Working Group 1
Geodetic Reference Frame

Activity Report

for

The UN-GGIM-AP Executive Boarding Meeting
Sydney, Australia
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In the period since the 5th UN-GGIM-AP (2016) meeting in Kuala Lumpur, Malaysia, WG1 activities have included:

- Efforts to improve access to the GGRF while also supporting regional geodetic cooperation within the Asia Pacific region. The Asia Pacific Reference Frame (APREF) incorporates GNSS data from a CORS network of approximately 620 stations, contributed by 28 countries in the Asia Pacific. Data are routinely processed by four Analysis Centres and made available publically. An additional GNSS CORS site from Thailand is now contributing data to the APREF GNSS network. Preparations are also underway to reprocess the APREF data archive using the IGS14 reference frame.

- The ongoing coordination of a regional GNSS campaign – Asia Pacific Regional Geodetic Project (APRGP). The APRGP2016 campaign ran from 18 to 24 September 2016, and data assembly and analysis is now underway. As of February 2017, the data of the APRGP 2016 were collected from eight member countries, including Bangladesh, Hong Kong (China), Japan, Malaysia, Philippines, Singapore, Sri Lanka and Vietnam. An APRGP 2017 Campaign is also currently being planned.

- The Asia-Pacific Geodetic Capacity Building (APGCB) Project has continued. Specific activity has included:
  - A joint UN-GGIM-AP, FIG and JUPEM forum on Geospatial and GNSS CORS Infrastructure was undertaken 16 – 17 October 2016, Kuala Lumpur – Malaysia. The forum compromised of 6 sessions, and 22 presentations. The forum hosted by JUPEM (Department of Survey and Mapping, Malaysia) had over 150 delegates from 21 countries. Over the 2 days, the forum attracted over 100 participants each day and these attendees actively engaged and contributed to the program. To review and access all presentations listed in the following sessions, please navigate to FIG Asia Pacific Capacity Development Network website for the appropriate links - http://www.fig.net/organisation/networks/capacity_development/asia_pacific/index.asp
  - WG1 has continued to support the Pacific Geospatial and Surveying Council (PGSC) including providing assistance with the development of their strategic plan. The WG1 Chair will attend the upcoming PGSC meeting in Suva, Fiji, in November 2017.
  - A joint technical seminar of UN-GGIM-AP, FIG, IAG, Japan Federation of Surveyors, International Committee for GNSS (IGC), Geospatial Information Authority of Japan (GSI) has been planned. The Seminar will be held 29-30 July 2017 before the IAG-IASPEI 2017 in Kobe, Japan. The programme will focus on geodetic reference frames and crustal deformation. The planned programme includes theory, ITRF, APREF, UN Initiatives,
monitoring and modelling of crustal deformation, case studies and software dealing geodetic adjustment.

- The WG will also commence planning of a workshop in Kamamoto, Japan in conjunction with the UN-GGIM-AP Plenary Meeting, October 2017.
- The WG will also contribute to a workshop in China, September 2017 to be held in conjunction with the Chinese Annual Geodetic General Assembly.
### Working Group 1 (WG1) - Work Plan Status

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<th>Objective</th>
<th>Goals</th>
<th>Deliverables</th>
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| Manage and support Asia Pacific countries to respond to the General Assembly Resolution on A Global Geodetic Reference Frame (GGRF) for Sustainable Development | To ensure the sustainability and enhancement of the GGRF in the Asia Pacific and provide the framework for all geospatial activity, as a key enabler of spatial data interoperability, disaster mitigation and sustainable development.  
To contribute to a global geodetic reference frame Road Map that will address key elements relating to the development and sustainability of the GGRF that meets the needs of the Asia Pacific. | **Year 1**: An interim report on the current status of the GGRF in the Asia Pacific.  
**Year 2**: An interim report on progress towards implementation of the UN GA GGRF Resolution in the Asia Pacific.  
**Year 3**: A final report on progress towards implementation of the UN GA GGRF Resolution. The report will include measures of progress towards implementation of the UN GA GGRF Resolution in the Asia Pacific. | Input from Asia Pacific member nations on the sustainability of the GGRF has been sought.  
Chair and vice-chairs of WG1 have been liaising closely with UN-GGIM GGRF Working Group to ensure strong input from the Asia Pacific region.  
WG1 members have been encouraged by the Chair to contribute to the UN-GGIM GGRF Working Group. |
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<td>Manage the Asia Pacific Reference Frame (APREF) project and provide a regional mechanism to incorporate Global Navigation Satellite System (GNSS) data and analysis from CORS stations across the Asia Pacific</td>
<td>Improve access to the GGRF in the Asia Pacific</td>
<td><strong>Year 1:</strong> APREF to continue while encouraging additional participation of member states through data and analysis contributions. A geodetic data portal to provide easy access to data and results. Encourage the development of national to international transformation parameters. Encourage the development of regional standards including the adoption of a common reference epoch. Support the activities of the Asia-Oceania VLBI (AOV) Group.</td>
<td>Chair of WG1 has ensured resourcing of the APREF central bureau</td>
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<td>To encourage open sharing of geodetic data in the Asia Pacific</td>
<td><strong>Year 2:</strong> on-going – as above. Work together with organisations such as the International Federation of Surveyors (FIG) and the International Association of Geodesy (IAG) to develop common approaches to crustal deformation monitoring and modelling and its application to geodetic control networks in our region</td>
<td>Chair of WG1 has ensured an APREF website is maintained. APREF website provides up to date geodetic coordinates and uncertainties for participating stations and member countries. Six CORS stations from Hong Kong (China) and four stations from Taiwan (China) have been contributed to the APREF GNSS network, four of them are approved for use in the IGS network after testing via APREF project. Another new CORS site from Thailand is contributing data to the APREF GNSS network.</td>
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<td>To encourage cooperation that addresses infrastructure gaps and duplications towards the development of a more sustainable GGRF, particularly ensuring improved multi-GNSS tracking in the Asia Pacific</td>
<td><strong>Year 3:</strong> on-going – as above</td>
<td>Australia has generated a densification of velocity field based on the APREF GNSS data set.</td>
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<td>To support the observation, analysis and development of national GNSS, Satellite Laser Ranging (SLR) and Very Long Baseline Interferometry (VLBI) infrastructure and their interconnection for reference frame improvement and providing an Asia and the Pacific perspective to the global geodetic community</td>
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<td>To encourage the sharing of real-time geodetic observations to support disaster risk reduction.</td>
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<td>Manage an annual regional GNSS campaign - Asia Pacific Regional Geodetic Project (APRGP)</td>
<td>Improve access to the GGRF in the Asia Pacific, particularly for developing countries To encourage open sharing of geodetic data in the Asia Pacific To encourage the use of geodetic data to enable spatial data interoperability, disaster mitigation and sustainable development in the Asia Pacific</td>
<td><strong>Year 1:</strong> APRGP to continue while encouraging additional participation of member states through GNSS data and analysis contributions. An annual analysis report to be prepared. Encourage the development of national to international transformation parameters. Encourage the development of regional standards including the adoption of a common reference epoch. <strong>Year 2:</strong> on-going – as above <strong>Year 3:</strong> on-going – as above</td>
<td>Chair of WG1 has produced a report that details geodetic coordinates and their uncertainty throughout the region and distributed to participating member countries. Australia has coordinated the APRGP 2016 campaign, data assembly and analysis is underway. A 2017 Campaign is currently being planned.</td>
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| Manage the Asia Pacific Regional Height System Unification (APRHSU) project | To facilitate regional height system unification to support spatial data interoperability, disaster mitigation and sustainable development in the Asia Pacific. To encourage open sharing of geodetic data in the Asia Pacific in accordance with the objectives of the UN General Assembly Resolution on the GGRF. | **Year 1**: develop a geodetic database and dedicated website to facilitate regional height system development. Data to include gravity, levelling and tide gauge observations. Conduct a planning workshop.  
**Year 2**: ongoing maintenance of a geodetic database and website. Conduct a capacity building workshop.  
**Year 3**: ongoing maintenance of a geodetic database and website. Conduct a planning workshop. | A report on the height systems of the Pacific Islands is in preparation. |
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| Support geodetic capacity Building in the Asia Pacific through technical workshops and developing partnerships with other organisations including the International Federation of Surveyors (FIG), the International Association of Geodesy (IAG), the United Nations International Committee for GNSS (UN-ICG) and the Pacific Geospatial and Surveying Council (PGSC) | To provide technical assistance for capacity building in Geodesy for developing countries, with the aim of ensuring the development, sustainability and advancement of the global geodetic reference frame | **Year 1:** conduct a regional geodetic capacity building workshop with a focus on either GNSS data processing, Geoid determination, or the use of open geodetic software  
**Year 2:** as above  
**Year 3:** as above | WG1 members have partnered with the FIG, IAG and PGSC to develop regional geodetic workshops that support geodetic capacity building.  
WG1 workshops has been arranged to coincide with other related conferences and meetings including the FIG symposium in Christchurch, New Zealand, and potentially the annual South East Asian Survey Congress. |
| | To make the global geodetic reference frame more visible and understandable to society | | |