



PACIFIC ISLANDS GIS&RS NEWSLETTER

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Greetings

The Pacific Islands GIS and Remote Sensing Council is pleased to share the first Issue of the 2019 GIS and Remote Sensing Newsletter.

This issue provides an overview of the 2018 Conference which was held at the USP Japan Pacific ICT Centre where it acknowledged its 20th Anniversary running. The event has over the years enabled the gathering and knowledge sharing of the Pacific GIS and Remote Sensing community, software, hardware and data vendors, consultant companies, scientists and users.

This is followed by a number of updates on USP'S GIS curriculum and the capacity building activities that the Pacific Flying Lab has recently been involved in.

In addition, a brief overview of the Advanced Geonode Training facilitated by the PARTneR Project. The GEONODE system is an open access geospatial data repository that was initially developed by the PARTneR project regional partner SPC through the Pacific Resilience Program and has been tailored for the PARTneR project.

The newsletter also shares the extensive work carried out by SPC and Fiji REDD+ in partnership with University of Hamburg on the '*Change detection of Forest cover in Fiji between 2006 and 2016 wall to wall mapping*'.

This issue also informs users the details about a five-day Workshop on the applications of GNSS which will be held in Suva, Fiji, from 24 to 28 June 2019. The Workshop is being organized by the United Nations Office for Outer Space Affairs in cooperation with the University of the South Pacific (USP) as part of the activities of the United Nations Programme on Space Applications.

Lastly an extensive article on the SOSPADIS Project in Fiji and Vanuatu. The SOSPADIS project aims to contribute to the knowledge and understanding of the dynamics underlying the socio-spatial organisation of Informal Settlements in Melanesia.

Once again, we are proud to say that The Pacific Islands GIS and Remote Sensing Newsletter continues to be the only publication in the pacific region that focuses on GIS and Remote Sensing.

Happy reading and please consider sharing an article to be included in the next publication.

Newsletter Editorial Team



WOLF Forstreuter



SEREIMA Kalouniviti



NAVNEET Lal

Initiated in 1993, the Pacific GIS&RS Newsletter, which is now facilitated through the PGRSC Council, has since been an information and knowledge tool for the Pacific region.

2018 Pacific Islands GIS and Remote Sensing User Conference - Summary

Introduction

The Pacific Islands GIS and Remote Sensing User Conference 2018 was held at the USP Japan Pacific ICT Centre. The Conference acknowledged the 20th Anniversary of the GIS and Remote Sensing Regional Conference which has over the years enabled the gathering and knowledge sharing of the Pacific GIS and Remote Sensing community, software, hardware and data vendors, consultant companies, scientists and users.

The Participants

The weeklong conference highlighted presentations from various companies and image data providers such as DigitalGlobe and Airbus. This included consulting companies i.e BlueCham, 3S PROSPECT, Opengis.ch, and Drone Services (Fiji) Pte Ltd as well as the Submarine drone company Surfbee, SkyEye Pacific, Inside, Esotxy and the hardware & software company Trimble represented by Allterra.

The following international organisations were present at the Conference: GIZ, UNOOSA, ISPRS and UNDP. Regional organisations such as NIWA, FFA, SPREP, SPC, ESA and MacBio were also represented.

The following academic and scientific institutions were present: University of Guam, University of the South Pacific, Centre for Space Science Technology New Zealand, University of PNG and Fiji National University.

The following regional and international projects presented during the conference i.e CommonSensing, Survey and Spatial New Zealand, FOS4G Oceania and PARTNER.



2018 Conference participants group photo at the USP Japan Pacific ICT Centre

Opening Session

The Opening Speech was presented by the Permanent Secretary Ministry of Lands & Mineral Resources Mr. Malakai Finau, who is also a member and Trustee of the Pacific GIS and Remote Sensing Council (PGRSC).

The Opening Remarks was presented by the SPC-Geoscience, Energy and Maritime Division Director, Dr. Andrew Jones.

Dr Russell Howorth, who is a member and Trustee of the PGRSC also addressed conference participants and donors and presented the Philipp Muller Memorial Address.

Dr. Wolf Forstreuter provided an overview of the Conference programme and highlighted that the discussion session during the week, workshops at the end of the week, and social events to enable networking amongst participants.



Presentations

The weeklong conference comprised of 61 presentations where each presenter were allocated 15 minutes to present and 5 minutes to answer questions or respond to comments and discussions. The power-point presentations are available on the PGRSC Conference website.

Discussion Session

In the discussion session participants who are experts in their field are given an opportunity to discuss and exchange knowledge and experiences on a given topic of discussion. The 2018 discussion session focused on four topics where data providers, scientists sharing of best practice examples from other regions like USA, Australia and Europe. The Discussion Session was initiated at the 2005 conference by John Trinder from ISPRS, Les Allinson from PICISOC and Wolf Forstreuter from the Fiji GIS&RS User Group¹. This year participants collaborated and shared their experiences and knowledge on the following topics:

Satellite Image Data and Drone Data for Mapping of Atoll Islands, lead by Nick Rollings from the University of the South Pacific. USP houses the Pacific Flying Lab. Drones are increasingly user friendly to handle and are being used in low lying atoll islands like Tuvalu, Marshall Islands or Kiribati. However, it is often a costly process to utilise compared with satellite image data. WorldView satellite images have been available for USD 10.50 per km² and this covers 8 spectral bands including near infrared and red edge. These spectral bands are important for delineating bread fruit, pandanus and other basic crops of atoll islands. In addition, in order to rectify images, it is necessary to setup ground control points, which is a time consuming process. In summary, the use of drones requires more time and capacity to carry out the work compared to the use of satellite images. On the other hand, image data captured by drones provide higher resolution. Drones are available in the countries and can capture images immediately.

Mapping of Mangrove and Sea Grass in Melanesian Countries guided by Jan Steffen of a GIZ project, which will be moving towards blue carbon. The mangrove areas of countries such as Fiji, Solomon Islands, Vanuatu and PNG sum to an enormous number of square kilometre i.e. more than 4,000 km coastline for PNG alone. It is important to map the mangrove areas as such but also different strata dominated by specific mangrove species as salinity variation and other factors change mangrove species composition. This can degrade the mangrove cover without a visible deforestation. For detailed analysis the spectral information of the image data is essential i.e. the red edge and the yellow band. These spectral bands are not covered by Landsat or Sentinel satellites. On the other hand, it would be far too expensive to cover all mangrove areas such quality image data even providing the solution that this image data can be accessed in the cloud and where the user pays only for usage of the data only. The discussion revolved around multi stage approach similar to forest inventories, where the complete area is to be covered by low cost low resolution image data, while a systematic and random sub-sampling would apply high resolution image data.



Jan Steffen leading the discussion on mangrove mapping and sea grass.

Cloud Computing, lead by Sachindra Singh from the SPC-GEM Division. Cloud computing is the on-demand availability and delivery of computing services through the internet i.e. servers, storage, databases, networking, software, analytics, and intelligence for more instant access to spatial data. GIS and RS software in the Pacific is transitioning towards cloud based computing, however recognising that weak internet connectivity and bandwidth is constantly a challenge. A number of software companies like eCognition have invested alot into developing codes, therefore a number of software products are not yet available in the cloud.

GIS and RS as Essential Tools for Disaster Response, lead by Litea Biukoto also from the SPC-GEM Division. GIS and remote sensing is extremely useful in disaster response to map out areas that have been devastated and where access is limited. It can be used to quickly assess how severe the impact of a disaster is. However, it continues to be highlighted that timely allocation of funding and resources to enable rapid assessment and data collection during and after a disaster event, remains to be a challenge for the pacific. At the same time, National Disaster Management Offices are not fully equipped with the necessary GIS and image analysis tools. However, countries have processes and GIS&RS services in place that is activated to assist in data captures and analysis.

Social Events

The social events is aimed at establishing relationships between companies, scientists and GIS&RS users as well as build on existing networks. More so is the need to connect Pacific users from various disciplines and backgrounds. The social events included an activity every evening.

(i) The **Conference Opening Cocktail** with quiz questions and prizes. The cocktail was hosted by DigitalGlobe where the Regional Sales Representative Peter Kinne lead the quiz and the distribution of prizes. (ii) On Tuesday a **Yaqona (Kava) Evening** hosted by Fiji which included a mix of popular Fijian music. (iii) On Wednesday a **Social Night Out** where a few PGRSC Committee representatives guided or chaperoned interested conference participants through Suva's nightlife to experience Fiji's social environment. (iv) The Conference ended on Thursday with a **Closing Cocktail** and which featured the Spatial Business Award sponsored by SIBA. The evening also included the announcement of Poster Competition winners and distribution of prizes. The PGRSC acknowledge Vodafone Fiji for sponsoring the poster competition prizes for two categories i.e. student and professional. (v) Saturday boats were carrying the still remaining conference to a **Picnic at the Sandbank** within the Suva reef.



¹ See Newsletter 1, 2006

Workshops

The following trainings and workshops took place at the end of the week i.e

GBDX workshop conducted by Andrew Steele, a developer at Digital Globe. GBDX is a Digital Globe Platform that allows users to build, access and run spatially advanced workflows and tools to extract information that can be actionable at a global scale. The platform utilises the most robust and comprehensive cloud-based satellite image library, providing location intelligence derived from big data.

Radar Workshop conducted by Hirdeshni Gautam, SPC Geoinformatics unit. The session introduced the basics of processing radar images using SNAP, the Sentinel Application Platform. Radar analysis application is a relatively new remote sensing tool in the Pacific. Radar images have unique radiometric and geometric characteristics, which are fundamentally different from images obtained from optical sensors.

QGIS customisation workshop conducted by Marco Bernasocchi. As an open source software, QGIS has comprehensive power and the ability for a user to customise the tool to their likings, specifically the development of plugins and the utilisation of command lines. The workshop introduced various ways QGIS can be customised for an intended application.

Introduction to QGIS Workshop conducted by Carol Chan. The workshop was aimed at introducing basic QGIS to new users. The software is free and widely adopted in the Pacific. It is a robust tool that produces quality analytical results.

Introduction to Drone Flight and Image Processing conducted by Richard Russell from Drone Service Fiji and Travis Parker from the University of California.



The above shows a UAV Workshops conducted by Travis Parker.

Perspective

The Pacific Islands GIS&RS User Conference is currently the only regional GIS and RS platform in the Pacific region. It was initiated as a Fiji National Conference which later developed into a Pacific conference. Discussions at the 2017 conference identified that there is a need for more inputs from countries on the content and programme of the conference. Following this discussion, the PGRSC have identified country focal points that the committee will collaborate with to capture feedback, ideas or suggestions from local GIS&RS user groups on the conference program. The first meeting between the PGRSC Committee and country focal points was held in 2018 where discussions highlighted the 2020 Conference to be hosted in Vanuatu. This would be the first to be held outside of Fiji.

Opening Speech by Mr. Malakai Finau

Permanent Secretary, Fiji Ministry of Lands and Mineral Resources at the 2018 Pacific Islands GIS & Remote Sensing User Conference



Permanent Secretary Ministry of Lands and Mineral Resources, Mr. Malakai Finau presenting the Opening Speech

The Permanent Secretary, Fiji Ministry of Lands and Mineral Resources presented the conference opening speech addressing the Pacific Island Heads of Organizations and Inter-government organisations; Members of the Pacific Geospatial and Surveying Council; forum participants; and invited guests.

Mr. Finau expressed that the week-long deliberations will enable discussions on innovative ways to foster regional solutions with Pacific specialists, practitioners and scientists from the public and private sectors who are closely involved in the field of GIS and Remote Sensing. The event will also enhance bonds and networks that has been forged. These networks will represent a strong pacific front at regional and international forums on GIS and Remote Sensing.

The Permanent Secretary reaffirmed that the Ministry of Lands and Mineral Resource's is committed to the GIS and Remote Sensing Council. The former Minister opened the conference in 2017, and officially launched the GIS and Remote Sensing Council in March 2018. This is a clear signal of the Government's priority for GIS and Remote Sensing data, both nationally and regionally, which has not wavered. The Fiji First Government launched the Vanua GIS system in 2016, therefore the Ministry will continue to work hard at it recognising the importance and value of GIS and Remote Sensing data - for disaster assessments and rehabilitation work or for agriculture, telecommunications, earthquake hazard assessments, deep sea mineral exploration, sand & gravel extraction, environment, forestry, mangroves, climate change, sea level rise, the Pacific flying lab, the sugar industry, water, artificial intelligence (AI) and electricity.

For government representatives working as senior technocrats and bureaucrats it is clearly understood that government policies depend on solid, real-time data to plan, to expand or contract attention, and most importantly to prioritize resources. Pacific people need services, infrastructure and room to grow their businesses - whether that is a small market stall in rural Sigatoka or a fully-fledged supermarket in Labasa or the Suva corridor, all these competing priorities rely on data.

GIS and Remote Sensing solutions, and the building of Pacific grown expertise is a core vehicle towards meeting these needs. It is perhaps one challenge to ensure that as practitioners divided along sectoral industries, who may have limited discussions among sectoral peers, the Conference is a space for experts in these often disparate silo's, to have lateral discussions where one can hopefully collaborate, and more importantly, avoid duplication of effort and resources.

Mr. Finau acknowledged and thanked the trustees namely Mr. Rajendra Singh and Dr. Russell Howorth and the PGRS committee, Wolf and the team, some of whom are staff in the Ministry for their tireless efforts on this front. SPC and USP was gratefully acknowledged as well for their commitment to the annual conference dating back 18 years, which has now evolved to an autonomous body through the GIS and Remote Sensing Council. The staff of both institutions gives up their personal time and effort, outside of work hours to make this annual gathering a success. At the same time the PS urged participants from the region to get more involved with the Council. As experts in a field of cutting-edge technology, the tyranny of distance no longer limits us and therefore the Council can begin to look at more

innovative ways to encompass more regional thinking at the Council level because the conference is for the Pacific. It must be grown and developed for the Pacific and by the Pacific people.

Mr. Malakai Finau also acknowledged and thanked the Government of Vanuatu for graciously offering to host the 2020 Conference and confirms that Fiji will support Vanuatu to the best of their ability on that front. It is also important to note that the Pacific GIS and Remote Sensing Council has an MoU with the regional Science, Technology and Resources Network (or STAR) Conference. Good solid GIS and Remote Sensing data is useless unless there is a relationship with robust science - so that the applications of both are meaningful to the lives of Pacific people. All these regional forums and gatherings only showcase the high regard that the GIS and RS community should place on discussion and collaboration - where diverse technical minds and opinions can only shape winning solutions for all.

Mr. Finau shared an important observation that he was advised on and that is, that the field of GIS and Remote Sensing continues to break the glass ceiling where more women stand shoulder to shoulder with their male peers as experts in this field. This is to be commended and should be greatly encouraged. It is with high hopes that the enrolments and marketing outreach at USP in this field of studies continues to increase this trend.

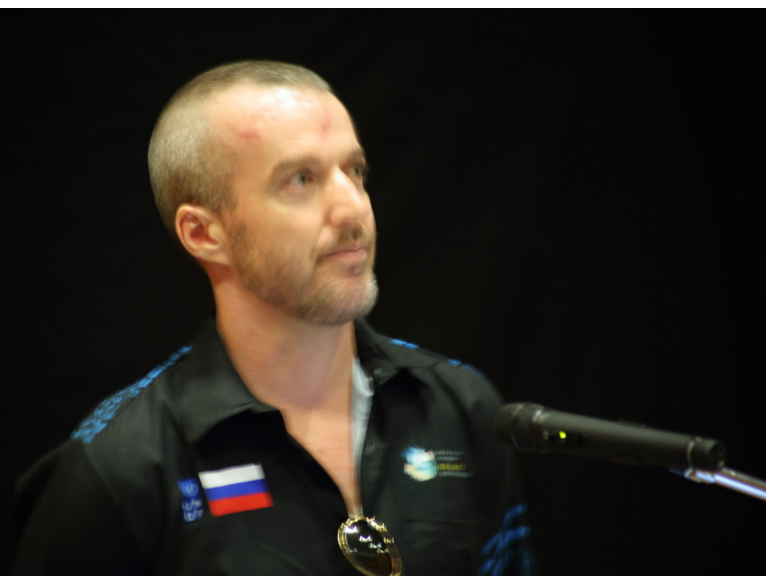
The Permanent Secretary graciously acknowledged and thanked the various sponsors who have come forward to sponsor the event while at the same time hopes that the private sector in Pacific Island countries can become as invested in this annual regional meeting because the private sector is the engine of economic growth in any country.

The Fiji Ministry convenes its own National Fiji Geospatial Information Management Council meetings regularly with an Annual Conference. It is the Fiji National forum for GIS and Remote Sensing experts and the team always enjoys the valuable synergy from the regional Conference to the national one and vice versa. Mr. Finau then pointed out an interesting presentation topic to be presented by Mr. John Sullivan that details new developments on the acquisition of image data. Very specifically a data hub that will be established where users do not purchase image data that is often very expensive. This image data hub in the cloud allows a user to analyse the image data of interest and download it soon after. The only cost will be for data and software usage.

Mr. Malaki Finau declared the 2018 Pacific GIS and Remote Sensing Conference OPEN.

■ Opening Remarks by Dr. Andrew Jones

Director, Geoscience, Energy and Maritime Division, SPC,
at the 2018 Pacific Islands GIS & Remote Sensing User Conference



SPC GEM Division Director, Dr. Andrew Jones presenting the Opening Remarks.

The Director, Geoscience, Energy and Maritime Division, SPC, Dr. Andrew Jones, delivered the Opening Remarks for the 2018 Pacific GIS and Remote Sensing User Conference. The Director addressed the Permanent Secretary of Lands and Mineral Resources, distinguished representatives of SPC's Pacific Island members from Fiji, the Pacific and International, sponsors, fellow scientists, CROP colleagues and in particular acknowledged USP for hosting the conference venue.

The Director recalled having just arrived in Fiji in his new role as Director of the SPC's GEM Division, and was invited to present the Opening Remarks for the 2017 GIS & Remote Sensing User Conference. The GIS and RS Conference meeting is about the sort of technical building blocks that are the foundations of GEM's core business. It brings the whole Pacific GIS and Remote Sensing Community together. To be part of that community, one needs to be present at this conference which was honour.

To make decisions that improve the lives of Pacific people, we can and will continue to strive to improve how we use our GIS systems, but the point is that we are using them.

The Director highlighted Remote Sensing recognising that it is not yet part of routine operations. However, over the past 12 months, it has been observed that the remote sensing landscape in the Pacific has become increasingly crowded and increasingly confused. In such a landscape, how can we convert one of the most powerful decision-making analytical processes in the history of humanity, into every day operations for the under-resourced governments and people of the Pacific?

Dr. Jones briefly mentioned three things, for consideration: **Science, Sustainability, and Coordination.**

Science - Decision makers love a map produced through remote sensing images. And for good reason. But what most partners don't realise, is that remote sensing is predominantly just the measurement of electromagnetic radiation. It requires

interpretation and science. Dr. Jones shared - Many years ago I was handed a map of the sea surface northwest of Australia, a map produced by a remote sensing consultancy, which showed oil slicks everywhere. But that was an interpretation. What it actually showed was areas of the sea surface that were flat, from which the electromagnetic radiation was not reflected back to the sensor. Through scientific research, I was able to show that the sea surface was flattened by current action and coral spawning, and was nothing to do with oil slicks, which influenced the investment of millions of dollars. The observation was that partners don't understand the fundamental difference between the science of interpreting remote sensing data, and using a remote sensing interpretation as part of technical assessment or decision making process. And in my opinion it is up to the people in this room to ensure the integrity of remote sensing through science by making that differentiation clear for Pacific people.

Sustainability – the Pacific needs new initiatives to ensure that remote sensing remains relevant and cutting edge. The conference is an opportunity to hear about some first-class new initiatives. Technical partners and our donors also welcome new initiatives. Everyone has a boss or a board back at headquarters, that need to be convinced in terms of investing other people's money in the Pacific, and a new initiative makes that job so much easier.

However, there is now too many new initiatives, which are simply not sustainable. The three year cycles of funding and people means that both will come and go. We need to focus on business processes and data management and organisations that have worked for the past 20 years that will still be working in 20 years. Innovate within a sustainable system.

Coordination – the past 12 months has shown the incredible potential to use remote sensing for the benefit of Pacific people, and bring organisations flocking to the Pacific. We have met with multiple technical organisations from all four of SPC's metropolitan members and multiple UN agencies. All forms of private sector players are present in the conference, from local operators to international conglomerates.

How can we expect a government official who is not a remote sensing expert, and is expected to be the policy expert, operational implementer and technical advisor for their nation in three different sectors, to navigate such a complex stakeholder group? To make the best decisions for investing their time and resources for the benefit of their people.

It is up to the people in this conference to put our own agendas aside for the good of Pacific people. We need to coordinate our efforts and to speak with one voice.

The Director added as an example, the Pacific GIS and Remote Sensing Council, the P-G-R-S-C- and the Pacific Geospatial and Surveying Council, the P-G-S-C-. The Pacific needs one council, one body, and representative of the Pacific people, to lead the agenda and coordinate the efforts of the myriad of stakeholders.

SPC is ready to support any council that unites us in these efforts.

Dr. Jones expressed and acknowledged the Pacific GIS and Remote Sensing Conference as a key component, perhaps the key component, in bringing those things together. It showcases the science, its longevity is an exemplar of sustainability in the Pacific, and is only through a forum such as this that we can coordinate our efforts.

The Director ended by solemnly and humbly asking that conference participants make every effort to ensure that, in the following conference, people are able to speak about the successes in sustainably coordinating GIS and Remote Sensing science for the good of the Pacific people now, and in the future.

■ Philipp Müller Memorial Address

Dr. Russel Howorth at the 2018 Pacific GIS and Remote Sensing User Conference

Dr. Russel Howorth is a Board Member and Trustee of the Pacific GIS and Remote Sensing Council



Dr. Russel Howorth presenting the Phillip Muller Memorial Address

Colleagues,

It gives me great pleasure to have been invited by the 2018 PGRS Conference Committee to be with you this morning. I recall some six years ago I stood before this annual conference of the day to give an Opening Address at which I concluded by suggesting that Philipp Muller be acknowledged for his vision in the early 1990s in regard to the emergence of, and future role of, GIS and RS in the Pacific Islands.

I am not here today to recant that message or the history books. But what I do want to do is quickly and simply “join the dots” for many here today who never had the opportunity to know or work with Philipp. I want to do this, by way of providing a brief background and context before I talk a little about the observations I want to make about the future.

Philipp was Director of SOPAC from 1992-1998. Throughout this period he and I would spend early mornings at the office over a cup of coffee. He was great for both being a sounding board and throwing out ideas. Sometime around 1993 during one, or more likely several, of these early morning sessions, he expressed the view “What do you think about this emerging GIS and RS stuff and our island region?” A second view was, “If it is truly a future essential tool how do we SOPAC contribute to making it effective for our people?” Philipp clearly in his mind had already separated the respective roles of the tool technicians from the users.

As a consequence over the mid and late 1990s Philipp worked steadily towards establishing SOPAC as the home amongst the regional organisations for supporting the countries in developing an interest in and an understanding of the value of GIS and RS.

By the time he retired in 1998 he had in my view succeeded and left the incoming Director Alf Simpson and myself as his Deputy to consolidate those early positive outcomes.

Fiji was a natural home to play a member country guinea pig role, but some other countries were keen to get engaged. Initiatives such as the Regional GIS Newsletter and National GIS User Groups were two early gains. But at the same time difficulties with implementing and sustainability of these two early gains for-shadowed the future. The newsletter needed the committed institutional support and key committed personnel. As for the National User Groups their success required potential users to simply recognise that fact.....“how can you get an answer if you do not know the question to ask!”. So difficult times were ahead for the sustainability of both the Newsletter and the National User Groups.

Nonetheless. Some very key technical advances were taking place. Examples of applications in improving scale of the spatial data and on-land resources inventory mapping were emerging from around the region and across resource sectors. The extension of applications into non-resource sectors of both government and the private sector particularly for asset management and demographic purposes grew rapidly.

The emergence of digital elevation models and stitching these to coastal LIDAR surveys were amongst the key technical advances. Long gone were the days of my coastal beach profile surveys throughout the 1980s. Well-informed site specific consideration can now take place of the vulnerability to climate change and sea-level rise, and exposure to extreme weather events, and use in coastal planning.

It would be remiss of me if I did not highlight the growing importance of the use of GIS and RS in our Pacific Ocean environment. For many years hampered by lack of precision control points this matter is now overcome. So with many of our island countries with over 95% of their sovereign territory being the ocean space of their Exclusive Economic Zone the use of GIS and RS tools in the oceanic environment is a key opportunity. Applications for example in fisheries, biodiversity, pollution, maritime surveillance and shipping, and deep-sea minerals within and beyond national jurisdiction are seemingly unlimited.

And so here we are today. I would submit that today GIS and RS technology in the region is here to stay. It is potentially everybody’s business, at all levels vertically down and horizontally across our societies around the region. BUT whose responsibility is it, and furthermore is there an issue about who has control, and if so how are the protocols for that control established and operationalised?

In my latter years at SOPAC, I developed an interest in this regard in the need to establish National Information Systems for each country. Myself, and others held consultations in a number of countries. Unfortunately, but to be expected, for many years this strategy fell on deaf ears because the users and in particular the decision-makers simply did not understand the potential value of spatial integration of data across sectors as an imperative in supporting the progress of development in a sustainable manner. Make no bones about it this was not just a Pacific island challenge. The UN system a few years back in its work in developing the 2030 Development Agenda highlighted the “Data Revolution” taking place globally.

Now let me look briefly to the future.

This background for me highlights both a threat and a challenge for the future. Especially for those new to this topic. Furthermore, this background highlights that there is only one cost effective solution. A solution which I raised in my Closing Address to this Conference last yearand that is effective, collaborative communication in all its forms amongst all stakeholders.

National governments through building effective public-private partnerships are key to this effective and collaborative communication. Who and How is the data entry quality checked? Is there a charge for information retrieved? Is the data a national asset? If so should it be freely available? And then there is the matter of mis-use.

So now let me touch on the role of the recently established Pacific GIS and RS Council. When I was approached to be a Trustee along with three other colleagues I thought long about what value, if any, I could bring to the table for the future.

I accepted the request to be a Trustee because now, nearly 30 years on from those early morning sessions with Philipp I am convinced that not only was he right, but furthermore to optimise and sustain the benefits for the people of our region was going to be as big if not bigger challenge than keeping pace with the technology developments. The PGRS Council is in a unique position to play a role in this regard for the future.

The Council was launched on the 2nd of March 2018, and its current Constitution states five objectives:

- To promote the development of GIS and Remote Sensing (RS) data, technologies, methods and services for the Pacific region;
- To enable collaboration and share lessons learnt across regional agencies and commercial parties;
- To discuss and establish methods in building adaptation for the Pacific environment for solutions working already well outside the region;
- To manage the distribution, publication and awareness of conference outcomes.
- To establish robust links with other GIS, RS and scientific bodies regionally and globally.

You will hear from others, in particular my good friend and colleague of us all Dr Wolf Forstreuter of the benefits and challenges of the Council over the past year. It is not my role to reflect on them here.

Last year in my Closing Remarks at this Conference, and as my final word, I emphasised that I was confident the new Council will have as a key focus of its work these aspects of communication. I added, “You as members of this Council have a responsibility to return home and foster the intent and purpose of the Council including engaging in better communication. You must come back here to future Conferences to present concrete actions being taken and thereby demonstrate progress is indeed being made at all levels to ensure the benefits of GIS and RS are better integrated into the planning for development process”. I trust those of you returning this year will have come prepared to respond to this challenge.

I close my Address to you today by repeating those words and wishing you well for this Conference.

For my part I will go away seeing my role as a trustee of the Council as one working to ensure the Council has in place resources to fulfil its role for the benefit of all in the region.

Thank you

■ The University of the South Pacific Graduation 2019

The Geospatial Science program is in its 5th year of operations and had the honor to see its second cohort of students graduate this March, 2019. A total Number of # students graduated majoring in either the developer or analyst stream. Some students also graduated with a Geospatial science and a relevant major.

Several graduates have already commenced their attachments at government agencies such as The Ministry of Lands, & Minerals and Resources as well as NGO's such as The Pacific Community (SPC), while other students are pursuing their Masters or Postgraduate studies in backgrounds such as Climate Change and Environmental Geoscience.

Shewta Sharma, swooped in this year's Gold Medal, majoring in Geospatial Science and Geography and is currently a Graduate Assistant at the University of the South Pacific pursuing her Masters and is part of the teaching staff of the School of Geography, Earth Science and Environments.

Loki Lutumailagi, a star student has managed to scope in funding from the University of New Caledonia and is pursuing his Masters in investigating the Socio- spatial Dynamics of Informal settlement in the Pacific Island Countries.

Giving well wishes to all the graduates and hope to see them change GIS in the Pacific Islands.

■ Masters of Geospatial Science – University of the South Pacific

Geospatial Science is an innovative approach to applying spatial knowledge and technology to solve contemporary problems. The University of the South Pacific presents a new MSc in Geospatial Science and is officially being offered from semester 1, 2019.

The Master of Geospatial Science offered through the School of Geography, Earth Science and Environment focuses on the multidisciplinary application of Field Survey Mapping, Cartography, Core GIS Spatial Analysis, Geospatial databases programming and Remote Sensing Image Interpretation. The MSc is unique among all programs. It provides to the student a practical, hands on educational experience that prepares students for a career in a technical GIS field.

Students who are interested in undertaking this programme needs at least a PG Diploma in a cognate discipline with a GPA of 3.0 or above, or completion of Bachelor of Geospatial Science with a GPA of 4.0 or above. The Masters in Geospatial Science allows students to choose between a research thesis, or two postgraduate's units plus a supervised research project.

The University as of current has four students enrolled in the MSc of Geospatial Science, most of whom are collaborating with projects such as GIZ REDD+ and The University of New Caledonia.

■ Training and Capacity Building in the Region – Pacific Flying Lab

The Pacific Flying Labs is a Fiji-based knowledge hub that focuses on solving local and regional challenges and providing a support ecosystem to enhance local and genuine capacity building within the region. To efficiently meet the implementation of capacity building, the Pacific Flying Lab, through the University of the South Pacific conducted trainings for the Ministry of Lands and Mineral Resources and The Ministry of Women, Children and Poverty Alleviation in April, 2018.

Hands on training on PIX4D Essentials was provided to 8 participants from the Ministry of Lands and Mineral Resources. This was to assist the Ministry on the Heritage Mapping Project. Ten staff from the Ministry of Women, Children and Poverty Alleviation were trained on basic introduction to GIS software, to support and enable the operation of the Ministry's new GIS Department. In addition, two final year geospatial students will be entering into an internship with the ministry which will strengthen the partnership between the Ministries and the University.

In addition, the Pacific Flying Lab has been working closely with National Disaster Management Office (NDMO), in using drones to better prepare for natural disasters such as Tsunami's. As a means of gauging the perception of people's response to tsunami drills, Pacific Flying labs engaged drones to monitor the movement of the participants during the drill. Members of more than 4 campuses and the Fiji Sports Council were participants to the drill. South Pacific Flying labs together with The University of the South Pacific will continue to support and build on genuine and local capacity building.

■ PARTneR Advanced GEONODE Database System Training 10 – 12, September 2018, Apia

The overarching aim of this three year project is to enable risk-informed decision-making and evidence-based planning to reduce the risks and impacts from natural hazards and contribute to achieving sustainable development for Samoa. Since its inception in June 2016, the PARTneR Project has held a number of consultative and training workshops for its stakeholders in its implementation to fulfil its three fundamental components;

1. Risk mapping and decision support tool developed;
2. Data collation and management system developed; and
3. Risk tool trainings and materials developed and applied.

From the 10th – 12th September 2018, the PARTneR project held its ‘Advanced GEONODE Database System’ training as a follow-up to the initial ‘Basic Introduction to Database Management Systems’ that was held in August 2017. The GEONODE system is an open access geospatial data repository that was initially developed by the PARTneR project regional partner SPC through the Pacific Resilience Program and has been tailored for the PARTneR project. This system provides a centralized data repository that can be accessed by all PARTneR project stakeholders whether acquiring data or uploading new data to share information enhancing collaboration between local Ministries, Agencies and organizations.

The three-day training was designed to introduce the PARTneR stakeholders to the newly modified Samoa GEONODE which has been set up under the Ministry through the technical support of the IT Division. Over the course of the training, participants engaged in hands-on practical exercises on how to operate the numerous functions of this tool as a by-product that would complement the use and application of the risk and loss modelling tool ‘RiskScape’ which is the core tool that is being tailored for Samoa under the PARTneR project.

The training was attended by representatives of various Ministries and Agencies whom have been active stakeholders of the project since its inception. As with previous trainings and workshops that have been conducted, this training was carried out to continuously build the capacity of the stakeholders with the tools of the project to ensure that they are utilized and sustained effectively and efficiently in its numerous applications. The Samoa GEONODE is now available online through the following link; www.samoageonode.ws

For more information on the PARTneR Project or any of its tools visit the following links or please contact:

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- <https://www.niwa.co.nz/natural-hazards/research-projects>
- <https://www.niwa.co.nz/pacific-rim/research-projects>
- <https://www.riskscape.org.nz/>
- <https://wiki.riskscape.org.nz/index.php/Overview>



Change Detection of Forest Cover in Fiji between 2006 and 2016 as Wall to Wall Mapping

- Lanjeta Rokotuiwakaya, Wolf Forstreuter and Viliame Tupua

Introduction

In 2017 Fiji REDD+ worked with the University of Hamburg to establish the Forest Reference Level. The University of Hamburg offered their services with the SPC-GEM Division as the sub-contractor and where the SPC team and the Management Services Division of the Fiji Forestry Department conducted forest change detection between 2006 and 2016 as wall to wall mapping. The work was initially conducted with the selection of 2007 and 2017 but this was changed to 2006 and 2016 according to the preference by World Bank. World Bank also requested results for 2012 in between the 10 years period.

The Image Data

Geoinformatics was previously involved in forest change detection mapping of 1991/1992, 2001 and 2007 which were compared through wall to wall mapping. This change detection method was able to produce the 2007 layer and where the polygons were adjusted to the 2006 Landsat image cover. The 2007 layer was produced by interpreting optical ALOS data, captured by a Japanese satellite with 10 metre resolution.

To begin with, all image data after 2001 needed to be de-striped because the thematic mapper sensor of Landsat 7 from that period was defect. This was followed by geometrical and atmospheric correction of all image data. Three sets of GIS backdrops were produced: (i) visual band combination red, green, blue and (ii) false colour IR combination infrared, red, green and (iii) a vegetation index layer.

Landsat 7 and 8 was utilised, besides the ALOS data coverage. This is because there were no Sentinel image data available from Fiji. The Landsat resolution of 30m was resampled to 25m through geometric correction.

The Mapping

The 2016 image data had the best quality image with less clouds, therefore the team started with the interpretation of the 2016 image data.

The team delineated (i) natural forest, (ii) mangroves, (iii) water bodies, (iv) none forest. The two classes (v) hardwood plantations and (vi) pine plantations were based on the lease areas, which were copied in. The classes were not based on image interpretation. The reason being that hardwood plantations could have mahogany underneath the canopy of natural forest which is not visible. Pine plantations could show clear cuts where replanting could take place. Therefore these areas would not be classified as a deforestation area. It was decided 'not' to apply 'deforestation rate calculation' on the two classes i.e hardwood and pine plantations.

The visual image interpretation mapping was carried out by adjusting the polygons from the 2016 interpretation to the 2012 forest cover. The same was applied to the 2012 forest cover polygons to the 2006 cover. This was done to avoid any additional statistical error if a new delineation was to be carried out.

The interpreter toggled between the natural colour backdrop, the false colour infrared interpretation and the vegetation index. Each interpreter had two screens and could load different GIS backdrops at the same time. QGIS and MapInfo software was available therefore both tools were used.

In case parts of the image layer were disabled from interpretation due to cloud cover, Google Earth was displayed on the second monitor and the polygons were checked and adjusted. This method worked well as there was not much forest change.



Change Detection

The calculation of forest change was conducted in raster environment. All polygons were converted to raster layers. Then, the pixel ids 1 = forest, 2 = mangrove, 3 = pine plantation, 4 = hardwood plantation, 5 = coconut, 6 = water body and 7 = none forest, were for one layer multiplied by 10. This created a layer were 10 indicated forest, 20 mangrove, etc. By combining both layers through adding up both ids, 11 indicated no change as forest in both layers, 17 deforestation and 71 afforestation. The change from one class to another class can documented with this method on pixel detail, which is 25 x 25 metre.

The change detection layer was created for Viti Levu and Vanua Levu including Taveuni as two seamless files. These files were cut into the map sheet coverages of the Lands Department 1:50,000 topographic map series. For every of these map sheet file covering 40 x 30 km the software counted the number of pixels for every change detection class. The listing was exported from the image analysis software to text files. Access imports these files and combine all to one table showing the change 2006 to 2012 and one table showing the change 2012 to 2016.

The calculated deforestation rate was with about 1% which is very low. Timber removal happens in Fiji through selective logging, which is not visible with Landsat image data.

Summary and Outlook

The visible interpretation of forest cover was needed due to setbacks experienced through automatic classification of Landsat image data in 1991/1992 and 2006 in Fiji. Like other volcanic Pacific islands Fiji has strong atmospheric disturbance over hilly forest areas, which affects the interpretation process. In such cases, visual interpretation by experienced local foresters can be extremely valid however this would require several interpreters working on the same area where several people are handling the files, and which could lead to problems. For similar tasks, the change has to cover: (i) the first interpretation (2016 layer) is performed automatically with visual adjustment only to save time; (ii) working in map sheets where one map sheet is analysed by one interpreter only; (iii) the preliminary results should already be displayed on the website to have a crowd sourced assistance and acceptance.

The mangrove areas were re-checked and partly corrected. The outer islands have now been mapped. The 2016 layer will soon be available on the SPC website and free to download. To get a copy of the forest and mangrove cover, please provide a hard-drive. GIZ, The Fiji Forestry Department and the SPC Geoinformatics Team will be able to assist providing the map data.

■ Announcement: United Nations/Fiji Workshop on the Applications of Global Navigation Satellite Systems

A five-day Workshop on the applications of GNSS will be held in Suva, Fiji, from 24 to 28 June 2019. The Workshop is being organized by the United Nations Office for Outer Space Affairs in cooperation with the University of the South Pacific (USP) as part of the activities of the United Nations Programme on Space Applications. The Workshop will be hosted by USP. The Workshop is co-sponsored by the Government of the United States of America and the European Commission through the International Committee on Global Navigation Satellite Systems (ICG).

The main objective of the workshop is to reinforce the exchange of information between countries and scale up the capacities in the region pursuing the application of GNSS solutions, wide-spreading information on the national, regional and global projects, which could benefit the region and to enhance cross-fertilization among them. The specific objectives of the workshop are: (1) to introduce GNSS and its applications to transport and communications, aviation, surveying, mapping and Earth science, management of natural resources, the environment and disaster management, precision agriculture, high precision mobile application, and space weather effects on GNSS; (2) to promote greater exchange of actual experiences with specific applications; (3) to encourage greater cooperation in developing partnerships and GNSS networks, in the framework of the regional reference frames; and (4) to define recommendations and findings, in particular in forging partnerships to strengthen and deliver capacity-building in the utilization of space science and technology for sustainable economic and social development.

The workshop technical sessions will promote productive discussions among participants, and cover a wide range of topics related to GNSS technology: (1) overview of GNSS in operation and development; (2) GNSS for disaster management; (3) GNSS reference frames and reference station networks; (4) GNSS applications; (5) space weather; (6) capacity-building, education and training in the field of GNSS; (7) international and regional experiences of the use and implementation of GNSS technologies; and (8) national GNSS programmes. During the workshop, a one day seminar on "GNSS spectrum protection and interference detection and mitigation" will be organized. The purpose of the seminar is to highlight the importance of GNSS spectrum protection at the national level and explain how to reap the benefits of GNSS. Specific presentations that demonstrate GNSS jamming and spoofing will be carried out.

The detailed information about the workshop, abstracts of the papers to be presented at the workshop is available on the website of the Office for Outer Space Affairs at: <http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2019/2019-un-fiji-workshop-on-the-applications-of-gnss.html>

SOSPADIS Project: Socio-Spatial Dynamics of Informal Settlements in the Pacific Island Countries: Application of an Agent-Based Model for Water Supply in Fiji and Vanuatu

- By Thomas GAILLARD (Independent Consultant - ECOSOPHY)

The Pacific Urban Context

Towns and cities in the Pacific Island Countries (PICs) will face a major challenge in the near future. With population growth, informal settlements (IS) are becoming a common feature of urban landscapes. In Melanesian countries, it is estimated that between 25-45% of the urban population now live in such settlements (Figure 13), and these figures are likely to increase in the foreseeable future, as natural growth and rural-urban migrations are major push factors.

Country and Capital City	Population of Main City 2013	Estimated Settlement Population	Annual City Population Growth Rate	Annual Settlement Population Growth Rate	Settlements as % of City Population 2013	Settlements as % of City Population 2023
Solomon Is., Honiara	64,600	22,600	3%	6-26%	35%	64%
Fiji, Greater Suva Area	244,000	50,000	2%	8%	20%	31%
Vanuatu, Port-Vila	44,000	15,400	4%	3-12%	35%	43%
PNG, Port-Moresby	500,000 to 700,000	225,000 to 315,000	2%	5-8%	45%	56%

Urban population and growth rates of informal settlements in Melanesian countries (PRIF, 2015)

Urban planning is undersized in the Pacific Islands region and many informal settlements remain largely unplanned, notably on customary lands in Melanesia. They are characterised by gradual organic (bottom-up) and owner-controlled growth, with a great deal of flexibility in the configuration of their urban spaces. The communities living in informal settlements develop great adaptation capacities to the physical conditions of the site, in respect of the natural topography of the surrounding environment. They are able to negotiate between formal and informal forces and still follow some structural rules of urban and social coherence. The kinship system, particularly the wantok system in Melanesia, appear to be very strong in squatter communities.



Seaside-Paama settlement, Port-Vila, Vanuatu

Basic infrastructure such as potable water, sewerage and storm water drainage are often lacking in informal settlements. These conditions are hazardous to health and tend to exacerbate the already severe socio-economic conditions of the urban poor as well as environmental pollution and degradation of the local ecosystem. There is a need to assist inhabitants of such settlements to improve their physical environment and hence quality of life. Local governments have a constitutional obligation to render services to residents of both formal and informal settlements. In Fiji for example, the recently adopted Constitution (2013) states that piped water to be supplied on user pays system despite legality status.

Study Rationale

The Millennium Development Goals (MDG), target 7D, requires “by 2020 to have achieved a significant improvement in the lives of at least 100 million slum dwellers”, with two main components: slum upgrading and the reduction in the formation of slums. More recently, the adoption of the 2030 Sustainable Development Goals shows this remains a global commitment to addressing this complex issue. Achieving goals such as health and wellbeing (Goal 3), improved water and sanitation (Goal 6) and sustainable cities and communities (Goal 11) demand an integrated and holistic approach. Lastly, the New Urban Agenda adopted at Habitat III in Quito (2016) recognizes the need to further strengthen the resilience of cities, human infrastructure and spatial planning by implementing integrated, age- and gender-responsive policies and plans and ecosystem-based approaches. While international organisations call for coordinated policies and actions related to slum-upgrading, there is an urgent need for innovative approaches, involving multidisciplinary teams of researchers, practitioners and policy-makers who can provide efficient strategies in the delivery of basic infrastructures and services.

PACIFIC ISLANDS GIS&RS NEWSLETTER

In order to plan any kind of urban intervention to settlements, there is a necessity to recognise informal settlements dynamics and their unusual morphological patterns. To understand how they can be transformed, upgraded, one needs to understand how informal settlements work, i.e. the morphogenesis of how they emerge and grow as well as how they are inhabited and used. Interventions like setting up basic facilities (e.g. water supply) can be better designed and implemented based on a proper understanding of growth processes taking place and the driving forces influencing this growth. Indeed, simulating the dynamics and geometry of a IS can help determine how many houses can still be built in the settlement, where these houses will arise, and the impacts of roads, flood zones and other landscape factors on further development of the area.

However, how can these socio-spatial patterns of informal settlements be captured and described? And how, once described, can they be integrated into a framework for specific water-related urban projects? Most of the difficulties faced by urban planners and policy makers are related to the absence of appropriate analytical tools that would permit them to undertake preliminary analysis with the purpose of assessing probable IS behaviour under different conditions. Current trends in modelling urban dynamics and self-organizing systems are the use of models such as Agent-Based Models (ABM), a bottom-up approach with agent representing the human and social units (households, dwellings) that make the city work in form of socio-economic objects or activities. Some interesting aspects in using this technique are the representation of the environment in 2- or 3-D, the integration with GIS and temporal-space variables, and the interactions between the different agents and between the agents and the surrounding environment. Research on IS dynamics have mainly been carried out in large cities in South & Latin America, Africa and Asia, with little research focusing on the Pacific Islands.

The SOSPADIS Project

The SOSPADIS project aims to contribute to the knowledge and understanding of the dynamics underlying the socio-spatial organisation of IS in Melanesia. It assumes that self-organisation is likely to play a significant role in the socio-spatial dynamics of IS and that decentralised individual-based decisions shape the built environment. The study breaks down the simulation into two distinct phases: a conceptual phase and then an implementation phase that actions the concept. The main objective of the conceptual phase is to gain an understanding of the driving forces that influence the built morphology of the settlements. Identifying the role played by these forces and the interactions between them can be used as a basis for implementing a predictive settlement growth ABM (vector-based housing model) that can reveal morphological trends and patterns of growth. This model can then be coupled with a consumer model that allow for an evaluation of water-demand and behaviours of the settlers in order to provide tangible information for water supply strategies.

The study will take place in urban areas in Fiji and Vanuatu. Based on a first literature review and on the IS situation analysis in Fiji completed by UN-Habitat in 2016, the Valenicina settlement located in Lami and the Tauvegavega settlement in Ba town have been selected for the project as they both show insufficient water supply systems. It is estimated that half of the households in the Valecinina settlement have no formal water connection, while one-fourth of the population in Tauvegavega have no access to piped water supply (UN-Habitat, 2016). In Vanuatu, IS have been selected within the Port-Vila Municipal boundaries and include the settlements of Seaside, Tagabe Bridge, Manples and Ohlen-Mataso.

Spatio-temporal analysis of the built morphology will be conducted for the selected sites using available aerial photographs and satellite images, and completed by drone data collection. Spatial metrics and morphological indicators will be used to set rules and thresholds for the housing model to enable simulation of the on-going development processes that occur in settlements. Based on environmental and spatial data, a settlement suitability map will be developed to provide information on possible future development within the settlement boundaries.

This project has received financial support from the French Ministry of Europe and Foreign Affairs through the Pacific Fund, the Office of Regional Cooperation and External Relations of the Government of New Caledonia and the University of New Caledonia. It is led by a multidisciplinary team of researchers from the University of New Caledonia, University of the South Pacific and Massey University bringing their expertise in urban geography, social science, geomatics, data mining, modelling and simulation.

For more Information

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