., & Muduli, K. (2022). Implementation barriers of smart technology in Indian sustainable warehouse by using a Delphi-ISM-ANP approach. *International Journal of Productivity and Performance Management*, *71*(3), 696-721.
9. Mohamed, A., Doaemo, W., & Muduli, K. (2022). A review on fly ash as a sustainable material to reinforce the mechanical properties of concrete. *International Journal of Materials Engineering Innovation*, *13*(1), 58-72.
10. Muduli, K., Raut, R., Narkhede, B. E., & Shee, H. (2022). Blockchain technology for enhancing supply Chain performance and reducing the threats arising from the COVID-19 pandemic. *Sustainability*, *14*(6), 3290.
11. Pattnaik, P. K., Mishra, S. R., Panda, S., Syed, S. A., & Muduli, K. (2022). Hybrid Methodology for the Computational Behaviour of Thermal Radiation and Chemical Reaction on Viscoelastic Nanofluid Flow. *Mathematical Problems in Engineering*, *2022*.
12. Samal, B. P., Behera, R. K., Behera, A., Sarangi, B., Behera, S. K., Muduli, K., & Panigrahi, I. (2022). Fuzzy Logic Application on Dry Sliding Wear Behavior of Matrix Aluminum Composite Produced by Powder Metallurgy Method. *Composites: Mechanics, Computations, Applications: An International Journal*, *13*(1), 49-62
13. Shanker, S., Barve, A., Muduli, K., Kumar, A., Garza-Reyes, J. A., & Joshi, S. (2022). Enhancing resiliency of perishable product supply chains in the context of the COVID-19 outbreak. *International Journal of Logistics Research and Applications*, *25*(9), 1219-1243.
14. Sharma, H., Shanker, S., Barve, A., Muduli, K., Kumar, A., & Luthra, S. (2022). Interval-valued intuitionistic fuzzy digraph-matrix approach with PERMAN algorithm for measuring COVID-19 impact on perishable food supply chain. *Environment, Development and Sustainability*, 1-40.
15. Singh, S., Barve, A., Muduli, K., Kumar, A., & Luthra, S. (2022). Evaluating roadblocks to implementing a green freight transportation system: an interval-valued intuitionistic fuzzy digraph matrix approach. *IEEE Transactions on Engineering Management*.
16. Swain, S., Oyekola, P. O., & Muduli, K. (2022). Intelligent Technologies for Excellency in Sustainable Operational Performance in the Healthcare Sector. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, *13*(5), 1-16.
17. Swain, S., Muduli, K., Kommula, V. P., & Sahoo, K. K. (2022). Innovations in Internet of Medical Things, Artificial Intelligence, and Readiness of the Healthcare Sector Towards Health 4.0 Adoption. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, *13*(1), 1-14.
18. Syed, S. A., Ales, S., Behera, R. K., & Muduli, K. (2022). Challenges, Opportunities and Analysis of the Machining Characteristics in hybrid Aluminium Composites (Al6061-SiC-Al2O3) Produced by Stir Casting Method. *International Research*

Journal on Advanced Science Hub, 4 (8), 205-216. http://dx.doi.org/10.47392/irjash.2022.051

19. Syed, Shoeb Ahmed, Peter Oyekola. (2022). Simulation of Turbulent Flow in a two-stroke Grail Engine Cylinder. *Journal of Applied Engineering Science*, 20 (4), 1203-1213. https://doi.org/10.5937/jaes0-37354
20. Wailoni, X., Swain, S., Lafanama, S., & Muduli, K. (2022). Analytical Approach for Prioritizing Waste Management Practices: Implications for Sustainable Development Exercises in Healthcare Sector. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, *13*(1), 1-12.

Conference Proceedings

1. Anil Kumar, D., Rath, K. C., Muduli, K., & Ajesh, F. (2022). Design and modeling of virtual robot for industrial application in smart manufacturing assembly line. In *Intelligent Systems: Proceedings of ICMIB 2021* (pp. 471-483). Singapore: Springer Nature Singapore.
2. Biswal, D. K., Muduli, K., & Biswal, J. N. (2022). Analytical Hierarchy Process Strategy for Assessment of Overall Equipment Effectiveness. In *Recent Trends in Product Design and Intelligent Manufacturing Systems: Select Proceedings of IPDIMS 2021* (pp. 303-313). Singapore: Springer Nature Singapore.
3. Biswal, D. K., Muduli, K., & Biswal, J. N. (2022). Plant Layout Improvement Using CRAFT: A Case of Food Packaging Unit. In *Recent Trends in Product Design and Intelligent Manufacturing Systems: Select Proceedings of IPDIMS 2021* (pp. 315-326). Singapore: Springer Nature Singapore.
4. Lambrache, N., Chen, D., Fisher, J., Olaru, L., N'Drelan, B. - Forward and Inverse Kinematics of a Robotic Arm on Arduino Platform, 5th International Conference IEOM Society, Sapienza Universita di Roma, ID 492, July 26-28, 2022
5. Lambrache, N., Chen, D., Fisher, J., Olaru, L., N'Drelan, B. - Control of a 5 Degrees of Freedom Robotic Arm on Arduino Mega Platform, 5th International Conference IEOM Society, Sapienza Universita di Roma, ID 494, July 26-28, 2022.
6. Mishra, S., Mohmaed, A., Pattnaik, P. K., Muduli, K., & Ahmad, T. S. T. (2022). Soft Computing Techniques to Identify the Symptoms for COVID-19. In *Advances in Data Science and Management: Proceedings of ICDSM 2021* (pp. 283-293). Singapore: Springer Nature Singapore.
7. Mohamed, A., Piso, K., Mogili, U., & Muduli, K. (2022). OEE in Sustainable Can-Making Manufacturing. In *Recent Trends in Product Design and Intelligent Manufacturing Systems: Select Proceedings of IPDIMS 2021* (pp. 353-369). Singapore: Springer Nature Singapore.
8. Mohamed, A., Ben, J., & Muduli, K. (2022). Implementation of Autonomous Maintenance and Its Effect on MTBF, MTTR, and Reliability of a Critical Machine in a Beer Processing Plant. In *Applications of Computational Methods in Manufacturing and Product Design: Select Proceedings of IPDIMS 2020* (pp. 511-521). Singapore: Springer Nature Singapore.

9. Mohamed, A., Muduli, K., Yadav, D. K., & Jena, P. (2022). Corrosion Performance in Grain Structure of C22 in Acidic Environment. In *Recent Advances in Industrial Production: Select Proceedings of ICEM 2020* (pp. 469-476). Springer Singapore.

Book Chapters

1. Adimuthu, R., Muduli, K., Ray, M., Singh, S., & Ahmad, T. S. T. (2022). Exploring role of Industry 4.0 techniques for building a promising circular economy concept: manufacturing industry perspective. In *Machine Learning Adoption in Blockchain-Based Intelligent Manufacturing* (pp. 111-124). CRC Press.
2. Lambrache, N., Renagi, O., Olaru, L., N'Drelan, - Composite Materials with Natural Fibers. In Fiber-Reinforced Plastic, IntechOpen, London, United Kingdom, 2022 https://doi.org/10.5772/intechopen.101818
3. Peter, O., Swain, S., Muduli, K., & Ramasamy, A. (2022). IoT in Combating COVID-19 Pandemics: Lessons for Developing Countries. *Assessing COVID-19 and Other Pandemics and Epidemics using Computational Modelling and Data Analysis*, 113-131.
4. Rath, K. C., Muduli, K., Das, R. P., Ramasamy, A., & Mohammed, A. (2022). Disruptive Technology-Enabled Circular Economy for Improving the Sustainability of the Supply Chain: A Case of an Emerging Economy. In *Handbook of Research on Supply Chain Resiliency, Efficiency, and Visibility in the Post-Pandemic Era* (pp. 335-351). IGI Global.

Books

1. Kandasamy, J., Muduli, K., Kommula, V. P., & Meena, P. L. (Eds.). (2022). *Smart Manufacturing Technologies for Industry 4.0: Integration, Benefits, and Operational Activities*. CRC Press.
2. Muduli, K., Mohamaed, A., and Dehury, A. (2022). Theory of Metal Cutting, *Notion Press*, India, ISBN: 9798887173610

Patents

1. Bathula, S., Behera, R., Khamari, B, Majhi B., Muduli, K. (2022). A Apparatus To Fabricate Aluminium Hybrid Composite. 202022103231, Germany
2. Das, M., Das, R., Muduli K., Swain S. (2022) An Intelligent Logistics and Supply Chain System, 202022100358, Germany
3. Jena, P.K., Khamari, B, Mohamed, A., Muduli, K. (2022). A Device for Forming Dissimilar Copper with Metal Joint by Pulsed- Gas Tungsten Arc Welding, 202022105492, Germany.
4. Muduli, K., Mohamed, A, Kommula, V. (2022). AN INTELLIGENT LOGISTICS AND SUPPLY CHAIN SYSTEM, 2022/01481, South Africa.
5. Mohamed, A, Biswal D, Jena, P, Muduli K. (2022). A System for Skin Tissue Regeneration Using Nanomedicine and Nanofiber, 202021106754, Germany.

DEPARTMENT OF MINING ENGINEERING

Head of Department: Dr Jim Lem

Introduction

Amongst the four engineering departments at the Papua New Guinea University of Technology, Mining Engineering Department is the newest, established in 1988. The Department offers two Degree programs: Bachelor of Mining Engineering (Honors) and Bachelor of Mineral Processing Engineering (Honors). In addition, it also offers postgraduate programs in Mining and Mineral Process Engineering at the Masters and PhD levels. The postgraduate programs offered are mainly by research: research based master of philosophy (MPhil) and doctor of philosophy (PhD).

To date, there are far fewer top graduates who did post graduate studies and took up academic positions in the Department. Our graduates have had high preferences for employment in the industries owing to the far superior salaries and other benefits, particularly in the mining and petroleum industries. This has seen less output in research in the Department over the years. Our mining and mineral processing engineers work in many parts of the world, such as Australia, America, Canada, Africa, Indonesia, Thailand, Mongolia, Sweden, and the Solomon Islands.

Currently, we have four (4) students enrolled in Master of Philosophy in the Department embarking on research in Mining and Mineral Processing areas. The Department is committed to delivering quality teaching, research, and outreach activities, including Government and Industry based projects and postgraduate research and development studies.

The Mining Department continues to enjoy healthy industry partnerships and collaborations, propelling staff and students to engage in real-industry-based research projects and consultancies. The Department signed MoUs with K92 Mine, the University of Queensland (Australia), the Mineral Resources Authority (MRA), and local alluvial resources landowners. A major project being undertaken by the Department is the “Development of alluvial gold resources evaluation model” in partnership with the Mineral Resources Authority (MRA).

RESEARCH THEME AND FOCUS AREAS

The Department's research focus and interests are resource exploitation and extraction techniques, environmental solutions to mining-related waste, and safety. The main focus areas are;

Mining Engineering

- Environmental engineering
- Mining production optimization
- Geological modelling and evaluation of uncertainties
- Engineering geology
- Geomechanics and rock mass deformation and behavior
- Alluvial mining techniques and resources evaluation

- Innovative solution to Acid Rock Drainage (ARD) problems from mine waste.
- Mineral Economics
- Mineral Taxation Policy
- Underground Mining Methods and Optimization
- Ore Reserve Estimation
- Rock Slope Stability Analysis

Mineral Process Engineering

- Mineral processing
- Froth flotation
- Hydrometallurgy of gold and base metals – copper, nickel, chromium, cobalt, etc.
- Process plant design & optimization
- Froth flotation of base metal sulphides and gold
- Process data analysis and statistical modelling
- Processing of industrial minerals
- Mine & mill waste management
- Alluvial gold extraction, process optimisation with a focus on fine gold recovery and elimination of mercury (Hg)
- Fundamentals of froth flotation
- Gravity concentration of gold
- Pyrometallurgy
- Reprocessing of mill/mine waste

INDUSTRY FUNDED AND INDUSTRY BASED COLLABORATIVE RESEARCH PROJECTS

1. Third Independent Peer Review Project for PanAust Frieda River Copper Project on Environmental Impact Statement (EIS) - Independent Peer Reviewer
   Dr G. Arpa, Dr O. Renagi, Dr J. Lem, Mr Kenny Michael, (2022)

The PNG Unitech appreciates the opportunities provided by PanAust Frieda River Project in fully supporting CEPA's suggestion for the inclusion of the Unitech-led IPR team. This continues to support the PNG University of Technology's mission and vision to grow world-class technocrats through high-quality experimental teaching, research, and ardent application of science, technology, and innovation through industry-based projects

PanAust Frieda River Project conducted the East Sepik Province (ESP) Consultation from June to October 2022 as part of the **EIS** (Environmental Impact Statement) Awareness, a prerequisite for the grant of the Environment Permit for the Frieda River Mine. To ensure the best outcome for the Consultation, which was run and overseen by CEPA, a Unitech team was invited as strategic Independent Observers. The Unitech Team acted as a technical representative on behalf of the company addressing clarifications over matters or issues arising of a technical nature.

2. Hidden Valley Mine Closure Planning Project: TSF Leachate quality analysis

J. Lem, J. Witne, Dr. W. Kobal, Dr G, Arpa (2021 -2022)

The Hidden Valley Mine is an open pit gold and copper mine in production since 2010. The Hidden Valley Mine a wholly owned subsidiary of Harmony Gold Mining Company Limited. The run-of mine ore, after size reduction, is subjected to a combination of gravity separation, froth flotation, and cyanide leaching to recover gold and silver values. In addition, Hidden Valley Mine has constructed and operates a Tailings Storage Facility (TSF) within which the processing residue, tailings, is stored. Hidden Valley Mine is forecast to close production in the year 2026. Currently, a work program is in place to develop a mine rehabilitation and closure plan. The Tailings Leachate Trial is one part of this program undertaken by the Environmental Division section of the mine to inform the closure planning for the TSF.

The tailings leachate trial set-up consisted of four 1000 liters of plastic tank open at the top and exposed to the atmosphere. The tanks are each filled with a known weight of tailings material. The bottom end of the tank is opened and connected to a tank of similar dimension and size by a pipe, where the leachate volume is monitored and ports installed for regular sampling. The tanks were directly exposed to climatic conditions such as incidental rainfall, temperature, etc. Samplings were done weekly in January 2021 and then monthly until March 2022. The samples collected were analyzed by ALS in Australia.

The Morobe Consolidated Goldfields (MCG) then engaged the Mining Engineering Department of PNG UNITECH to analyse and interpret the 12 months Tailings Leachate Trial data. The 12 months of data received consisted of field data (rainfall, temperature, pH, EC, ORP, DO, turbidity, salinity, the volume of leachate, etc.) and chemical assay data from ALS.

The scope of this project was to evaluate the 12 months of Leachate Trial data to provide an indication of:

- Changing leachate volumes as a function of climatic conditions
- Temporal trends in key leachate parameters (particularly, pH, SO4, cyanide, and dissolved metals).
- Any correlations between pH and other key parameters, i.e., SO4 and dissolved metals (i.e., is pH (or some other function) the driver of the observed changes to water quality

This project was completed with final payment made on November 30, 2022

3. ***Process Mineralogy of fluorine in K92 Gold Ore***
   Jim Lem (2020-2023)

A potential metallurgical issue at the K92 Gold Mine related to the undesirable accumulation of fluorine, a penalty element in the Au-Ag-Cu Concentrate, was investigated by the Mining Engineering Department. The research aimed at identifying the gold-bearing minerals, the distribution, and association of gold minerals across the size range, the major F-bearing minerals, the association of F-bearing minerals with gold minerals, and eventually establishing the potential mechanism promoting F recovery. Ultimately devise potential strategies to reduce F recovery with the caveat that gold-silver-copper recovery is not impacted negatively. The mineralogical analysis was performed using a combination of MLA, and chemical assay and

the findings were presented at K92 Gold mine site on February 12, 2020. The investigation established the following; (i) Chief gold-bearing mineral is calaverite, AuTe2 (ii) Major F-bearing mineral is sericite, KAl2(AlSi3O10)(OH,F)2 (iii) Talc does not contain F (iv) The plant is recovering high amount uneconomic pyrite which can be rejected. **The mine took action: Stopped application of carboxymethyl cellulose – a depressant for talc**

4. ***Rio Tinto Ilmenite Ore Upgrade – World Challenge on Process Innovation***

Eric Agorhom, Clement Owusu*, Jim Pae Lem (2020 – 2023)*

**Senior lecturer, Minerals Engineering Department, UMaT, Tarkwa, Ghana*

This open process innovation challenge managed by HEROX is worth US$ 350,000.00. Rio Tinto is seeking ideas for how to cost-effectively improve TiO_2 content in their ilmenite ore (from 32% TiO_2 content to 50% or better) by isolating and separating out lower-quality hematite inclusions (lamellae) from the ore matrix and liberating gangue (non-valued) material. This was a two-stage challenge. The details can be seen in this link: https://www.herox.com/OreUpgrading/updates. Our research team (Eric Agorhom team), which is a collaboration between PNG University of Technology and the University of Mines & Technology, Tarkwa, Ghana, won the Stage I challenge worth US50,000.00. Although a successful process was not defined in the stage (II) component of the challenge, our research team is currently exploiting techniques of froth flotation and process mineralogy to ultimately achieve the intended goal.

5. K92 Mine Gold Ore Bond Work Index Test Work

J. Lem, F. Kisai (2019 – 2023)

This technical project is continuing since 2019. As a result, the K92 Gold Mine is forecast to increase production in the year 2023 onwards with a target annual gold production of 400 to 500 000 ounces. The work demand for this increase, the Mining Department purchased new comminution equipment, including a continuous grinding mill, steel balls, and rods for grindability or bond work index tests.

These ore grindability test results are so critical for the mine as it directly affects the overall plant performance and, eventually the daily gold production. The Mining Engineering Department is playing a vital role in ensuring success at K92 Gold Mine in this space.

STAFF RESEARCH ACTIVITIES, ABSTRACT

Studies of Aggregates from PNG: Materials from Bumbu, Busu & Yalu Rivers of Morobe Province

Francis Kisai, J. Lem, 2019 to ongoing research

A good number of local mining sites for sand and gravel have been operating for decades in the Busu and Bumbu rivers of Morobe Province. Gravels, particularly from Busu & Bumbu rivers, are consumed in large quantities in Lae, Morobe Province. However, consumers know little about the quality of these gravels to date. This ongoing research is being carried out at the

Mining Engineering Department to evaluate the quality of these river gravels to understand their suitability for producing aggregate (raw material for concrete and road). The river gravel samples are analyzed for petrographic, physical, mechanical, and chemical properties.

Preliminary work on samples obtained from Bumbu showed materials of sedimentary nature are predominant, followed by those of volcanic rock types. The clasts seem to be well-graded. The majority of the samples were rounded, with significant irregular shapes. The surface texture of the clasts was rough to smooth. In terms of the shape, the workability of the gravel looks satisfactory. Work is still in progress to complete physical tests to determine the water absorption value, porosity, and dry density of samples. Mechanical tests of Aggregate Impact Value (AIV) and Los Angeles Abrasion tests (LAA) are employed to determine the samples' hardness. Magnesium Sulphate Value tests to determine resistance against chemical weathering and frosting. All these values will be compared against PNG and Australian (American) standards of testing materials to ascertain if the studied material is suitable for construction purposes.

This ongoing research aims to establish the reasons for the fast breakdown of sealed roads and then determine corrective measures for the sealed roads to last long.

Formation Mechanism, Ore Genesis and its Implication on the Milling and Recovery Processes, and the Environment of the Mt Bai Porphyry Copper Gold Deposit in Rai Coast, Madang Province, Papua New Guinea. (*Yawas Dekba & Gabriel Arpa*) *2019 to --- ongoing research.*

The Mt Bai Porphyry Copper Gold Deposit is approximately 40 kilometers due Southwest of the township of Madang and 8 kilometers inland from Astrolabe Bay (Melanua Harbour) along the Rai Coast. The deposit was recently discovered within an area not previously covered (interpreted) by a geological survey of Papua New Guinea (Regional Geology Map of PNG 1:250K, Madang Sheet).

The Mt Bai Intrusive complex intrudes the recent Pleistocene to middle Miocene sediments, and the mineralization is generally hosted within an older metadiorite stock to late diorite and porphyry stocks. The deposit is longitudinal and runs northwest in the southeasterly direction having a strike length of 7km by 1km wide. From recent fieldwork done so far (Dekba Y, Neinen E, Sumaiang R, Unpublished, 2019), mineralization is from the surface down to about 700m (from first-pass surface mapping with variation in (RL) relative to sea level) and still open down the depth and along strike length. The mineralization comprises an earlier quartz + pyrite + chalcopyrite phase with a later multiple phases overprinting of massive chalcopyrite bornite + quartz + carbonate + (bms) galena + sphalerite replacing the earlier mineralization.

This study aims to determine and understand the fluid chemistry (magma source), formation mechanism, i.e., structural setting and interaction of magmatic fluids, and the emplacement of different intrusive phases of mineralization events that will characterize the different ore types. Understanding these parameters will help determine the milling and recovery process for mining purposes and the handling and discharge of tailings into the environment when the project is developed into the mining stage. Also, on a regional scale, the outcome of the study will help to try to explain why most of the island arc magmatism and volcanism in the Bismarck seas, New Ireland and New Britain Island, etc. are Rhyolitic in composition (felsic-

intermediate) in nature (continental crust) than mafic in nature (Oceanic crust). These will strengthen the idea that part (or fragmented parts) of the Australian Craton still extends further out than initially thought and may give weight to the notion that the collision margin between the Australian and Pacific Plates may in fact, be further out along the Ontong Java Plateau and the Pacific Plate boundary than initial thought (On mainland PNG)

RESEARCH/PROJECT REPORT

Lem, J. Kobal, W., Witne, J., Arpa, G., (2022)**. Hidden Valley Mine Closure Planning Project: TSF Leachate Quality Analysis Report**

Lem.J., (2021). **Optimization of Gold Recovery in the Carbon-in-Leach circuit of Hidden Valley Au-Ag-Cu Mine.** A report on test work for the Hidden valley Gold and Silver Mine

WORKSHOPS/CONFERENCES/PUBLICATIONS/MEETINGS ATTENDED

- Yowa, G. (2022). **Natural Pozzolans**. International Journal of Geosynthetics and Ground Engineering https://link.springer.com/article/10.1007/s40891-022-00400-3

- Kobal, W. (2022). **Pyrite and AMD**. Presented during the Geoscience, Exploration & Extraction (GEE) Conference, Port Moresby, November 2022
- Yowa, G. (2022). **Bena Serpentinite, Manus Scoria, Simbu Kondaku Tuff and Rabaul Volcanics**, Presented during the Geoscience, Exploration & Extraction (GEE) Conference, Port Moresby, November 2022
- In partnership with Papua New Guinea Mineral Resources Authority, the Mining Engineering Department hosted the 5th National Alluvial Mining Convention here in Unitech. The Theme of the convention was: "**INCORPORATING A SAFER, SUSTAINABLE AND FORMALIZED ALLUVIAL MINING SECTOR IN PNG AS AN SME ACTIVITY" 21st to 22nd September 2021.** https://postcourier.com.pg/lae-hosts-alluvial-miners/

● Lem, J. (2021). Mineralogical analysis of K92 Gold Ore: Aspects Promoting Fluorine Accumulation Presentation of findings at the K92 Gold Mine. *December 12, 2021*

POSTGRADUATE RESEARCH

The research topics, supervisors, sponsors, and funding sources are presented.

Student	Research Topic	Funding Source	Supervisor
Tracey Vokain	Environmentally benign lixiviant for gold leaching	Self	Dr J Witne & Dr J Lem
Mr. Mondu Akura*	Hydrometallurgical extraction of gold in the K92 Gold Ore	GAP	Dr. J. Lem
Francis Kisai*	Evaluation of aggregate quality	self	Dr J Lem
Michelle Maiti**	Recoverable gold loss through TPP plant	OTML	Dr J Lem

** Finalizing MPhil thesis*
***Currently a project metallurgist at OTML, application for admission awaiting approval*

FINAL YEAR UNDERGRADUATE STUDENTS' RESEARCH PROJECTS

Mining Engineering

#	TOPIC/TITLE	STAFF	STUDENTS
1	Time study analysis of production mucking. *(K92 Mine)*	Dr Arpa	1. Emoni Hadassha 2. Kamare Gomez
2	Ground water modeling *(K92 Mine)*	Dr Arpa, Y.Ramsey & D. Yawas	1. Kongo Fabien 2. Kuk Jason
3	Ulternative Open pit mine design for Irimufimpa. *(K92 Mine)*	Mr Pakne, Dr Ail, Dr Arpa, Hans Matarab	1. Morehari Gilmore 2. Nonah Nonah
4	Optimization of Mine ventilation network analysis. *(K92 Mine)*	Dr Arpa & Philip Rimits	1. Paia Joel 2. Pim Joshua
5	Economic analysis of proposed twin incline design. *(K92 Mine)*	Dr Ail & Mr Pakne	1. Rumints Jordan
6	Equipment Selection. *(K92 Mine)*	Dr Ail and Mr Pakne	1. So-onwai Henry
7	Strength of Rockmass model. *(K92 Mine)*	Dr Arpa, D. Yawas and Y. Ramsey	1. Wilson Toros
8	Stability analysis of Dam extension design. *(K92 Mine)*	Dr Arpa, Dr Ail & H. Matarab	1. Taimi Sedrick
9	Swell Factor and Rock Density. *(K92 Mine)*	Dr Arpa, D. Yawas, and Ramsey Y.	1. Salvado Leonie

MINERAL PROCESS ENGINEERING

Hidden Valley Projects
Final year students research projects. 2022

#	TOPIC/TITLE	STAFF	STUDENT(S)
1	Determination of bond work index for Hidden Valley sulphide ores	Dr. J. Lem	Rosemary Kiminja
2	Sulphidisation of oxidized Cu – Au ores	Dr. J. Lem	Abigail Mileng
3	Leaching kinetics of K92 Gold ore	F. Kisai	Basil Taubuso
4	Effects of clayey minerals on gravity concentration of gold	Dr J. Lem	Billy Wosuwos

5	A baseline study on the crystallization of jarosite – Lihir Mine working condition	Dr W. Kobal	Brian Nokondopa
6	Production of ferric alum from Mt Bai Cu – Au ore	Dr W. Kobal	1. Claudia Solok 2. John Jr. Lepus 3. Johnson Yasa
7	Investigating thickener design using flocculants made from local materials	Dr J. Witne	Elijah Oa
8	Optimization of gold recovery in in porphyry copper ore	Dr J. Lem	Isaac Nindil
9	Application of DETA (Diethylenetriamine) to minimize the effect of copper on gold cyanidation	Dr J. Lem	Kathleen Aruma
10	Flotation of OK Tedi Skarn ore	Dr J. Witne	William Webster
11	Studying adsorption kinetics of locally produced activated carbon	Dr J. Witne	Elizah Namba
12	The hydrometallurgical processing of base metals: the positive side of Fe	Dr W Kobal	Scholastica Towal
13	Leaching kinetics of K92 gold ore	Dr J Witne	Simon James
14	Process mineralogy of K92 Au ore	Dr J Lem	Gibson Kaupa
15	Leaching of K92 gold ore	Dr J Lem	Kristy Maxine
16	Mineralogy study of K92 mine tailings	Dr J Witne	John Ioba
17	Determination of optimum collector dosage for K92 Gold ore	Dr J Lem	Nickita Kawage
18	Reduction of talc in copper flotation from locally produced depressant (cassava starch)	Dr J Witne	Paul Nopro
19	Investigation alternative sources for pH modifier	Dr J Witne	Nyoka Seseare
20	Optimising alluvial Au recovery: Wau - Bulolo	Dr J Lem	Tracy Paisat
21	Mineralogical study for K92 copper concentrate	Dr J Witne	Kawale Walai
22	Determination of optimum grind size for K92 Au ore	Dr J Lem	Renof Puio
23	Processing of refractory gold ore	Dr J Lem	Benjamin Mangip

24	Mineralogical study of K92 copper concentrate	Francis Kisai	Brian Tauvasa

DEPARTMENT OF SURVEYING AND LAND STUDIES

Head of Department: Dr. Andrew Pai

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 developing human resources adept in the holistic management of land resources and in eking out the best value out of them in a sustainable manner through coordinated research activities. It is also actively involved in finding Disasters, Risks, and Disaster Management, Disaster linked to climate change, and tectonic activities. The human resources developed in the Department have broad exposure to the state-of-the-art technology, e.g., recent developments in 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 many research programs, including densification of Benchmark points for PNG using the latest GPS / GNSS technology, GIS, remote sensing, and cartographic communication through thematic maps; property valuation, and land management research programs, and 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 landowners under Plantation Redistribution Scheme
25) Impacts & effects of special agriculture and business lease (SABL) on customary landowners

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 heighten 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,
36) Renewable energy needs Feasibility study, etc.

B. Name of the Faculty Member/Position/Area of Specialization/Research interests

Name	Position	Area of Specialization
Dr. Sujoy Kumar Jana	Associate Professor	Hazard and Disaster Management, Resource Planning and Management, Geography and Management
Dr. Sailesh Samanta	Associate Professor	Remote Sensing, GIS, Climatology, Geography, Natural Disaster, Disaster management, Site Suitability, Environment, Renewable energy
Mr. Job Suat	Senior Lecturer	Remote Sensing, GIS, Cartography, Survey, Infrastructure Development Surveys, Cadastral Data Modelling, Survey Practice -Laws & Regulations.
Mr. Wycliffe Antonio	Lecturer	GIS, Cartography, Geospatial Database modeling and development
Mr. Suman Holis	Lecturer	Property Valuation, Property Development, Land Administration
Dr. Andrew Pai	Lecturer	Property Valuation, Land Administration
Dr. Cathy Koloa	Lecturer	Planning, Spatial Modeling, Hazard Management, Hydro geomorphology
Mr. Lewi Kari	Lecturer	Vegetation monitoring, Remote Sensing, GIS, Digital Image Processing, Manual Image Processing, Aerial Photogrammetry, Geography, Cartography, CAD, ILG. Web Mapping, Route Analysis
Mr. Jerry Mille	Lecturer	Land Administration, Social Mapping, ILG Creation, Land Disputes & Settlement
Dr. Tingneyuc Sekac	Lecturer	Renewable and Clean Energy, Disaster Management, Climatology, Rural Development Planning, Urban Planning, Remote Sensing, Geospatal Data Science, GPS, and GNSS
Mrs. Rosemary Adu McVie	Lecturer	Knowledge and Innovation place/spaces - 'knowledge (community) precincts', 'innovation and cultural districts', 'science and technology parks', 'high technology districts', and 'innovation clusters'. 'Property Management, Corporate Real Estate Management, Property Valuation, and Urban and Regional Planning.
Mr. Navua Kapi	Lecturer	Engineering Surveys and Designs, Lease Surveys, Remote Sensing & Photogrammetry, Urban and Regional Planning & Subdivision, Mine Survey, Geodesy and

		GPS, Hydrographic Surveying, UAV Surveying, and Mapping, Deformation monitoring, Underwater Lease Surveys, Construction Surveys, Rural and Urban Valuations, Survey Hardware and Software Maintenance and technician, Claims and BOQ for any Engineering and Construction services.
Mr. James Seniala	Lecturer	Property Valuations, Property Management
Mr. Lepani Karigawa	Lecturer	Rural Valuation, Urban Valuation, Incorporated Land Groups, Property Management, Customary Land Registration
Mr. Clifford Jr Mespuk	Lecturer	Engineering Survey, ID Survey, Drainage Hydrology
Mr. Paulus Motoro	Lecturer	Property management, Property Valuation, Property Economics/Finance
Mr. Glen Yali	Lecturer	Geospatial Forest Biomass (Carbon) Modelling & Assessment for REDD+ Implementation, Pre-exploration Mineral Remote Sensing Detection, Customary Land Boundary Survey, Spatial Data Science, Marine Remote Sensing Detection, Soil Fertility Mapping, GPS Vehicle Tracking & Telematics
Ms. Camilla Yanabis Kwaudi	Senior Technical officer	Cartography, GIS DBMS, Web mapping
Mr. Heva Honeaki	Senior Technical Instructor	Hydrographic Surveying, Computer-Aided Drafting, EDM Calibration, GPS GNSS, Cadastral Surveying, Automated Surveying
Mr. Adward Buidal	Principal Technical officer	Certified UAV Pilot (Drone Pilot), Surveying Profession, specifically Mining and Civil Engineering Survey with a fair bit of Cadastral Surveying.
Mr. Joe Yapakae	Senior Technical officer	Cadastral Surveys and Engineering Surveys.

C. List of Scientific Paper Publications in Peer-Reviewed Journals

1. Adu-McVie, R., Yigitcanlar, T., Erol, I., & Xia, B. (2022). How can innovation district performance be assessed? Insights from South East Queensland, *Australia. Journal of Place Management and Development*, https://doi.org/10.1108/JPMD-06-2022-0053. (SCOPUS INDEX)

2. Adu-McVie, R., Yigitcanlar, T., Xia, B., & Erol, I. (2022). Innovation district typology classification via performance framework: insights from Sydney, Melbourne, and Brisbane. *Buildings,* 12(9), 1398. https://doi.org/10.3390/buildings12091398. (SCOPUS INDEX).

3. Jana, S.K., Varo, J., Kaloumaira, J., Suka, M., Vela, L., Odrovakavula, S., Tuiono, I., & Sekac, T. (2022). COVID-19 national response on tourism sector: a case study of Western division of Vitilevu, Fiji Islands. Pandemic Risk, Response, and Resilience,

COVID-19 Responses in Cities Around the World, 427-442. https://doi.org/10.1016/B978-0-323-99277-0.00019-X**.**

4. Sekac, T., Jana, S.K., & Pal, I., (2022). Spatio-temporal vegetation cover analysis to determine climate change in Papua New Guinea. *International Journal of Disaster Resilience in the Built Environment.* https://doi.org/10.1108/IJDRBE-05-2022-0045 (SCOPUS INDEX)
5. Yatu, G. & Samanta, S. (2022). Modeling of potential renewable energy in Papua New Guinea: Biomass and solar energy. *Spatial Information Research.* https://doi.org/10.1007/s41324-022-00436-7 (SCOPUS INDEX)

D. Book Chapter/Editor

1. Kaloumaira. J., Suka. M., Varo. J., Naikatini. M., Sekac.T and Jana. S.K (2022). Artificial Intelligence and its Importance for College of Enginnering, Science, and Technology, Fiji National University During COVID-19 Pandemic, 2023 Apple academic press, Inc. CO-published with CRC Press (Taylor & Francis).

2. Pani. S.K., Muduli. K., Jana.S.K., Bathula.S., and Khan.G.L (2022). Advancements in Artificial Intelligence, Blockchain Technology, and loT in Higher Education. Mitigating the Impact of Covid – 19. AAP Advance in Artificial Intelligence and Robotics, CRC Press, Taylor & Francis Group, Apple Academic Press. **Hard ISBN:** 9781774910924
   E-Book ISBN: 9781003300458
3. Samanta, S. . (2022). Exploration of Solar Energy in Papua New Guinea through Remote Sensing and GIS. Current Advances in Geography, Environment and Earth Sciences Vol. 8, 26–48. ISBN 978-93-5547-966-2 (eBook).

E. List of Conference Proceedings/Workshop/Seminar

1. Den, E., Samanta, S. (2022), Solid Waste Dumping Site Suitability Analysis using Multi-Criteria Decision Approach in Lae City, Morobe Province, Papua New Guinea, 9th Huon Seminar, The PNG University of Technology, Lae, Morobe, 30-31st August, 2022.

2. Lal, R.R., Varo, J., & Jana, S.K. (2022). Earthquake Characteristics and Ground Motions in Christchurch, New Zealand. In: Pal, I., Kolathayar, S., Tawhidul Islam, S., Mukhopadhyay, A., Ahmed, I. (eds) Proceedings of the 2nd International Symposium on Disaster Resilience and Sustainable Development. Lecture Notes in Civil Engineering, vol 294. Springer, Singapore. https://doi.org/10.1007/978-981-19-6297-4_5. (SCOPUS INDEX).

3. Pai. A (2022) A culturally inclusive valuation model for assessing compensation in the compulsory acquisition of customary land, 9th Huon Seminar, The PNG University of Technology, Lae, Morobe, 30-31st August, 2022.

4. Pai, A (2022). Whiter customary land, dressed in the emperor's robe or disclosed in its cultural splendour?. PNG UoT Research Seminar Series 5, Rose Kekedo Foyer, Dated: 12th-April 2022.

5. Sekac, T., Jana, S., Sutherland, M., & Samanta, S (2022). Spatio-temporal analysis of Climatic Variables and Vegetation Cover to determine climate change in Papua New Guinea. PNG UoT Research Seminar Series 8, Rose Kekedo Foyer, Dated: 17th-May 2022.

F. Winning Project

1. Ongoing collaboration research Project: PIURN

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

Research Team Members and Affiliations

1. Dr Krishna Kumar Kotra, Lecturer, School of Biological and Chemical Sciences, FSTE, The University of the South Pacific (USP) – Principal Investigator
2. Dr Sailesh Samanta, Associate Professor, Dept. of Surveying and Lands, PNG University of Technology (PNGUNITECH) – Co-Investigator / Co-funder
3. Dr Srikanth Bathula, Senior Lecturer, Dept. of Applied Sciences, PNG University of Technology (PNGUNITECH) – Co-Investigator
4. Mr Erie Sammy, Hydrogeologist, Dept. of Water Resources, Govt. of Vanuatu – Co-Investigator / Co-funder
5. Lokesh Padhye, Senior Lecturer, Oceania Water Research Consortium (OWRC), Dept. of Civil and Environmental Engineering, University of Auckland, New Zealand – Co-Investigator / Co-funder
6. 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: On going

2. Collaboration research Project: ACIAR Program

Project Title:

Better soil information for improving PNG's agricultural production and land use planning – Building on PNGRIS and linking to the Pacific Regional Soil Partnership Towards National Drinking Water Standards in Vanuatu: Applied Research and Capacity Building (Collaboration UNITECH – DSLS and Agriculture).

Research Team Members and Affiliations (DSLS)

1. Dr. Sailesh Samanta, Associate Professor at Department of Surveying and Land studies, PNG University of Technology. Co- Investigator.
2. Dr. Tingneyuc Sekac, Lecturer at Department of Surveying and Land studies, PNG University of Technology. Co- Investigator.

F. Undergraduate Research Projects for Year 2022

Year 4 BTSR Research Project

Student Name	ID	Supervisor	Research Topic
Andrew Kevin	18400807	Mr Heva Honeaki	Designing Road Alignment Along start from Sarawaget street to Laloki street at Coorperate Unit.
Benjamin Tiri	19400727	Mr Edward Buidal	Proposed Drill & Blast - Set Out
Isaiah Nekiau	19400830	Mr Edward Buidal	UAV Monitoring of Shoreline Erosion at DCA Beach Shoreline, Lae MP
Narol Jnr Akis	17400545	Mr Heva Honeaki	Cattlefarm, besides Sogeri Market. (Subdivision & Proposal of new staff houses, a mini mart, and a new extended market)
Brian Pedro	19400683	Mr Edward Buidal	Proposed Bridge site survey in Upper Baiune, Bulolo way District
Infiniti Roga	19400854	Mr Edward Buidal	Drilling & Blast Design
Ronald Yanewai	19400789	Mr Joseph Yapakae	Creating a Proposed Residential Subdivision on the Cricket Field behind Security Office
Gideon Kambao	14400378	Mr Clifford Jnr Mespuk	Integration of drone with RTK GPS techniques for road engineering surveys
Eleazar Kandiki	19400645	Mr Edward Buidal	Proposed Design of an Open-Cut Pit Mine
Shanaya Tivon	19400734	Mr Joseph Yapakae	Identification Survey of Portion 446 - Taraka Primary School, Lae, MP
Guna Barime	17400576	Mr Clifford Jnr Mespuk	Road Design along Independence Drive- Taraka to Bumayong Alignment
Louis Kangol	19400652	Mr Edward Buidal	Design of Tailing Storage Facility at Unitech Sports Field
Solo James	16400341	Mr Joseph Yapakae	Proposed a subdivision Design of a Commercial area/Shopping area around Unitech Sogeri
Samuel Paku	16400416	Mr Edward Buidal	Unitech Sports Field
Henry Yoke	18400869	Mr Clifford Jnr Mespuk	Road Alignment along Unitech Fence
Clayrick Steven	19400861	Mr Edward Buidal	How to carry out Subdivision Design in Occupied Area - Playing field to Habitat
Janetha Sirias	19400710	Mr Edward Buidal	Volumetric Stockpile Surveying using Drone Technology within the Aggregates and Construction Industries

Victor Nakanol	19400669	Mr Edward Buidal	PNG Unitech Campus Sewerage Outlet
Solomon Wailyo	19400752	Mr Clifford Jnr Mespuk	Oil Palm along Independence Drive
Martin Gaso	17400723	Mr Clifford Jnr Mespuk	Redesigning of existing road alignment from 2nd gate to Warangoi Drive
Nelson Patrick	19400847	Mr Edward Buidal	Portion between Oil Palm Plantation and Temporary existing Road
Samuel Abert	19400614	Mr Clifford Jnr Mespuk	Proposing a New Carpark on Vacant Area infront of Sandover Building
Wayne Warka	19400758	Mr Clifford Jnr Mespuk	New Road Alignment
Terry Yaks	19400885	Mr Edward Buidal	Road Alignment that will connect Fly Drive and Sarawaged Road beside Rainforest Habitat
Oscar Kabieng	18400636	Mr Clifford Jnr Mespuk	PNG Unitech gate to Lae Biscuit

Year 4 BGIS Research Project - 2022

SURNAME	NAME	Topic	Supervisor
Danwer	Jaiel	CONTINGENCY PLANNING AND EMERGENCY PREPAREDNESS OF WATER RESCUE- MADANG AIRPORT.	Dr. S. Samanta
Gam	Flora	FLOOD ZONE MODEL OF KINGS TIDE AND NORMAL TIDE ALONG THE COASTAL OF LAE CITY	Dr. C. Koloa
Imo	Joshua	IDENTIFYING THE REGISTERED INVESTMENT PROMOTION AUTHORITY (IPA) CERTIFICATE AGAINST UNREGISTERED FOR THE RENTAL HOMES AT EAST TARAKA.	Mr. Glen Yali
Kasau	Jude	SOIL EROSION AND RIVER ASSESSMENT ON BUMBU RIVER BESIDE LAE CHRISTIAN ACADEMIC	Dr. T. Sekac
Kaupa	Tatyanna	UTILIZING GIS & RS PRINCIPLES AND TECHNIQUES TO PROPOSE AN OPTIMAL ROAD LINK FROM SAIDOR STATION TO MADANG TOWN.	Mr. Lewi Kari
Kore	Amos	COASTAL FLOODING AND RISK ASSESSMENT OF GULF PROVINCE: USING GIS SPATIAL METHODS ON COASTLINE.	Dr. T. Sekac
Peter	Merolyn	IMPACT OF SHIFT IN RIVER COURSE TO THE SURROUNDING AREA USING REMOTE SENSING AND GIS TECHNIQUES - A CASE STUDY OF BUMBU RIVER IN MOROBE PROVINCE OF PAPUA NEW GUINEA	Dr. S. Samanta
Pondros	Clintis	GEO- SPATIAL ASSESSMENT AND MONITORING OF INDUSTRIAL WASTE AND ITS RELATED IMPACT. A CASE STUDY IN LAE CITY, PAPUA NEW GUINEA.	Dr. T. Sekac
Sakep	John Jnr.	CRIMINAL ANALYSIS USING GEO-INFORMATION APPLICATION	Mr. Glen Yali
Tagaga	Apisai	THE APPLICATIONS OF GIS AND REMOTE SENSING IN TOURISM MANAGEMENT; A CASE	Mr. Glen Yali

		STUDY IN EAST NEW BRITAIN PROVINCE, PAPUA NEW GUINEA.	
Tolulu	Dessiederia	CHANGE DETECTION IN VOLCANIC DEPOSITS OVER TIME USING GIS AND REMOTE SENSING TECHNIQUES: CASE STUDY IN RABAUL CALDERA EAST NEW BRITAIN PROVINCE	Dr. S.K. Jana
Wamil	Jacob	A GEOSPATIAL TECHNOLOGY APPROACH TO DETERMINE HOUSEHOLD WATER DISTRIBUTION AND THEIR POSSIBLE MITIGATION FACTORS.(A CASE STUDY OF NAWAEB BLOCK).	Mr. W. Antonio
Wayne	Anderson	TO USE G.I.S AND REMOTE SENSING APPLICATIONS TO DETERMINE AND ASSESS FACTORS AFFECTING CELLULAR COVERAGE IN BULOLO DISTRICT.	Mr. Lewi Kari
Wesley	Jeffrey	SITE SUITABILITY ANALYSIS USING GIS AND REMOTE SENSING TECHNIQUE FOR SOLID WASTE MANAGEMENT IN LAE CITY.	Mr. W. Antonio
Yafalibubu	Dorah	COASTAL MANAGEMENT: SHORELINE DELINEATION AND CHANGE ANALYSIS ALONG THE COAST OF ALOTAU TOWN USING GIS AND REMOTE SENSING TECHNOLOGY	Dr. C. Koloa

Year 4 Property Studies Research Project - 2022

	STUDENT	TOPIC	SUPERVISOR
1	Allan Bond	Not yet submitted; advised to do so urgently	Mr. Jerry Mille
2	Berolyn Ropa	The value of properties in Port Moresby during the past 4 years, present value and the value that will be in the next 4 years	Mr. Suman Holis
3	Charlie Kisisp	Formalizing informal property rental market into real estate market in PNG. A case study of 9 mile blocks, Lae	Mr. Lepan Karigawa
4	Eddie Martin	Assessing the Factors that have Impacts on Compensation for Land Acquisition in Mining Industries: A Case of Morobe Province – Hidden Valley	Mr. James Seniela
5	Eliab Sangundi	Entitlement of traditional landowners in PNG to the full benefits of their land and trees cut down for logging activities	Mr. Paulus Motoro
6	Elvina Peleti	Impacts of urban growth on residential property values in Lae, Morobe Province. (A case study of Kamkummu)	Dr. Andrew Pai
7	Eshrol Moreo	Improving Access to Water and Sanitation Provision in the Urban Area of Simbu Province. A Case Study of Kundiawa Town	Mr. Jerry Mille
8	Ezekiel Panosi	Real estate market cycle: Where is Port Moresby currently in the property market cycle?	Mr. Suman Holis
9	Faith Pu	Assessing the impact of informal settlements on property values of neighboring residential properties in urban Areas: A Case Study of Kamkumung, Lae City	Mr. Lepan Karigawa

10	Gideon Kulanji	Is the customary land tenure system hindering economic development in Papua New Guinea?	Mr. James Seniela
11	Gregory Ita	Incorporating Customary land in Lae Urban Growth, and Sustaining it the Papua New Guinean Way	Mr. Paulus Motoro
12	Jamishcha Allan	Urban Land Tax as a source for financing infrastructural development: A case study of Lae City	Dr. Andrew Pai
13	Jerothy Kapipi	Increase in rentals and prices of residential properties and its effects on the lives of middle-income and low-income residents in Lae City	Mr. Jerry Mille
14	Kepas Maibon	Informal real estate housing development and the impacts that exist in urban settlement within the formal sector of urban setting	Mr. Suman Holis
15	Larson Kosi	Ascertaining the sustainability of Incorporated Land Groups in Papua New Guinea: Wapicguhu and Wapigehu Incorporated Land Group in Lae City (Case Study)	Mr. Lepan Karigawa
16	Luther Aki	Redevelopment of Existing Police Accommodation to modern standards (Bumbu Police Barracks)	Mr. James Seniela
17	Lydia Dindi	The impact of Covid 19 on renting commercial properties (retail space) in Lae City	Mr. Paulus Motoro
18	Marywens Koni	Factors affecting the value of real estate market for residential properties in Lae	Dr. Andrew Pai
19	Melrose Gilbert	Assessing impact and affordability on standalone rental residential house in Eriku, Lae City	Mr. Jerry Mille
20	Nazaleng Yawing	Analysis of intra urban traffic congestion stretched along the Eriku to Kamkumung junction road	Mr. Suman Holis
21	Paul Ariaka	Assessing the base of value: Customary Land Valuation in Rural Areas	Mr. Lepan Karigawa
22	Robert Komni	Rental Markets in two major cities of Papua New Guinea (Lae and Port Moresby) based on the increasing demand placed by population growth, urbanization and industrialization.	Mr. James Seniela
23	Victor Napilua	Land Tenure of the Kilenge, a West New Britain people	Mr. Paulus Motoro

G. Postgraduate Students Research Project, 2022

PG Student Research Project 2022.

SL No	Name of the Student	Course	Tittle of the thesis	Supervisor (S)
1..	Imen Papa	Ph. D in Property Studies/1	Sustainability of Gold and Copper mining project on state and customary lands in PNG-A case study of Ok Tedi Gold and Copper mine	Dr. Jacob Babarinde Dr. Andrew Pai

2.	Lennie Dimo Kiap	Ph. D in Geomatics/3	Remote Sensing and GIS Application in Crude Oil and Ground Water Pre-Exploration Analysis and Mapping: A Case Study at Okapa- Wanikanto and Ebigo Village & Rainforest, Eastern Highlands Province, PNG	Dr. Sujoy K. Jana Dr. Sailesh Samanta Dr. Tingneyuc Sekac
3.	Nebare Poi	Ph. D in Geomatics/4	GIS and Computer Based Spatially Connected GeoInformation System for Resources Management and Rural Development Planning at Micro Level	Dr. Sujoy K. Jana Dr. Tingneyuc Sekac
4.	Clifford Mespuk Jr.	Ph. D in Geomatics/2	The application of unmanned Aerial Vehicles (UAV Drone Technology) for Remote Sensing as a tool for Rural and Urban development in PNG: A case study of Wapenamanda town planning	Dr. Sujoy K. Jana Dr. Tingneyuc Sekac
5.	Ashemah Malagh	MPhil/2	Determination of a Feasible Road Alignment from Erap to Lowai and Dinangat as an Economic Corridor (Morobe Fisika Road) Using Engineering Survey & GIS Techniques - A Case Study of Erap/Lowai/Dinangat Economic Corridor, Morobe, PNG.	Mr. Navua Vali Kapi Mr. Lewi K Kari
6.	Edwin Nidkombu	MPhil/2	Upgrading Settlement to a proper subdivision	Mr. Navua Vali Kapi Dr. Tingneyuc Sekac
7.	Resila Karipal	MPhil/2	Using GNSS & GIS Applications combined with UAV technology to create a Digital Cadastral Database for a Peri-Urban settlement - A case study of Igam -Block, Lae City	Mr. Navua Vali Kapi Mr. Lewi K Kari
8.	Heva Honeaki	MPhil/2	The Importance of Identification Surveying Identify Encroachment; Case Study of Encroachment to the Boundary of PNGUOT Taraka Campus	Mr. Navua Vali Kapi Mr. Job Suat

REPORTS FROM THE RESEARCH INSTITUTIONS

APPROPRIATE TECHNOLOGY AND COMMUNITY DEVELOPMENT INSTITUTE (ATCDI)

Acting Director: Mr. John Tenakani

Introduction

The Appropriate Technology & Community Development Institute (ATCDI) is located at the PNG University of Technology (PNGUoT) in Lae, Morobe Province. Its purpose is to conduct research and develop technologies appropriate to Papua New Guinea communities' needs and provide technical assistance and information to these communities. The projects are identified through requests from stakeholders.

The Institution aims to assist the rural communities within Papua New Guinea through technical advice and training. Internal revenues, university funds, donor funding, and recurrent salaries financially support its operations. There are five program areas of focus: Energy, Water and Sanitation (WaSH), Appropriate Technology (Small Industry), Food and Downstream Processing, and Community Information. In addition, the Community Information Centre responds to community requests for information on various development issues.

ATCDI is driven by the vision to be a leading Institute in the country providing innovative development services. Its mission is to improve the living standards of local communities through research, development, application, training, and dissemination of information to address the needs of the communities. And its core value is to ensure quality services are delivered to less developed communities.

Research Areas

- Water Supply
- Appropriate Technology
- Renewable Energy

Objectives

- Identify problems affecting the communities and initiate the application of relevant, appropriate technologies for socio-economic development aimed at improving the living standards of the people.
- To demonstrate and effectively popularize the usefulness of various appropriate technologies which have successfully been experimented at the PNG University of Technology through relevant training avenues and workshops.
- To provide the opportunity for student engagement in research activities and as well as to expose the local people to various scopes for employment generation through Science & Technology.

Highlights and Achievements

No	Project Titles	Program	Team Leader	Achievements
1	Kapari Water Supply Project	Water Supply & Sanitation	Sona Anegi	Successfully installed a solar bore water supply system that provides water to the nearby communities. The system utilizes a submersible pump that delivers water to an elevated tank which then is accessed at the bottom via a tap.
	Nuknuk Village Water Supply (Salamaua)	Water Supply & Sanitation	Sona Anegi	Project pending – • Experiencing less volunteer labor at project site. A challenge for locals to involve and take ownership of the community project 'projects sustainability concern' • The supply system will combine solar water pump to deliver water from a flowing stream some 3.5km inland at 28m elevation to 65m uphill to allow gravity system to supply the community which is located along the coast. • Requires more volunteer labor from community to

				construct a 50kLferro cement tank • Procurement of main project materials about 70% already made and transported to site • Project completion date target April of 2023 **Action Plan:** • Strategize holistic community project approach for successful project installation
2	Gobadik Ram Pump Pilot Project	Appropriate Technology	Robert Kipong	Successfully built and installed a hydraulic ram pump at Gobadik, in Lae. The system does not use electricity however uses the force of water to pump fresh spring water up 30 meters to a 1000 L tank where it is accessible to the community. More than 4,500 Gallons of water is pumped per day. Pump is still in operation. Progress is still ongoing to install an elevated 9000L tank to increase the capacity

				and reach houses further inland. • Technical report is being compiled • instructional manual is still being written "How to Build a RAM PUMP" • Short article will be put published soon after the official launch of this project
3	Charcoal and Charcoal Stove Production	Appropriate Technology	Robert Kipong	Built and tested charcoal stoves using concrete and sand. Moreover, charcoal is being produced using a Tongan Kiln built at ATCDI workshop. The charcoals are being produced from coconut shells and hardwood. • Plan to sell charcoal stoves • Plan on selling locally produced charcoal • A training shall be developed after feedbacks are received from the people.

4	Brick Mold Production using a Pre-fabrication technique	Appropriate Technology	Robert Kipong	Improved brickmould production output from one per week to two per week.
5	Downstream processing of food and soap products	Food and Downstream Processing	John Tenakanai, Scientific Officer BSc in Food Technology, PNG University of Technology MSc of Leadership (Business Administration), Divine Word University john.tenakanai@pnguot.a.c.pg	Noni juice of 200 Liters was extracted and bottled for consumers. Turmeric powder and coconut oil were processed and sold, the total amount of 3.5 kg ad 20 liters, respectively. Various soap sizes numbering 15 batches were produced and sold to clients. Funding is derived from internal revenues.

Research Publications and Training

Undergraduate student final year research projects as part of Internship with ATCDI

No	Name	Supervisor	Title of Research Project	Department
1	Ishmael Lohu Wanguwe Raisis Asher Koigiri	Robert Kipong Eric Lagaia Richard Kakito	**Engineering Design and Planning:** Production of updated engineering schematics for Powerlines and Street Lights	ATCDI Estates and Services
2	Ishmael Lohu Joyleen Aisi	Robert Kipong	**Production Engineering:** Charcoal stoves	ATCDI
3	Hatsen Bimai	Robert Kipong Ronald Dei	**System Rehabilitation:** Repair of Damaged Micro Hydro Power Plant Daulo Eastern Highlands Province	ATCDI
4	Ronald Kunii	Robert Kipong	**Design Improvement:** Ram Pump stand for stability	ATCDI

5	Ishmael Lohu Cecil Max Aiso	Robert Kipong	**Water Resource Management and Ram Pump Technology:** and construction of ram pump testing rig utilizing water recycling.	ATCDI
6	Rayond Zeming Benjo Jerry	Robert Kipong Ronald Dei	**Production Engineering:** Production of Brick Molds	ATCDI
7	Joyleen Aisi Jason Chui Rayond Zeming Benjo Jerry	Robert Kipong Ronald Dei	**Water Resource Management and Ram Pump Technology:** Design and Installation of Ram Pump at Gobadik	ATCDI
8	Joyleen Aisi Jason Chui Rayond Zeming Benjo Jerry	Robert Kipong	**Design Improvement:** Standardization of Rope and Washer Pump for quick and easy construction and operation	ATCDI
9	Joyleen Aisi Jason Chui Rayond Zeming Benjo Jerry	Robert Kipong	**Production Engineering:** Charcoal Production utilizing Tongan Charcoal Kiln	ATCDI

Staff Training

1. Nosare Maika Australian Award Scholarship, PhD study in Mechanical Engineering, James Cook University, 2022 – 2026.

Research Interests

No.	Researcher	Research Interests
1	Mr Nosare Maika	PhD Thesis, Development and Design Optimization of High-capacity Gravitational Vortex Hydro Power Plant (GVHPP) for High and constant Flowing River Conditions Employing Computational Fluid Dynamics and Modelling

2	Mr Robert Kipong	Humanitarian Engineering: Innovative approaches and interactions in crisis management
3	Mr Sona Anegi	MSc Humanitarian Engineering with Sustainability;

SOUTH PACIFIC INSTITUTE FOR SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT (SPISARD)

Acting Director: Dr. Veronica Bue

1. Background of SPISARD

The South Pacific Institute for Sustainable Agriculture and Rural Development (SPISARD) was established in the Department of Agriculture (DoA) of the Papua New Guinea University of Technology (PNGUoT) in 2003 and started conducting outreach extension activities in 2004. The SPISARD is an institute-conduit that promotes sustainable agriculture and rural development. The Institute is tasked to develop location and farming-specific extension methods and approaches, providing training and transfer of appropriate and sustainable agricultural technology, conducting applied and development-oriented research on food and cash crops and livestock, and developing appropriate farm implements. The target is to improve and attain sustainable integrated farming system practices suitable for the subsistence and semi-subsistence farming community with enhanced farm productivity and income and minimum impact on the quality of the environment.

Over the years, the Institute has broadened its scope to a more holistic approach to include other programs in the area of household food security, household livelihood strategies in peri-urban settlements, gender issues, resource management, education, health, clean and safe water supply, improved sanitation and hygiene, solar lighting, HIV/AIDS awareness and other relevant programs that affect people, their lives and livelihoods.

The Institute operates through a "model village approach", an avenue to channel research, training, and extension activities with active participation from the target population and communities. This approach complements the existing models in that the development process takes place in the farmers' environment with immediate "real-time" feedback mechanisms based on the farmers' perspective and satisfaction. For the SPISARD, its model's uniqueness is its participatory strength in engaging under- and postgraduate students, academic staff of the DoA, and internal sister academic departments of the University. The activities were conducted in the model villages that were established in various agroecological zones in the country.

1.2 VISION

The vision of the Institute is:

To be dynamic and innovative in providing leadership and life-long learning in extension and sustainable agriculture development, positively impacting rural communities in Papua New Guinea, Melanesia, and the South Pacific Island Countries (PICs).

1.3 MISSION

The mission of the Institute is to:

- Collaboratively advance the development of "Model Villages" and improve the skills of the people involved in the rural development activities to help themselves towards improved welfare and livelihood;
- Create, foster, and implement collaborative action and learning opportunities through demonstration projects and learning centers;
- Promote direct participation of farmers in the pursuit of improving their farming systems to increase productivity, income, household food and nutritional security, and sustainably manage the environment.

1.4 FUNCTIONS

The functions of the Institute are:

- Conduct applied research in sustainable agriculture, household food and nutritional security, household livelihood strategies, extension training, and rural development;
- Train and develop human resource needs of agriculture and community development in PNG, Melanesia, and the PICs;
- Develop and promote appropriate farm implements;
- Develop appropriate post-harvest and food preservation technology and promote nutrition;
- Provide agriculture extension services, including technical information in suitable forms to farmers;
- Provide market, credit, and agri-business management information to farmers
- Develop and transfer improved agricultural technology
- Develop appropriate extension methods
- Evaluate research, extension, and development policies.
- Provide advisory services to the government, private and rural communities.
- Preserve and promote agricultural bio-diversity in crops and livestock farming.
- Popularize rice cultivation for food security
- Initiate aquaculture for family nutrition.
- Initiate agro-forestry, and social forestry.
- Promote and harness traditional farming systems and their environmental control and land usage.

The Institute receives an annual budget of K100, 000.00 from the University that helps to support its outreach activities to rural communities. This report presents community outreach activities conducted in 2022.

1. Activities conducted in 2022

2.1. Preliminary Observation

Two Preliminary Assessments were done to identify the Training Needs of the rural populations in Kendale and Masandanai villages in Ialibu, Southern Highlands Province, and Angoram, East Sepik Province, respectively.

2.1.1. Training Needs Assessment – Ialibu, Southern Highlands Province

In February 2022, the Acting Director of the SPISARD, along with a team comprising Mr. Kewa, Mrs. Tiko-Motoro, Ms. Parau, and Mr. Narimbi, embarked on a one-day trip to Kendale village in Ialibu, located in the Southern Highlands province, to carry out a Training Needs Assessment. This trip was initiated in response to a request from the Deputy Mayor of Ialibu District, who expressed interest in collaborating with the SPISARD on various projects. The team's visit to Kendale village is a testament to the SPISARD's commitment to collaborating with local communities and stakeholders to identify their training and development needs and develop tailored programs to meet their needs.

Based on the observations of the Team, Kendale village is situated in the basin of Mt Yalibu and Giluwe and presents an immense opportunity for sustainable and profitable farming. The region boasts an abundance of arable land, marshes, and rivers, home to a diverse range of aquatic plants and animals that could serve as alternative feed ingredients to be used in Stock

Feed Making. This presents a promising avenue for exploring innovative and sustainable farming practices that can support the growth and development of the local agriculture industry while preserving the natural environment. Preliminary findings underscore the potential for Kendale village to become a leading hub for sustainable agriculture in the region. The SPISARD remains committed to working with local stakeholders to harness this potential. After the participatory need assessments, proposed training was identified in order of their priority which includes (i) vegetable farming, (ii) stock-feed making, and solar drying. The last two weeks of September were set for the first batch of training (nursery practices and vegetable farming) to be conducted. However, due to the national election, Trainers were not able to deliver the trainings as expected and postponed to early 2023.

Left: Dr. Bue, Mrs. Tiko-Motoro and Mr. Kewa giving address to the villagers at the gathering. Center: One of the village accommodations offered to the visiting SPISARD team. Right: The village Council standing, giving his introduction with his villagers seated at the gathering place. Photo Credit: SPISARD.

2.1.2. Training Needs Assessment and Development of a Cocoa Budwood Garden – Masandanai Village, East Sepik Province

Training Needs Assessment

In September 2022, a team of officers from the SPISARD conducted a preliminary trip to Masandanai Village in Angoram District, located in the East Sepik Province. Masandanai is a remote riverine village in the Karawari Local Level Government (LLG). The aim of the trip was to establish a connection with community members and leaders to foster agriculture and community development activities in the area.

The visit allowed the team to gain a deeper understanding of the community's development and training needs, which will serve as a foundation for developing tailored programs to support their growth and prosperity. This initial visit represents a key milestone in the SPISARD's ongoing efforts to build meaningful partnerships with local communities and promote sustainable development.

On Thursday, 8th September 2022, the SPISARD team convened a meeting with the village councillor, village leaders, women, and youth at the councillor's meeting house in Masandanai Village. Despite half of the villagers being away at Angoram for a mortuary, the meeting was well attended, with approximately 50 people in attendance. The team's engagement with the community provided valuable insights into their current ventures, particularly in cocoa farming, which was introduced to the villagers through the Smart Cocoa Program led by

Governor for East Sepik Province, Allen Bird. While cocoa farming presents a promising opportunity for the community, it was noted that the villagers have not received any training on how to grow the crop or where to obtain Cocoa Board certified seedlings. Despite reaching out to neighboring communities for support, the challenge remains significant. This highlights the need for targeted training and support programs to enable the community to fully realize the potential of cocoa farming and other agricultural ventures.

In light of the challenges faced by Masandanai Village in obtaining Cocoa Board certified seedlings, a cost-saving strategy was identified by the SPISARD team. The community was encouraged to establish their own cocoa budwood garden, which would enable them to propagate their own seedlings at a reduced cost. During the meeting with community members, it was discovered that the village already had a budwood garden, which had been planted and managed by the former ward councillor. However, ownership of the garden was unclear. Therefore, the community agreed to formally recognize the former ward councillor as the owner of the garden. To support the development of the budwood garden, the SPISARD donated a full set of 180 clone seedlings to the community (18 standard clones x10 seedlings per clone). This initiative is expected to provide the community with a sustainable and cost-effective source of seedlings for their cocoa farming operations, thereby promoting long-term growth and prosperity. Further, the community needed help in proper measurements in block lining and nursery practices for the development of the budwood garden. Requests were made for the SPISARD Cocoa Officer, Mr Fanua to make a second trip to the village to help in developing a budwood garden. Plans were set for Mr Fanua to make his second trip in October and the community was tasked to allocate and clear a place for the budwood garden.

Moreover, to support the development of cocoa farming in Masandanai Village, the SPISARD team identified the need for targeted training programs. The proposed training sessions will focus on key aspects of cocoa block establishment, husbandry and management practices, and grafting skills. In collaboration with Mr. James Fanua, the SPISARD team made arrangements for the delivery of these trainings however, due to budgetary constraints, it was not possible to conduct these trainings and were postponed to2023.

This delay is expected to have minimal impact on the overall development of the community's cocoa farming operations, as the training sessions will provide essential knowledge and skills to enhance the sustainability and profitability of cocoa production in the village.

Top left to right: SPIARD Team addressing the community in the ward councillors 'haus man' (meeting house). Bottom left and centre: Cocoa seedlings being loaded off the vehicle and onto the motor canoe. Right: SPISARD team presenting the cocoa seedling to the ward councillor. Photo Credit: SPISARD.

Development of a Community Cocoa Budwood Garden

In October 2022, Dr Bue and Mr Fanua travelled to Masandanai village for the development of a cocoa budwood garden for the community. The Team realized that a site has been allocated and virgin forests were already cleared for the garden. The community was really keen in the development of the garden and there was a very good turn up of youths and elders on the first day. Mr Fanua gave a talk out in the field on block lining, different varieties of coco clones and nursery practices before all participated in clearing the weeds, doing the measurements, digging holes and planting the seedlings according to the Cocoa Board standards. However, due to transportation losses, 42 seedlings were damaged and are yet to be resupplied to complete the budwood garden. These seedlings will be supplied in early 2023 as the work in Masandanai village progresses. The Team look forward to continued collaboration with Masandanai Village to identify opportunities for growth and development.

Masandanai Community participating in the Budwood Garden establishment led by Cocoa Officer Mr. James Fanua

2.2. Baseline Survey

2.2.1. Baseline Household Income and Dietary Survey – Kapari, Central Province

To gain a better understanding of the socioeconomic conditions and dietary habits of households in Kapari, a baseline survey was conducted from 29th March 2022 to 5th April 2022. The survey was carried out by Ms. Tabitha Parau, and a comprehensive report is currently being finalized. The primary objective of the baseline study was to establish important benchmarks that can be used to evaluate the effectiveness of selected program interventions and assess their impact on household income and dietary diversity. The findings of the baseline study will serve as a valuable reference point for future planning and development activities in Kapari, as they will provide a clear picture of the existing socioeconomic situation and inform the design of targeted interventions to improve the wellbeing of the local population.

2.3. Outreach Activities

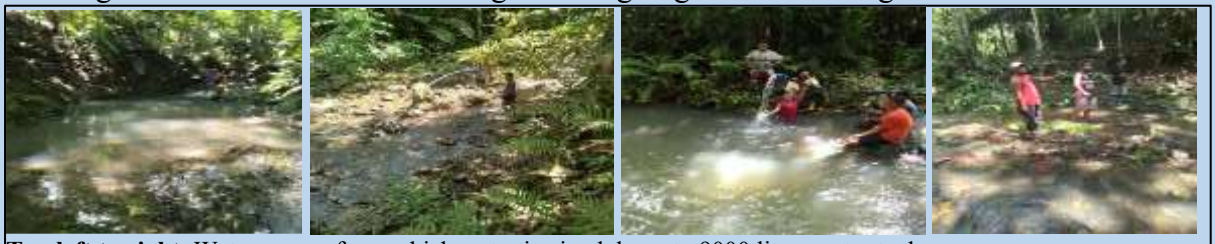
2.3.1. Meithe Village Gravity-Fed Water System and Cocoa Nursery

i. Gravity-fed Water System

The Meithe Gravity Feed water system represents a significant milestone in the SPISARD's efforts to improve cocoa nursery and farming development, and to enhance the livelihoods of the local population. This initiative is expected to play a pivotal role in supporting the nursery setup and cocoa development in Meithe village and its surrounding areas. By providing a

reliable source of water for irrigation and other agricultural activities, the water system will enable farmers to cultivate their crops more efficiently, leading to increased yields and improved incomes.

Moreover, the Meithe Gravity Feed water system will provide local communities with access to clean water, which will have a positive impact on their health and wellbeing and cut down on excess time being spent by women sourcing water which can be used in other productive activities. Overall, the Team believe that this initiative will contribute significantly to the sustainable development of Meithe village and its people, and the SPISARD is committed to ensuring its success through ongoing monitoring and evaluation.



Top left to right: Water source from which water is piped down to 9000 litres water tank.
Bottom left to right: Water piped into the water tank and distributed various points in the village. Photo Credit: SPISARD

The gravity-fed water system, which spans a total distance of 3km from the mountains to the village below, required an equivalent length of poly piping to be installed. The installation process, which involved setting up the materials and delivering the water to the tanks and village area, took a total of 3 days. This crucial development was funded by the Kapari Development Association (KDA) and carried out by the Agriculture Department of the South Pacific Institute for Sustainable Agriculture and Rural Development (SPISARD) in collaboration with the Appropriate Technology and Community Development Institute (ATCDI) at PNGUoT.

The implementation of the gravity-fed water system was a resounding success, as evidenced by the pictures above. Within a mere three days, the villagers were able to access clean water in their homes for essential activities such as cooking and washing

ii. Cocoa Nursery Development

After the successful completion of the gravity-fed water system, a cocoa nursery was promptly erected in Meithe Village, with the assistance of Cocoa Officer Mr. James Fanua, who supervised the establishment of the nursery. The nursery has the capacity to hold up to approximately 30,000 seedlings.

Additionally, Mr. James Fanua provided a demonstration to the villagers on how to perform block lining and plant shade trees. The villagers are expected to use this knowledge to carry out block lining in their own cocoa blocks and begin planting shade trees. A follow-up visit

will be conducted at a later time to assess the progress of the villagers' block establishment in preparation for transplanting cocoa seedlings.

2.3.2. Establishment of the Integrated Community Transformation Centre (ICTC) at Hamara Model Village, Oro Province

The people of Kokoda LLG (Ward 14) in Oro Province have completed the construction of the ICTC in Hamara Village. The Centre is set to open in December 2022. As part of their industrial training, 10 students from the CDS Department spent eight weeks in the village conducting community profiling work. A 5-day training program on Stock-feed making and Cocoa Husbandry is scheduled to start in January 2023. The Centre is scheduled for opening during the same time.

2.4. Partnerships

The SPISARD is actively establishing partnerships with relevant organizations to facilitate training delivery and promote rural community development.

Small and Medium Enterprise Corporation

In mid-2022 Mr. Nick Kewa, a committee member of the SPISARD, met with the Director of Small and Medium Enterprise Corporation (SMEC) to come to an agreement of collaboration with the SPISARD. The goal of this collaboration is to improve the financial literacy of rural farmers in PNG.

The SPISARD's mission is to develop location and farming-specific extension methods and approaches, providing training and transfer of appropriate and sustainable agricultural technology, conducting applied and development-oriented research on food and cash crops, livestock, and the development of appropriate farm implements. The target is to improve and attain sustainable integrated farming system practices suitable for the subsistence and semi-subsistence farming community with improved farm productivity and income and minimum impact on the quality of the environment. SMEC's mission is to provide support and assistance to small businesses and promote entrepreneurship in PNG.

By collaborating with SMEC to provide financial literacy training, the SPISARD can further achieve their mission of improving the livelihoods of rural farmers by addressing one of the major challenges they face: lack of financial knowledge. This collaboration will help farmers gain knowledge about access to credit facilities, loan applications and basic bookkeeping, which can lead to better financial management and decision-making, ultimately improving their income and quality of life. The collaboration will also promote entrepreneurship and small business development in rural areas, which aligns with SMEC's mission. Overall, this collaboration has the potential to contribute significantly to the sustainable development of rural communities in PNG.

Visit to the SPISARD by Member for Bogia Open, Madang Province

Honorable Robert Naguri, a Member of Parliament from Bogia in Madang Province, recently met with the Department of Agriculture, the SPISARD team, the ATCDI team, and the Vice Chancellor of the Papua New Guinea University of Technology, Dr. Ora Renagi. The purpose of the meeting was to seek expertise in agriculture and rural development, with a particular interest in having SPISARD and ATCDI work on rural development in his electorate.

This meeting demonstrates Honorable Naguri's commitment to promoting rural development in his constituency, and his recognition of the importance of agriculture as a means of improving the livelihoods of rural communities. By seeking the expertise of organizations such as SPISARD and ATCDI, he is taking a proactive approach to addressing the challenges faced by rural farmers and communities, and working towards sustainable development.

SPISARD's focus on sustainable agriculture and rural development, combined with ATCDI's expertise in community development and technology transfer, can provide valuable support to Honorable Naguri's efforts. Through collaboration with local stakeholders and the community, they can help to develop and implement strategies that promote agricultural productivity and income generation, while also addressing environmental and social concerns.

Overall, this meeting highlights the potential for partnerships between government, academia, and civil society to work towards sustainable development in Papua New Guinea, particularly in rural areas where the majority of the population resides.

2. Conclusion

After reviewing the various activities and initiatives carried out by the SPISARD over the past year, it is evident that the organization has made significant progress in promoting sustainable agriculture and rural development in Papua New Guinea. From the establishment of cocoa nurseries, budwood gardens and gravity-fed water systems to the training of farmers and the building of community centers, the SPISARD has demonstrated a strong commitment to improving the livelihoods of rural communities.

In addition, the SPISARD has actively sought out partnerships with other organizations to enhance the delivery of training and development programs. These collaborations have helped to build stronger networks and increase the reach of the SPISARD's initiatives.

As we look forward to the coming year, we are confident that the SPISARD will continue to make a positive impact in Papua New Guinea. The dedication of its staff, the support of its partners, and the resilience of the communities it serves all contribute to a bright future for sustainable agriculture and rural development in the country.

SUSTAINABLE ENERGY RESEARCH INSTITUTE (SERI)

Director: Dapsy Olatona

The Sustainable Energy Research Institute (SERI) was inaugurated in 2018 so that all Renewable Energy Practitioners in PNGUoT can interact and carry out collaborative research and consultancy activities under one umbrella.
The SERI lab and SERI office is currently located within Applied Physics Department.
Even though SERI has no dedicated building or infrastructure of its own (similar to ERMC, ATCDI, and Biotech), it has grown significantly in outlook due to the large membership, oversea funding, and the significant impact it has within the PNG Energy community. SERI can therefore be described as a floating albeit well-sustained establishment.
SERI's research and sustainability are derived from the research and input of its members. The SERI members and experts are primarily full-time lecturers and technical staff of several departments at PNGUoT. While the individual research by the members can also be attributed to the 'several' departments, SERI plays a significant role in coordinating and providing support and assistance to all energy research and development in PNGUoT.
The list below does not include all activities supported by SERI but just the few that were initiated and coordinated by the SERI Director at the Secretariat in 2022.

1. **PNG power grid digitalization roadmap.**
(Ongoing research and consultancy activities carried out by 7 SERI members, 13 students, and an external company)

2. **Agricultural Photo voltaic research**
(Ongoing research headed by Dr Olatona and Mr. Poloma Agriculture Dept in partnership with an oversea university)
3. Renewable Energy as Saving Graces for Pacific Island Nations Fighting Climate change
(Widely referenced European conference by Rena Lovo et al)
4. Multi Hybrid Power system combining Hydro, solar and biodiesel
(Ongoing research headed by Dr Shoeb: Mech Engineering Department)
5. Longevity of Solar Power Installations in three PNG provinces
(Ongoing research headed by Dr Olatona and SERI members from three departments)

Research and Feasibility studies under AP Dept Capstone Project in 2021 and 2022
1. Hydro Power potential for power generation to supply Kombu Glirande village in Kerowagi District in Chimbu Province: By WENA Dorugl
2. Design & Construction of a prototype energy efficient reverse cycle car air conditioning system: By Miss BON Tatianna and Miss Shameka BANTA
3. Experimental Determination of Numerical Aperture and its importance in Efficient Optical Fibre Communication: by MALAI Kallen
4. Renewable Energy Design and Fabrication of Biogas Digester for Household Uses: By MALKEN Philemon
5. Energy efficient Food storage facility at PNGUoT Mess: By BANIAN Tommy and PIAKOU Emmanuel
6. Mini Hydro Electricity for Kegosuku village Chimbu: By Yanda Mathias Thomas Clifford, Gaima Joshua
7. Mini Geotherml Electricity for Matupit village Rabaul, ENBP: By Malmalit Ronnie, Poko Rickson, Tomadek Boa

REPORTS FROM THE RESEARCH CENTRES

ENVIRONMENTAL AND RESEARCH MANAGEMENT CENTRE (ERMC)

Acting Director: Assoc. Prof. Patrick S. Michael, PhD

INTRODUCTION

The Environmental Research and Management Centre (ERMC), established in 1993, is mandated to conduct environmental research and management programs involving faculty and students from the PNG University of Technology (PNGUoT) and sister institutions from within PNG and abroad. The ERMC's mandated areas of research and development are in environmental, climatic, and natural resources management. In line with this, specific research focuses on environmental sustainability and sustainable use of natural resources with minimal negative impacts. Sustainable use and management of natural resources are impossible when the general environment is adversely impacted. Therefore, research focuses on understanding the management of degraded environment using environment-friendly techniques and strategies to protect the environment for environmental sustainability. Most of the research is underpinned by climate change and environmental sustainability. Part of the mandates includes the development of policy in areas related to the management of the environment, such as Biodiversity Conservation, Protected Area Establishment and Management, Regulation and Control, Monitoring and Risk Management, Biosecurity and Transboundary Movement, and Border Surveillance. Most of these are underpinned by interests in developing regulatory frameworks for proper administration and management towards benefit sharing, capacity building, research and development, and conservation and management.

This report points out some tasks ERMC has managed to do under Associate Professor Patrick Michael as the Acting Director. Although much research is anticipated, significant progress has been made, particularly in establishing contacts and developing several projects.

RESEARCH AND DEVELOPMENT

Despite the existence of ERMC for the last 29 years, only a little has been achieved in environmental research, and the output (publication, student training, fund generation, and contribution to policy development) has been negligible. Part of the problems has been the need for more establishment of scientific officers, insufficient laboratory space, and the introduction of state-of-the-art scientific equipment. This includes standardizing a handful of equipment already available in the labs that have never been installed. Progress has been made to ensure missing parts of these equipment are identified and standardized.

The dire research and developmental needs of ERMC have led to plans to recruit research students from within the University directly, e.g., top final students, and externally from the community or industry to do research from ERMC. To address some of these problems, ERMC has formed a working group of staff from academic departments with interests in environmental research and management, e.g., the department of Civil Engineering, Mining, Agriculture, and Applied Sciences, to name a few. The roles of this working group are to develop a funding proposal, propose projects, supervise project students, respond to calls for proposals, and get involved in the research and development activities of ERMC. In addition,

the group members will take up ERMC-proposed projects, supervise students from their departments, and co-supervise with other members. Some possible projects have been proposed and will be circulated among the members to consider and propose for students from their departments to consider.

CURRENT PROJECTS

The Centre has made significant progress in the last three months, and several others are under the pipeline/initial stages of development. The major projects for action include:

(i) **Certificate III in Project Planning and Management** – The syllabus of this course has been written in consultation with Global Green Growth Institute (GGGI) and Climate Change and Development Authority (CCDA). The course development has advanced to maturity, and eligibility for expression of interest (EOI) has been prepared in anticipation of putting up the advertisement. The teaching staff has been organized, and classes (online) are planned to start in March 2023.

(ii) **The PNGRIS2** – The PNG Resource Information System 2 (soil) with ACIAR has been signed by the VC. ERMC will be involved in this project along with the Agriculture Department and the Department of Surveying and Land Studies (GIS). This project is in its final progress and will start sometime in June 2023.

(iii) **Project examining climate impact in PNG with Climate and Security Policy Centre at the Australian Strategic Policy Institute (Climate and Security Policy Centre | Australian Strategic Policy Institute | ASPI**. ERMC was involved in writing the concept paper and is with partners for further advancement.

(iv) **Climate change, sustainable energy, and nuclear safety** – This is an EU project at its very early stage. ERMC has submitted their filled Table of Partners Form with the CV of the Director.

(v) **Observations of climate change and food crop production systems in selected Sites of Markham Valley** – This is an Australia-Papua New Guinea Economic Partnership Project headed by SPISARD, and ERMC is a partner. This project is at its conceptual framework stage, and the proposal was submitted.

(vi) **Irrigation and Mechanisation of sweet potato production in PNG – opportunities and limitations**. ERMC and NARI have partnered with the University of Queensland to develop the concept notes, submitted to ACIAR for consideration as the initial step. This project will be up for full proposal as the approval is given.

(vii) **Improved sweet potato production management project** – This project has been verbally discussed with project leaders from ACIAR and CSIRO for further studies to be proposed and carried out. At this stage, the possibility of involving a Ph.D. researcher is prominent.

(viii) **New Guinea Islands Cocoa Project –** This is an ACIAR project where the first component has been completed, but ERMC will be involved in several studies in the second component. Initial discussions have been held, and more direct involvement will occur as the second component of the project kick start later in 2023.

CONCLUSION

There is much to be done. For ERMC to realize its full potential in research and development, it must carry out several things included in the 2023 implementation plan, with staffing and

standardization of the labs being the most important. The 2022 Annual Report points out and emphasizes some of these critical steps needed to be taken in 2023.

UNITECH BIOTECHNOLOGY CENTRE (UBC)

Acting Director: Professor Tom Okpul

i) EXECUTIVE SUMMARY

This report covers research and development work in modern biotechnology that is being undertaken at the UNITECH Biotechnology Centre (UBC). The Centre aims at using biotechnology tools to enhance agricultural production to alleviate poverty and improve livelihoods in Papua New Guinea (PNG). The laboratory facilities are also used for undergraduate and postgraduate teaching and research. The research and development objectives, current and potential research, and developmental opportunities are outlined. Collaborations between Academic Departments and Research Centres of the PNG University of Technology (PNGUT) and other government Departments and Institutions in research and national issues are highlighted. Numerous challenges that should otherwise give UBC a competitive edge in research and development and self-sustenance are acknowledged. As they are pivotal in setting the impetus to venture into collaborative R&D projects with various stakeholders such as the Fresh Produce Development.

PREAMBLE

The UNITECH Biotechnology Centre (UBC) was established by the Council of the Papua New Guinea (PNG) University of Technology (PNGUT) in 1997 in recognition of the immense role that modern biotechnology could play in contributing to national development. The UBC became an independent entity as a Centre of the PNGUT on the 29th of November 2013. Administratively, the UBC is managed by the Director who reports directly to the Pro-Vice Chancellor (Academic). The focus of the UBC is on modern biotechnology.

Biotechnology is a broad term for a group of technologies based on the application of biological processes. It has diverse applications in medicine, agriculture, food processing, manufacturing, and environmental management. The term "modern biotechnology" is used to distinguish recent, research-based activities from traditional fermentation technologies such as bread, cheese or beer making, and animal and plant breeding, which were the first examples of biotechnology. Modern biotechnology includes a range of techniques from recombinant DNA technology, molecular and cellular biology, biochemistry and immunology through to information technology. Gene technology is a specific subset of biotechnology, based on the manipulation and modification ("recombination") of the genetic material of living organisms to develop new characteristics, processes and products.

Biotechnology is a powerful enabling technology, with applications that have the potential to revolutionize many industry sectors including

agriculture , forestry, fishing, pharmaceuticals and health, chemicals, textiles, food processing, environmental industries, energy and mining.

VISION

An appropriate vision for the UBC that encompasses the nation's current developmental issues in the face of the changing climate is *"to be leaders in the use of agricultural biotechnology to improve livelihoods"*.

MISSION

The UBC strives to accomplish high quality research, training and development outcomes with an entrepreneurial characteristic that emphasizes the application of agricultural biotechnology in addressing issues associated with food and livestock production, forestry, and the environment in PNG.

ORGANISATIONAL STRUCTURE

The UNITECH Biotechnology Centre (UBC) was established by the Council of the Papua New Guinea (PNG) University of Technology (PNGUT) in 1997 in recognition of the immense role that modern biotechnology could play in contributing to national development. The UBC is a Centre that is housed at the Agriculture Department of the PNGUT. Administratively, the UBC is governed by a Technical advisory Committee (UBCTAC), and is managed by the Director who reports directly to the Head of Agriculture Department and the Deputy Vice Chancellor.

THE UBC TECHNICAL ADVISORY COMMITTEE (UBCTAC)

Taking a new form as an independent entity of PNGUT, a revised UBCTAC is proposed for 2015 and beyond to include relevant university officials, Centre and Departmental representatives, and representatives from relevant government departments and institutions (Table 1).

Table 1. Current membership to the UNITECH Biotechnology Centre's Technical Advisory Committee

No.	Representative	Department/ Centre/ Institution[a]
1	Dr. Patrick Michael	Chairman-UBC-Committee
2	Prof. Tom Okpul	UBC – A/ Director
3	Prof. Gariba Danbaro	Agriculture Department, PNGUT
4	Dr. Ronnie Dotaona	Agriculture Department, PNGUT
5	TBA	ERMC, PNGUT
6	TBA	National Agricultural Research Institute
7		Mr. Elias Taia, Department of Agriculture and Livestock

8	TBA	Conservation & Environment Protection Agency
9	Head - Agriculture	*Ex Officio*

[a]PNGUT = PNG University of Technology; ERMC = Environmental Research and Management Centre; and UBC = UNITECH Biotechnology Centre.

PERSONNEL

The current staffs who are directly engaged at the UBC include the A/ Director, and a Senior Technical officer, and other Departmental staff and postgraduate students (Table 2).

Table 2. List of staffs and current postgraduate research students who were directly engaged in research and teaching at the Unitech Biotechnology Centre in 2022

Name	*Position*	*Qualification*	*Research Interest*
Prof. T. Okpul	A/ Director	PhD (UQ)	Plant genetics &
Prof. S. Akanda	Plant Pathologist	PhD (OSU)	breeding Plant Animal
Prof. G.	Animal Breeder	PhD (Kobe)	Animal genetics & breeding
Dr. P. Michael	Crop Physiologist	PhD (UA)	Plant physiology/
Dr. M. Maino	Crop Protection	PhD	environm't Plant virology/
Dr. R.	Entomologist	(PNGUT)	nematology Insect
Dotaona	Plant Pathologist	PhD (CSU)	pathology
Dr. Gwendolyn	Senior Technical Officer	PhD	Plant pathology
Ban Mrs Totave	Research Officer	(PNGUT)	Laboratory management
Kamen Ms	Research Officer -FPDA	Diploma	S/potato weevil bio-
Mr. S. Poloma	PhD Student	MSc.	Mycorrhizal symbiosis in
Mr. R. Manus	MSc. Student	BSc.Ag	rice Genetic diversity
Ms Dollah	MSc. Student	BSc.Ag	Plant Pathology
Inapo Ms.	MSc. Student	BSc.Ag	Entomology
Roberta Sio	MPhil. Student	BSc. Ag	Plant pathology
Mr. I. Bunsa	PhD Student	MSc.	Heavy metal biochemistry
Mrs. Sogoing	PhD student	MSc.	Colloidal nanoparticlces
Denano Mr. J.	MPhil. Student	PGD	Cysteine protease

STRATEGIC OBJECTIVES

The strategic objectives that the UBC aims to achieve are:

i) Transfer and develop cutting edge biotechnologies.
ii) Provide an environment that encourages creativity and investment in the field of biotechnology.
iii) Direct applications of biotechnology to achieve health and food safety.
iv) Use biotechnology to achieve food and health security.
v) Protect the environmental resources of PNG through the development of appropriate biotechnology applications and products.
vi) Strengthen the relationship between the biotechnology

program and society.

SPECIFIC OBJECTIVES

i) To facilitate high quality human development in the field of biotechnology at undergraduate, postgraduate, short courses and on-the-job training levels.

ii) To facilitate high quality research, and provide a conducive environment for institutional collaborations, in the fields of microbial, agricultural, forestry, industrial and environmental biotechnology.

iii) To provide quality scientific advisory support to the PNGUT, and the government of PNG on issues pertaining to biotechnology and biosafety; and

iv) To promote and create awareness on biotechnology issues by hosting visits for any interested individuals or groups and carry out educational programs especially during school visits.

FACILITIES AT UBC

i. Plant tissue culture area
ii. Portable growth chambers (needs to be checked)
iii. Containment-1 laboratory with capacity to undertake basic nucleic acid (DNA/RNA) assays involved in genotyping, disease diagnosis, paternity testing, gene transformation (gene technology) and gene expression analysis. The most important equipment required to undertake these molecular tasks include; thermocycler or polymerase chain reaction machine, electrophoresis apparatus, gel documentation system and accessory computer (yet to acquire), bio-safety cabinet (yet to acquire), fume hood (yet to acquire), Enzyme linked immunosorbent assay reader and accessory computer (yet to be acquired), -20°C freezers, -80°C Freezer (faulty power) and incubators.

iv. FACILITY RENOVATION AT UBC

The renovation work, particularly for ceiling replacement and painting of all walls and the exterior wall has been scoped and is pending the engagement of the contractors.

v. NEW EQUIPMENT

The Centre acquired a new Autoclave through the support of the ACIAR Sweet potato Weevil project headed by Dr. Ronnie Dotaona.

FEASIBLE RESEARCH AREAS

i) **Agriculture**
   a) Disease diagnostics (plant and animal)
   b) Pathogen-tested plant production
   c) Genotyping and Gene discovery
   d) Biodiversity assessment (plant and animal)
   e) Germplasm conservation
   f) Genetic manipulation (plant)

ii) **Forestry**
   a) Clonal propagation
   b) Disease diagnostics
   c) Biodiversity assessment
   d) Genotyping and Gene discovery.

FINANCIAL REPORT

Internal Support funding 2022:

- The Vice Chancellor, A/ Prof. Ora Renagi committed K100, 000 to drive R&D in agricultural biotechnology.

CURRENT RESEARCH AND DEVELOPMENT ACTIVITIES

Faced with immediate challenges especially that surrounding accreditation of the laboratory, staffing, and essential equipment, the Centre is taking a proactive approach in addressing these issues whilst performing its mandated role. The current and proposed research & development (R&D) opportunities for the UBC (and potential commercial opportunities) cover a broad range of areas including plant disease diagnostics and assessment of biodiversity using DNA-based techniques, pathogen-tested plant production, clonal forestry, and gene discovery.

The Centre's activities to date can be categorised into the following areas:

a) Industry-oriented research and development
b) Student research projects
c) Other research studies
d) National participation on biotechnology-related issues

Industry-oriented research and development

i) Potato plantlet production – Potato Seed Scheme – Fresh Produce Development Agency.

- ❖ Studies on microtuber production *in vitro* (Fig. 1) have been conducted

with a initial funding of K50, 000 by FPDA.

- ❖ This project will be reviewed this year for continuation into 2023.

ii) Genetic Barcoding of the 18 cocoa hybrids released by PNG Cocoa Board (PNGCB. Proposed budget: K30, 000.

Expected outcomes:

- ❖ Establish genetic identity of the selected cocoa hybrids
- ❖ Enable PNGCB to register their hybrids.

iii) Clonal propagation of coconut. This was one of the proposed areas identified by the Kokonas Indastri Koporesin (KIK) MOU that signed in 2021. Preliminary studies are underway and awaiting call from KIK.

Fig. 1. Potato plantlet growing in vials and micro-tubers produced in a conical flask.

Student research projects

Promising research projects conducted by students are being conducted at the UBC laboratory that has commercial potentials ranging from potential bio-pesticides to genetically modified plants (Table 3). These student projects are supported by various institutions and donor agencies, including the University's Graduate Assistance Program and collaborating stakeholders.

Other research studies

Other promising research studies initiated by UBC include:

iv) PNG Wild rice germplasm collection. Fifteen accessions of *Oryza* and *Leersia* spp. are currently maintained in ceramic pots. A recent collection was conducted together with researchers from Hirosaki University in Madang Province where several wild rice species were collected.

v) Breeding of locally adapted rice lines from crosses NR-1 x Finsch brown and NR-1 x TCS-10. The breeding work is now screening the 9th generation family lines.

vi) Screening for insect resistance in local corn. A population of 23 inbred lines are being monitored for the genetic study of the observed resistances.

IMMEDIATE CHALLENGES FACING UBC

The immediate challenges facing the UBC include;

i. Accreditation of the laboratory;
ii. Lack of staff (Research and technical) in certain fields of biotechnology; Limited funding support, and seed money to establish commercial projects;
iii. Lack of equipment and other facilities. Several equipment and computer software (Table 4) are urgently needed to give the UBC its independence and competitive edge in biotechnology research and development.
iv. Renovation (funded) of the Sir Julius Chan Building will be made to improvise the current setup to cater for an incubation room and staff office spaces and working benches and shelves; and
v. Development of research proposals and training programs.

Fig. 3. Students conducting molecular lab experiments.

COLLABORATIONS ON CURRENT RESEARCH ACTIVITIES

The numerous researchers from various academic Departments PNGUT and other collaborating institutions are involved in the several identified research areas (Table 4). Such collaborators include:

i. Agriculture Department, PNGUT;
ii. Forestry Department, PNGUT;
iii. Mining Engineering Department, PNGUT;
iv. National Agricultural Research Institute (NARI);
v. Fresh Produce Development Agency;
vi. Ok Tedi Development Foundation (OTDF); and

vii. PNG Cocoa Board (PNGCB)
viii. Binatang Research Centre (BRC)
ix. Kokonas Indastri Koporesin (KIK).
x. Hirosaki University, Japan.

PARTICIPATION AT THE NATIONAL/ INTERNATIONAL LEVEL

i. Alternate Focal Point for Genetic Modified Organisms (GMO) Issues for PNG through the Department of Agriculture and Livestock to the Food and Agriculture Organisation – *T. Okpul*
ii. National Bio-safety Committee through the Department of Environment and Conservation – on the safe handling of GMOs and products thereof –*T. Okpul, M. Maino*.
iii. IUCN SSC Crop Wild Relatives Specialist Group (Member, 2021-2025) – *T. Okpul*.
iv. Niugini Biotechnology Network (Member, 2020-) - *T. Okpul*
v. Biotechnology Program Advisory Group
Chairpersons: *T. Okpul (Infrastructure) & M. Maino (Technical capacity Development)*.

Table 3. Current biotechnological researches conducted at the UNITECH Biotechnology Centre and potential commercial opportunities

Research topic	Funding source[a]	Researcher	Commercial opportunity
i) Plant disease diagnosis			
iii) Molecular identification for East Sepik Vanilla Disease Survey Malcolm Kabiwaga, Cybill Poiya, Cindy Caleb, Nanda Siri, Rabi and T. Okpul	EU-STRET Program	Deane Woruba, Melanie Pitiki,	None
ii) Pathogen tested plant production			
a) Micro-propagation of plantlets and micro-tubers for seed potato production	UBC/ FPDA	Emmie Mauligen, T. Kamen and T. Okpul	High
iii) Biodiversity assessment			
a) Assessing the extent of its genetic diversity *Leersia hexandra* in Papua New Guinea		UBC Cybill Poiya, M. Kabiwaga, R. Manus, Chris Bugajim & T. Okpul	None
iv) Genetic manipulation			
a) Standardising protocols for rice plant regeneration and transformation	UBC	Cybill Poiya and T. Okpul	Long-term
v) Gene and gene product discovery			
a) Identification of gene(s) controlling shattering in the wild rice, *Oryza schlechteri*	UBC/PNG Cocoa Board	Cybill Poiya and T. Okpul	High
b) Identification of DNA barcodes for elite cocoa lines from Papua New Guinea.	PNGUT-GAP	Gerry Faure, Melanie Pitiki, M. Donald Sogoware, Peter Epaina and T. Okpul	
c) Investigating the use of colloidal nano particles as gene carriers to increase the efficiency of gene transfer by particle bombardment	UBC/ Applied Sci. Dept. and T.	Justin Narimbi, Srikanth Bathula Okpul	High
vi) Clonal forestry			
a) Micro-propagation of the eaglewood species, *Aqualaria crasna*.	UBC	M. Kabiwaga and T. Okpul	High
b) Identification of plant pathogens associated with agarwood formation in *Gyrinops ledermanii*.	UBC/ OTDF	M. Pitiki, M. Maino, J. Beko and T. Okpul	High
c) Production of fungal inoculum for agarwood formation in *Gyrinops ledermanii*.	UBC	M. Kabiwaga, M. Pitiki, M. Maino, J. Beko, K. Mulung and T. Okpul	High
v) Environmental research			
a) Investigating heavy metals in water, soil, sediment and plants along the Markham river system and its tributaries.	UBC/ Applied Sci. Dept. and T. Okpul	Sogoing Denano, William Modey	High
b) Assessing the potential of endemic wild rice species in bioaccumulation of heavy metal, and their use in mitigating environmental pollution from landfills.	UBC/ Applied Sci. Dept. and T. Okpul	Sogoing Denano, William Modey	High
c) Investigating cysteine protease as defence mechanisms of tropical trees against insect herbivores	BRC/GAP	Samson Hege, David Timi, BRC Researchers, T. Okpul	

[a]Funding sources: PNGUT-GAP = Papua New Guinea University of Technology – Graduate Assistance Program, AD = Agricutlture Department, UBC = UNITECH Biotechnology Centre, BRC
= Binatang Research Centre; NARI = National Agricultural Research Institute, EU = European Union, CIC = Coffee Industry Corporation, Private = Self-sponsored student research,

FD = Forestry Department, MED = Mining Engineering Department.. [b]Commercial opportunity available to UBC; Proposals refer to projects that are to be undertaken by postgraduate students in 2014.

Table 4. Essential equipment listed in order of priority that are needed to be acquired at the UNITECH Biotechnology Centre

Equipment/ Tool	Qty	Use	Supplier	Estimated Cost (K)
1. Tuttnauer Vertical Autoclave	1	Sterilization of equipments	EBOS	70,000
	1	Nucleic acid quantification	Thermo Fisher	10,000
3. DNAStar Software	1	softwares for sequence analysis, bioinformatics	Achema Pte Ltd	6,000
4. Millipore	1	Water sterilisation	Fisher Scientific	12,000
5. Incubator Std 300L	1	Microbial culture	Thermo Fisher	70,000
6. Fume Hood	1	Safe handling of volatile chemicals &	Alibaba	15,000
7. Air condition (temperature controlled)	?	Tissue culture growth room environment	Local	6,000
8. Tissue culture racks	6	Tissue culture	Alibaba	20,000
9. Real Time Thermal Cycler		Quantitative PCR	BioRad	30,000
10. ELISA reader		Virus testing	EMax Devices	15,000
11. Computer sets	2	RT-PCR and Gel Doc system	Datec	10,000
Total				**264,000**

MAJOR MILESTONE FOR 2022

i. Submission of the UBC Strategy to the Vice Chancellor's Committee.

ii. Complete renovation of the laboratory in preparation for accreditation.

iii. Submission of a funding proposal for laboratory equipment to the Secretary of the Public Enterprise Department as invited.

iv. Finalize the MOA and proposal for collaboration with OTDF on the collaborative partnership on developing eaglewood in Western Province.

v. Participate in developing collaboration with Corteva – a subsidiary of Dow- DuPont.

vi. Review the MOA for the extension of collaboration with the Fresh Produce Development Agency on its potato seed scheme.

vii. Finalize collaborations with KIK and PNGCB on coconut clonal propagation and genetic barcoding of the cocoa hybrids, respectively.

CONCLUSION

The Centre is focused on turning the challenges it faces into milestones that needs to be achieved in 2022 and onwards, and fully equipping

the laboratory in the process towards developing an enabling Centre of PNGUT. A Centre that can enable us *"to be leaders in the use of agricultural biotechnology to improve livelihoods"* in PNG.

RESEARCH SEMINAR ABSTRACTS

Whither customary land; dressed in the emperor's robe or disclosed in its cultural splendour?

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The conception of customary land is in the eye of the beholder. In the context of land administration policy and practice and for all intent and purposes of mainstream economic development, the conception of customary land is predicated on legal property. The legal property system is built fundamentally on the common law system, a creation of the colonial history of Papua New Guinea (PNG) under Anglo-Australian rule. However, the legal property conception superimposed on customary land (albeit, dressed in the emperor's robe), is rather contrived and therefore, remiss and amiss of customary land in reality. This is because customary land continues to exist and thrive in PNG within the domain of customary land tenure which is diametrically incompatible to the legal property paradigm. In customary land tenure, the indigenous land owners behold customary land with all its splendour and idiosyncrasies which emanate from the indigenous custom of the people. The implicative significance of this conceptual dichotomy is highlighted and the case for a pragmatic re-conception of customary land in modern PNG is advanced for land administration.

Key words:

Legal property, customary land, land administration

Capillary Pressure Versus Fluid Saturation in Hydrocarbon Reservoir for Optimum Producibility

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In reservoir analysis 3 critical parameters are vital for producibility of hydrocarbon from a reservoir. One is porosity, second is permeability and third is saturation of fluid. Saturation of particular fluid is how much that fluid occupies the pore space of the reservoir. This saturation is related with capillary pressure. Capillary pressure is the difference of pressure at the interface between two fluids. Capillary pressure is inversely proportional to the radius of capillary tube. In reservoir, pores are connected with other pores called pore throats. These pore throats are of different sizes and therefore, their diameters also are of different sizes. These pore throats in a reservoir behave like small capillary tubes. Now take the example of quartz sandstone which have coarse grains. These larger grains are sorted at the time of deposition in such a way that pores formed are of bigger sizes and permeability of rock are of high. Capillary pressure holding water in larger pores is very low and as a result displacement pressure of migrated oil from source rock entering into reservoir rock can easily displace water from larger pore spaces and occupies the most of the pore spaces. So, Oil saturation increases in larger pore. Very small amount of water is retained in larger pores. This water saturation is called irreducible water saturation. In shalisand or pure shale, finer to very finer grains are precipitated at the time of deposition and these grains are sorted in such a way that they formed very small pores and permeability is poor to very poor. The pore throats of these small pores are also of small diameter. Capillary pressure holding the water in small pores are very high as a result displacement pressure of migrated oil from source rock entering into reservoir rock are not sufficient to displace water from small pores or may be able to displace water a little amount. So, oil saturation against small pores are low order and water saturation is high. This water saturation is called irreducible water saturation which is practically very high against small pores.

Capillary pressure versus water saturation is plotted from the laboratory test after collection of cores of reservoir. Free water level is a level at which capillary pressure is zero. The depth of FWL can be obtained from the meeting point of two gradients (oil and water gradient) after lowering the RFT tool in a well. We can find out the height of water saturation above FWL by using the formula $P_c = h \Delta \rho g$ where P_c = capillary pressure at a particular saturation, h is the height of particular water saturation above FWL. As we know the actual depth of FWL, so from this h we can find out actual depth of reservoir versus water saturation.

This depth vs water saturation can be matched with the same obtained from formation evaluation data. If both are matched, then formation evaluation data can be used in other wells of the same field.

Fatigue Behaviour of Aluminium Alloy AA2024 to Titanium Alloy Ti6Al4V Friction Stir Lap Welded Joints

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In this study, for the first time, fatigue tests have been conducted on welds of AA2024 alloy to Ti6Al4V alloy (both being aerospace alloys) made using friction stir lap welding (FSLW). Pin bottom aimed for touching the Ti6Al4V plate but not penetrating ($d_{Pin} = 0$) although it was inevitable that pin could also readily penetrate ($d_{Pin} > 0$) with tool-pin position control. It has been found that, for both $d_{Pin} = 0$ and $d_{Pin} > 0$, fatigue limits of the FSL AA2024/Ti6Al4V welds were slightly higher than the fatigue limits of the FSL Al-to-Al alloy welds reported in literature. Detailed examination has demonstrated diffusion welding forming the very thin interface intermetallic layer during FSLW being the mechanism responsible for the good fatigue strength. For $d_{Pin} > 0$, a significantly larger diffusion AA2024/Ti6Al4V weld distance outside the pin width than that for $d_{Pin} = 0$ welds have been observed. This was the reason for the fatigue limit of $d_{Pin} > 0$ welds being comparable to that of $d_{Pin} = 0$ welds despite of the mix stir zone in $d_{Pin} > 0$ welds being a brittle one due to excessive growth of intermetallics. The different thermomechanical conditions for the different diffusion-weld widths have been demonstrated. The present study has provided a scientific basis for Al-to-Ti FSLW to be applied industrially.

Key Words:
Friction Stir welding, Fatigue strength, Fatigue life, lap joint, Intermetallic compounds

Analysis of Signal Processing Embedded with Fourier Transform

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Signal can be considered as function or mapping. Audio signal can be considered as one dimensional function of time whereas an image can be considered as a two dimensional function that varies in space. Generally a low frequency component represents the overall space of the signal and high frequency components are caused due to noise or presence of edges in an image. Systems manipulate signals, i.e. they can be considered as a map from functions to functions. Fourier Transforms can make the signal processing easier by changing its domain in which the underline signal is represented. In my presentation it will be shown how Fourier transform can be viewed as change of basis in the vector space model for the signal.

The Embedded Statistical Process Control Through Control Chart

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Statistical Quality control comprises the set of statistical tools used by quality control professionals. It can be divided into three broad categories- (i) Descriptive Statistics (ii) Statistical process control (iii) Acceptance sampling.

Quality derived from the best fit for use. It is inversely proportional to variability. Quality improvement is the reduction of variability in process and product. Quality improvement can be considered as waste reduction.

Statistical process control is a collection of tools that when used together can result in process stability and variance reduction. One of the most important key tool is the control chart.

Through the control chart we can very easily derived whether any ongoing process is under control or out of control. In my presentation I will discuss elaborately how through the control chart we can examine whether a process is under control or not.

Managing expectations in HDR supervision for students and supervisors: crucial hints and tips for success

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Abstract

There is often a disparity in what is expected from supervisors and students in the HDR journey. Knowing how these expectations differ and what you can do to close the gap on these differences can make or break a student's (and ultimately the supervisor's) success. Join Dr Bree who will work through an expectations questionnaire with you and outline some basic methods to make the journey a smooth and fruitful one. This presentation is aimed at all HDR students and all supervisors (even if you think you know everything!).

Predictive Validity of the STAT-P Test – Preliminary Results from PNG University of Technology

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The Councils of the University of Technology (UoT) and the University of Goroka (UoG) approved a requirement for certain categories of applicants to their courses to take an aptitude test as part of the application to their universities. Subsequently, the Special Tertiary Admissions Test-PNG (STAT-P), designed by the Australian Centre for Educational Research (ACER), and jointly administered by ACER and the two Universities, was used as part of the selection criteria for admitting students to the first year.

Selection of school leaver (SL) candidates to UoT courses are based on an aggregate score calculated from scores obtained in certain academic subjects at the Grade 12 examinations and STAT-P total scores derived from the verbal and quantitative reasoning scores. The academic subjects used are not necessarily the same for all Departments at UoT.

STAT-P does not test in-depth knowledge of specific academic disciplines and, it is not designed to predict a candidate's level of achievement in a particular discipline at the University. However, as an admission tool, it is desirable that STAT-P should have predictive validity, i.e., it should have a positive relationship with an outcome criterion at UoT. This type of relationship has not been studied since STAT- P began at UoT in 2016. Therefore, the objective of this presentation is to show and discuss the predictive validity of the STAT-P test using part of the data so far gathered at UoT. It is hoped that the results of this partial study will go a long way to satisfy the keen interest shown by Government, University authorities, ACER, parents and guardians, as well as the general public in the necessity and importance of STAT-P as an admission tool.

Finding the In-situ Horizontal Stress Orientation for Best Direction of Drilling the Inclined and Horizontal Well for Well Placement and Well Completion

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Horizontal / Inclined drilling in hydrocarbon reservoir is an important criterion for increasing drainage area for optimum production of hydrocarbon and it is cost effective. But horizontal / inclined drilling within the reservoir in any direction can have many complications during the operation. For proper borehole trajectory to drill horizontal well, information of fault regime of a basin and in-situ stress orientations are very important factors. For this, geological knowledge of basin study and Anderson's fault regime are important and need to be implemented. In normal faulted regime, the best direction to drill a horizontal well is in the direction of minimum in-situ horizontal stress. By doing so, horizontal wells have the tendency to be more stable with regards to well integrity. In thrust faulted regime or strike slip faulted regime, a horizontal well is to be drilled in the direction parallel to the maximum horizontal stress direction for greater well stability. Hence, knowledge of orientation of present day in-situ horizontal stress is essential.

In-situ horizontal stress orientations can be obtained from borehole breakouts as well as drilling induced tensile fractures (DITF). Borehole breakouts occur in minimum horizontal stress direction and are conjugate fractures 180 degree apart in a well while drilling and is due to shear /compressive failure of rocks. As it is compressive failure, so borehole breakouts are thick and can be identified. DITF occur in maximum horizontal stress direction are also conjugate fractures 180 degree apart due to tensile failure of rocks. DITFS are thin fractures as it is tensile failure. The above-mentioned types of fractures are identified by 'Micro Resistivity Image Tool' and 'Acoustic Scanner' tool.

Image logs data of one well of Bengal basin, India and another well of Bokaro coal field are analyzed for identification of breakout and DITF and finally in-situ stress orientations are found out for drilling horizontal wells that would be more stable. This type of drilling of horizontal well in oil & gas field of PNG would be beneficial for optimum production of crude oil and gas in optimum time in turn cost effective.

Key words: In-situ stress orientation, Borehole Breakouts, Drilling Induced tensile fracture, Stress anisotropy

Digital Marketplaces in India

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Digital marketplaces have transformed the economy and societies in India, by providing a platform for innovations, with a spectacular e-commerce growth accentuated during the pandemic. These innovations impact tremendously the way Indians' shop, bank, work, book their holidays, hail a cab, and indeed all walks of life. This shift has resulted in eCommerce activity moving across horizontals - from essentials like pharmaceuticals, groceries, work- from-home requirements to lifestyle categories like fashion, self-care, beauty attracting a diverse consumer group who were otherwise quite dependent on brick-and-mortar stores. Further, eCommerce activity moved along verticals such as medical apps, food and grocery, infants and kids, to name a few. Later, when lockdown rules were relaxed, exploration of different online-offline models like phyigital, q-commerce, etc have been on their way. In this backdrop, this research makes an effort to understand the enablers of the fast-growing online marketplaces in India. This work further explores the factors that drive such ecommerce growth in India, viz., supply chain and logistics, affordable devises(mobile) and data (accessible low-cost internet from 2G to 5G across the breadth and length of India); innovation in the payment gateways like Unified Payments Interface; consumer awareness and the public and private initiatives in these directions. This knowledge and inferences will be examined in the subsequent presentation on the Digital Marketplaces in the context of Papua New Guinea.

Digital Marketing in Papua New Guinea: Challenges and Prospects

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Digital Marketplaces in the context of Papua New Guinea is at its nascent stage with a mobile including *one bang* subscriber penetration rate of 30 per cent of the population while the enabling technology for online marketing are yet to emerge. In this backdrop the questions arise are (i) 'Is E-commerce happening in PNG if at all other than Port Moresby? (ii) Is S-commerce the possibility in PNG? (iii) If so, is it the same S-commerce operating elsewhere works out for PNG? (iv) Why E-commerce or S-commerce could not work in PNG? & (v) What is it that is working in PNG? Having explored these questions, the research further examines how the Facebook is used as somewhat an onsite marketing place in PNG. Hence, we explore the sellers via Facebook. Having this as our sample frame, the research study has collected data from the sample of around 150 sellers via Facebook. The subsequent part of the study examines the prospects of digital marketing in PNG. In doing so, we analyze four key drivers of the digital marketing process, viz., (i) Telecommunication Infrastructure in PNG, (ii) Journey of Technological Generations from 1G to 4G…., (iii) Payment Gateways: E-payment Systems in Place and (iv) Effective supply chain logistics. With this discussion, insight is drawn on the challenges and prospects of digital marketing in PNG.

Creating Sustainable Networks to Enhance Women Participation in Higher Education in Papua New Guinea

Rachel Aisoli-Orake, Veronica Bue, Mary Aisi, Imelda Ambelye, Mirzi Betasolo, Tindi Nuru, Dora Kialo, Shamsul Akanda, Sogoing Denamo, Lydia Yalambing, Susan Gasson, Elizabeth Spencer, Christine Bruce & Nick Roberts

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The challenges of raising the participation of women as leaders in higher education globally have been extensively but unevenly documented. Potential has been identified for international developmental networks to support an increasing presence of women as leaders in emerging higher education systems. Through an exploration of shared experiences and learnings in a specific developmental network of women, and some men, from universities in Papua New Guinea and Australia, the wider implications of local challenges became visible. A Collaborative Research Culture Framework has been used to highlight key collaborative principles that enable and enhance women's participation in higher education. The authors have framed their theoretical exploration of the issues informed by their own experiences of collaborating to overcome challenges faced by women participating in higher education.

Spatio-temporal Analysis of Climatic Variables and Vegetation Cover to Determine Climate Change in Papua New Guinea

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The present study assesses Spatio-Temporal vegetation cover variability and trend within Papua New Guinea and then determines its relationship towards climatic factors like rainfall and temperature. The investigation was probed for 34 years' time period. After testing and checking for serial autocorrelation in the vegetation data and climatic data series, Mann-Kendal non- parametric statistical evaluation was carried out to investigate the trends. Sen's method was deployed to investigate the magnitude of change NDVI unit per year, Rainfall mm per year and Temperature degree Celsius per year. ArcGIS spatial analysis tools were used for the calculation of mean NDVI, Rainfall and Temperature distribution and also for carrying out the spatial investigation of trends at each specific location within the study region. The common data used in the present study were CRU TS 4.03 for climatic data sets and GIMMS NDVI for vegetation datasets (NDVI). The assessments were carried out on an annual basis location wise. NASA GIMMS NDVI data was used as an input to investigate the trend and variability of vegetation cover within the study region. Rainfall and temperature datasets were retrieved from CRU TS 4.03 datasets and were further updated with a few ground station datasets. The overall annual mean was calculated for all variables. From the assessments, it is found out that, most vulnerable zones of higher rainfall are Morobe, Madang, and Southern Highland province, and zones vulnerable for low rainfall are mostly Eastern Highland, Chimbu, Enga, and Western Highlands Province. The yearly rainfall intensity is expected to increase. The temperature trend analysis shows that the temperature over time has increase at the rate of 0.01^0C/year. In the vegetation trend analysis, it was found out that, the vegetation has decreased over time. There is a common relationship detected between NDVI-Rainfall and NDVI-Temperature; that is, especially towards higher regions, the lower rainfall is the result of poor vegetation growth in the long term scale, however looking at short term scale, the lack of good vegetation covers also attributes poor rainfall distribution, however, the temperature factor is the main determinant especially in the higher regions. Mostly in the areas where there is enough rainfall, good vegetation cover is observed. The lower temperature in the highlands regions also is a sequel to less rainfall and poor vegetation growth. Especially in the coastal regions, the good healthy vegetation cover acts as an environmental cooling system.

Keywords: NDVI, Climate Change, Spatial, GIS, Correlation Co-efficient, Rainfall, Temperature

Women Vendors' Agency and Conflict Management: Experiences of Awagasi Market Vendors in Lae, Papua New Guinea

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Women make up a large part of informal urban markets in Papua New Guinea. They face vulnerabilities related to safety and operate within male-dominated mediation structure where women vendors' contributions to mediation and market governance to manage conflict peacefully in the informal urban market space are often invisible. However, in this paper we demonstrate how women vendors contribute towards preventing conflict at Awagasi market in Lae Papua New Guinea. This is obvious through the gains women vendors play roles of peacebuilding and peacemaking at Awagasi market. This has resulted in improvement in safety and security of the informal market and thus promoting the operations of the market. The study involved 18 participants of female and male vendors from five settlement compounds in Kamkumung settlement community. The study used focus group discussion, unstructured interview and creative research methods of photovoice and participatory creative mapping to examine different roles of women vendors towards sustaining peace and stability at Awagasi market. The research revealed sundry roles women vendors play to resolve conflict at Awagasi market. The study recommends that the recognition of women vendors' agency of conflict management can promote and strengthen the safety and security of informal urban market environments in Papua New Guinea.

Key words: Women vendors, informal urban market, conflict management, Awagasi market

ALLOCATION OF RESEARCH FUND

No	Date	Payee Details	Supervisor	Research/Conference	Approved in Meeting No.	Approved Amount
1	31.03.2022	Mr. Inia Bunsa	Professor M. Maino	Research	Meeting #5	K10,000.00
2	31.03.2022	Mr. Noel Paya	Mr. Navua Kapi	Research	Meeting #5	K12,347.27
3	31.03.2022	Ms. Ashemah Malaga	Mr. Navua Kapi	Research	Meeting #5	K4,611.23
4	10.06.2022	Mr. Shen Sui	Dr. Patrick Michael	Research	Meeting #6	K15,000.00
5	10.06.2022	Ms. Shirleyna Aipa	Dr. Patrick Michael	Research	Meeting #6	K15,000.00
6	19.07.2022	Mr. Timothy Ngembil	Dr. Patrick Michael	Research	Meeting #7	K10,000.00
7	19.07.2022	Mr. Peter Topas	Dr. Patrick Michael	Research	Meeting #7	K4,000.00
8	19.07.2022	Mr. Clifford Mespuk	Dr. Sujoy Jana	Research	Meeting #7	K27,296.73
9	19.07.2022	Mr. Michael Gaoma	Staff	Research	Meeting #7	K30,000.00
10	29.07.2022	Mr. Mondu Samuel Akura	Dr. Jim Lem	Research	Meeting #7	K20,000.00
11	09.08.2022	Ms. Runitha Nickson	Dr. Tingneyuc Sekac	Research	Meeting #7	K9,161.11
12	09.08.2022	Ms. Stephanie Anis	Dr. David Timi	Research	Meeting #7	K15,000.00
13	30.09.2022	Mr. Nathan Randa	Dr. Felix Pereira	Research	Meeting #7	K20,000.00
14	10.10.2022	Mr. Imen Papa	Professor Jacob Babarinde	Research	Meeting #7	K20,000.00
15	23.11.2022	Dr. Cossey Yosi	Staff	Research	Meeting #7	K18,400.00
16	25.11.2022	Mr. Luke Kolalio	Staff	Research	Meeting #7	K6,850.00
17	08.12.2022	Ms. Levi Kasa	Dr. Patrick Michael	Research	Meeting #7	K4,780.00
18	08.12.2022	Mr. Luke Jeffery	Dr. Patrick Michael	Research	Meeting #7	K3,000.00
19	30.09.2022	Mr. Sinafa Robby	Professor Macquin Maino	Research	Meeting #8	K13,800.00
20	30.09.2022	Mr. Tombo Wara	Staff	Research	Meeting #8	K19,916.88
21	09.09.2022	Ms. Paula Kaupa	Dr. R. Rao	Research	Meeting #8	K20,000.00
22	14.11.2022	Mr. Cassey Uvau	Dr. Cossy Yosi	Research	Meeting #8	K14,980.00
23	14.11.2022	Mr. Tata Telawika	Staff	Research	Meeting #8	K15,000.00
24	02.12.2022	Mr. Samson Hege	Dr. David Timi	Research	Meeting #9	K14,625.00
25	25.11.2022	Ms. Stephanie Konts	Dr. Mirze Betasolo	Research	Meeting #10	K15,000.00
26	25.11.2022	Dr. Nadiminti	Staff	Research	Meeting #10	K26,500.00
27	25.11.2022	Dr. Tingneyuc Sekac	Staff	Research	Meeting #10	K11,900.00
28	25.11.2022	Mr. Edward Miall	Dr. Revanuru Subramanyam	Research	Meeting #10	K14,500.00
29	25.11.2022	Mr. Joseph Kondave	Dr. Veronica Bue	Research	Meeting #10	K8,805.00
30	25.11.2022	Mr. Peter Kerowane	Mr. Nick Kewa	Research	Meeting #10	K14,530.00
31	08.12.2022	Mr. Francis N'Drewei	Dr. V. Bue	Research	Meeting #10	K9,020.00

32	15.11.2022	Dr. Wilson Kobal	Staff	Conference	Meeting #10	K2,948.26
33	15.11.2022	Mr. Yawas Dekba	Staff	Conference	Meeting #10	K2,948.26
34	15.11.2022	Mr. Gideon Yowa	Staff	Conference	Meeting #10	K2,948.26
35	18.10.2022	Dr. Londari Yamarak	Staff	Conference	Meeting #10	K3,283.32
36	10.10.2022	Dr. Tingneyuc Sekac	Staff	Conference	Meeting #10	K10,348.32
37	10.10.2022	Dr. Muhammad Ali	Staff	Conference	Meeting #10	K3,578.40
No	**Date**	**Payee Details**	**Supervisor**	**Research/Conference**	**Approved in Meeting No.**	**Approved Amount**
38	25.11.2022	Dr. Tingneyuc Sekac	Staff	Research	Meeting #10	K11,900.00
39	25.11.2022	Dr. Londari Yamarak	Staff	Conference	Meeting #10	K3,052.60
40	03.02.2023	Mrs. Wilma Langa	Staff	Conference	By A/Dean	K8,145.20
41	17.02.2023	Dr. Patrick Michael	Staff	Conference	By A/Dean	K11,779.60
42	27.02.2023	Mr. Iki Agoname	Dr. Revanuru Subramanyam	Research	By A/Dean	K13,992.00
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