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Report of the Permanent Committee on Geographical Information
System Infrastructure for Asia and the Pacific**

REPORT OF THE WORKING GROUP 3: CADASTRE

**Submitted by the Permanent Committee on Geographical Information
System Infrastructure for Asia and the Pacific (PCGIAP)
Working Group 3: Cadastre ****

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Permanent Committee on GIS Infrastructure for Asia and the Pacific

Working Group 3

Cadastre

STATUS REPORT

**FOR 17th UNRCC-AP Conference and 12th PCGIAP MEETING
Bangkok, THAILAND
18-22 September 2006**

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REPORT FOR WORKING GROUP 3: CADASTRE

Working Group 3 (WG3) is responsible for exploring technical, institutional and policy issues regarding the contribution of spatial data infrastructures (SDI) in designing, building and managing large scale, spatial, people relevant datasets, and in particular their role in cadastral, land administration and marine administration systems.

WG3 has been very active over the last three years (2003-2006) and had a successful period for its activities as summarised below:

- Successfully completed two major projects (cadastral template and marine administration projects) and one well underway (data integration project),
- Successfully organised three successful international workshops,
- Established three dedicated website for the projects,
- Successful and widely disseminated publication strategy.

Key activities undertaken since 16th UNRCC-AP Conference 2003 in Okinawa, Japan

WG3 has undertaken the following major activities over the last three years as part of its 2003-2006 workplan and particularly in response to Resolution 4 (and its three main components) of the 16th UNRCC-AP, Okinawa, Japan:

RESOLUTION 4 - “Cadastre and SDI”, 16th UNRCC-AP: Okinawa, Japan

The Conference,

Noting the outcomes of AGENDA 21 which promoted the importance of efficient and accessible land markets based on cadastral systems and the establishment of appropriate tenure systems, as key factors in support of sustainable development and environmental management,

Further noting the resolutions and deliberations of the 15th UNRCC-AP and the 6th and 7th UNRCC for the Americas on the need to better understand and appreciate the relationship between land administration and SDIs, and the integration of cadastral and topographic data in SDIs, in Member Nations,

Mindful of the benefits and difficulties of integrating cadastral and land tenure information with topographic information in providing an appropriate basis for supporting sustainable development and environmental management,

Bearing in mind the interest of member Nations in sharing experiences on cadastral and land administration issues, and particularly the role that cadastral data has in developing SDIs,

Recognising the difficulties Member Nations have in determining the efficiency, effectiveness and performance, and appreciating the global situation, of cadastral, land tenure and land administration systems,

Recalling the outcomes of the PCGIAP Working Group 3 (Cadastre) during their 2000-2003 Work Plan and its Workshop on Cadastral Systems in Asia and the Pacific 12-13 July 2003 in Okinawa,

Further recalling the importance of a cadastral template which is a standardized generic proforma that will enable the discovery of information, including matters concerned with Member Nations' land policy, laws and regulations, land tenure, land administration and cadastre, institutional arrangements, SDIs, technology as well as human resources and capacity building,

Recommends that

- the jointly developed PCGIAP/FIG Cadastral Template be adopted,
- PCGIAP support working Group 3 (Cadastre) in encouraging Member Nations in Asia and the Pacific region to complete the template during its 2003-2006 Work Plan,
- PCGIAP cooperates with the FIG Commission 7 (Cadastre and Land Management), the PCIDEA, the UN Economic Commission for Europe (UNECE) through the Working Party on Land Administration (WPLA) and the UN Economic Commission for Africa (UNECA) through the Commission on Development Information (CODI), in seeking to have countries world wide complete the template during its 2003-2006 Work Plan, and
- PCGIAP cooperate with FIG Commission 7 (Cadastre and Land Management) in placing the individual country cadastral template information on the joint FIG/PCGIAP Cadastral Template web site during its 2003-2006 Work Plan,
- And further recommends that the 2003-2006 Work Plan of Working Group 3 (Cadastre) of PCGIAP further include:
 - continuation of its activities to describe the marine cadastre concept, and
 - developing a better understanding of the relationship between cadastral and topographic mapping in the establishment and maintenance of Member Nations SDIs, by exploring the justification, and associated conceptual, institutional and technical issues.

1. Cadastre Template- The First Component of Resolution 4

The development of a cadastral template was one of the objectives of WG3. The cadastral template aimed to gather information in order to address key issues such as:

- the order of magnitude of the basic tasks in a cadastral system;
- an indication of the problems involved in the informal occupation of land within both the urban and rural areas;
- to try and understand the role of the cadastre in land administration and related SDI activities;
- to get an idea of the completeness, comprehensiveness, use and usefulness of cadastral data; and
- to gain an understanding of the capacity which is in place within countries to support cadastral and land administration systems.

As part of this objective and the implementation of the Resolution 4, WG3 in collaboration with FIG/Commission 7 has jointly designed and successfully established a dedicated website for

publicising the results of the cadastral template project (www.cadastraltemplate.org). This website is currently maintained and run by the Centre for SDIs and Land Administration, Department of Geomatics, the University of Melbourne. This is a world first and is a significant outcome from the project which will provide direct benefits to PCGIAP.

As part of encouraging Member Nations in Asia and the Pacific region and FIG members to complete the template during its 2003-2006 Work Plan, the WG3 has translated the Cadastral Template Form and Questionnaire into Spanish and Portuguese languages to facilitate Latin American and South American countries to participate and complete the cadastral template. The WG3-Managing team has also prepared a business card to promote the project world-wide. Further, in order to have more countries world wide complete the template, the WG3 has prepared and sent an invitation letter to the FIG Commission 7 (Cadastre and Land Management), the PCIDEA, the UN Economic Commission for Europe (UNECE) through the Working Party on Land Administration (WPLA) and the UN Economic Commission for Africa (UNECA) through the Commission on Development Information (CODI). Similar to this letter, an invitation letter also has been sent to all FIG Commission 7 members and to the Regional Centre of Excellence on Real Property in Eastern Europe and one to the Arab Federation of Surveyors.

As a result of these letters, all international organisations support the Cadastral Template Project and currently **39 country reports on cadastral systems** have been placed in this website. Analysis of these reports has been undertaken over the past year, culminating in the creation of a technical paper titled "*Assessing the Worldwide Comparison of Cadastral Systems*" which summarises the results of the analysis. This paper has been accepted for publication in the International Journal of Land Use Policy. This paper has employed several indicators which have been used to analyse and benchmark countries' cadastral systems, which contribute to an improved understanding of the complex relationship between cadastral, land administration system and National SDI initiatives. This analysis helps to enable a worldwide comparison of cadastral systems, forming the basis for best practice and a tool to improve national cadastral systems.

2. Cadastral Template International Workshop

As part of the Cadastral Template Project and WG3 Workplan (2002-2004), WG3 organised a two-day International Workshop (12-13 July 2003) on Cadastral Systems in Asia and Pacific region which was successfully conducted prior to the 16th UNRCC-AP conference and 9th PCGIAP meeting in Okinawa, Japan. The objectives were to understand the role that cadastre plays in a state or national spatial data infrastructure and to compare best practice as a basis for improving cadastres as a key component of SDIs. 45 people from 25 countries attended the workshop.

All information presented at the Workshop, together with related materials on cadastral template can be found on this website (www.cadastraltemplate.org), and also through PCGIAP-WG3 web page.

3. Marine Cadastre- The Second Component of Resolution 4

The second component of the Resolution 4 was to support research into Marine Cadastres in this region. The work and activity on this component started in July 2003 directly after the 16th UNRCC-AP conference in Okinawa, Japan. As part of this activity WG3 hosted an International Workshop

from 4-6 May, 2004 in Malaysia with an aim to develop guidelines on the establishment and maintenance of marine cadastres with emphasis on the use of appropriate ICT. The project also aimed to review best practice, to establish networks and to evaluate the potential for Asia-Pacific ICT expertise in establishing marine cadastres and addressing marine administration-the spatial dimension.

A dedicated website (www.marineadministration.org) has been designed and developed by WG3 and Centre for SDIs and Land Administration, Department of Geomatics, The University of Melbourne. The website contains country reports on Marine Administration systems based on a jointly developed template. All information presented at the International Workshop, together with related materials can be found on this website.

Currently there are six country reports online. However, WG3 aims to continue promoting Marine Administration in order to have a wider view of the Asia-Pacific region. The WG3 research team has analysed the results of the workshop and prepared a technical paper titled “Administering *Marine Environment-the spatial dimensions*”. This paper has been published in the Spatial Science Journal in 2005. Further discussion has been held with FIG Commission 4 to collaborate to further extend the number of countries participating in this project. Also, a technical paper on marine cadastre activities in Asia-Pacific region has been submitted to the FIG Commission 4.3 for publication in marine administration area.

4. International Workshop on Administering the Marine Environment

As part of the Marine Cadastre Project and WG3 Workplan (2002-2004), WG3 organised a four-day International Workshop (4th-7th May 2004) on Administering the Marine Environment – The Spatial Dimensions in Asia and Pacific region. The workshop was conducted in Kuala Lumpur, Malaysia and hosted by the Department of Survey and Mapping Malaysia.

The objective of the workshop was to better understand the spatial dimensions of administering marine environment in Asia and the Pacific region and particularly to facilitate:

- *an understanding of the needs of an SDI in the marine context;*
- *better understanding and appreciation of the administration of marine rights, restrictions and responsibilities; and*
- *the documentation of issues in establishing a marine dimension as a key component of National SDIs.*

The Workshop reviewed national administration of marine environments of countries in Asia and the Pacific region based on a common template to identify problems, issues, similarities and differences in spatial data infrastructures; institutional arrangements; the administration of rights, restrictions and responsibilities; technology and human resource and capacity building in the marine environment. 102 people from 11 countries attended the workshop.

Importantly the Workshop developed a common understanding of “marine administration” as part of an agreed resolution. In addition the Workshop developed a better understanding of the complex rights, restrictions and responsibilities in the marine environment and how to register and administer these interests.

The workshop also presented an opportunity for countries to identify and present the most important issues and challenges affecting their marine SDI activities, and discuss and develop resolutions and recommendations to the PCGIAP on administering the marine environment. The three main areas of discussion focused on:

- issues in administering the marine environment;
- definition of marine SDI and marine cadastre; and
- administration of marine rights, restrictions and responsibilities;

with key outcomes represented in the form of resolutions, concentrating on issues in the region and particularly the role of marine SDI and marine cadastre in aiding more effective marine administration.

Resolution 1 – Spatial Dimension of Administering the Marine Environment

The workshop recommended that all countries in the Asia-Pacific region with an extensive marine jurisdiction and administrative responsibilities be encouraged to include a marine dimension in their NSDI as part of their obligation to meeting their responsibilities under the United Nations Convention on the Law of the Sea (UNCLOS).

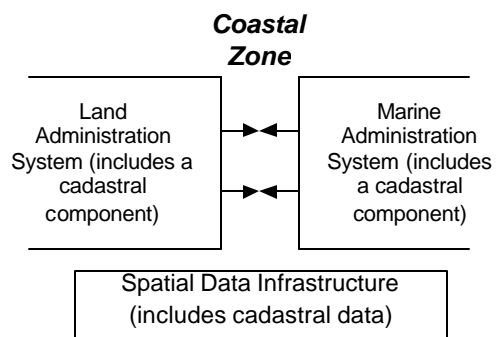
And further recommended that they cooperate with other countries to ensure technical, operational and policy consistency in the marine elements of NSDIs developed in the Asia-Pacific region.

Resolution 2 – PCGIAP-FIG Collaboration

Due to the importance of collaboration between different groups working on the same issues, the workshop recommended that PCGIAP and FIG collaborate through their respective work plans on marine cadastre, marine SDI, marine administration systems and ocean governance and encourages the FIG to participate in the Marine Administration Template Project.

Resolution 3 – Defining the Spatial Dimension of the Marine Environment

The terminology used to describe the spatial dimensions of the marine environment was unclear, with participants having different understanding of the terms marine cadastre and marine SDI. Therefore, the workshop recommended that the term marine administration system is adopted for the administration of rights, restrictions and responsibilities in the marine environment, with the spatial dimension facilitated by the marine SDI.



It further recommends that a marine cadastre is defined as a management tool which spatially describes, visualises and realises formally and informally defined boundaries and associated rights, restrictions and responsibilities in the marine environment as a data layer in a marine SDI, allowing them to be more effectively identified, administered and accessed.

Resolution 4 – Requirement for Further Development of Guidelines and Tools to Administer the Spatial Dimension of the Marine Environment

The workshop also recognised that more work needs to be done within Asia and the Pacific as a whole to more effectively manage the marine environment, and hence recommended that PCGIAP further investigates and develops guidelines and tools for administering the spatial dimension of the marine environment.

All information presented at the Workshop, together with related materials on marine cadastre can be found on this website (www.marineadministration.org), and also through PCGIAP-WG3 web page.

5. Integration of Built (cadastral) and Natural (topographic) environmental datasets within National SDI Initiatives- The Third Component of Resolution 4

A major initiative of WG3 is work on the project of the “Integration of Built (cadastral) and Natrual (topographic) environmental datasets within National SDI initiatives. Sustainable development, assisting informative spatial decision making and meeting "the triple bottom line" (economic, social and environmental objectives) requires an understanding of the natural and built environments and the relationship between them in order to observe and monitor change and to create realistic simulations of the changing environment.

It is very rare for institutions and companies to produce all the necessary spatial data for their applications and hence there is a need to access and integrate different spatial data from various sources. Over the last decade the establishment of Spatial Data Infrastructures (SDI) has aimed to address this need for integration, through facilitating and coordinating the exchange and sharing of spatial data between stakeholders in the spatial data community. The drive to establish SDIs is also driven by a need for governments and businesses to improve their decision-making and increase efficiency, as well as the advent of accessible, powerful information and communications technologies.

Within most countries however, built and natural environmental datasets have been developed to serve different purposes and are usually managed separately. This separation is recognized as a barrier to implementation of sustainable development objectives. Merging of these datasets at a local level has been achieved to some degree, however, attempts to integrate the datasets at a national level, even where SDIs are well developed, has been difficult and problematic internationally.

This research aims to introduce the importance and significance of the integration of various built and natural environmental spatial datasets through the creation of a framework and model for integration, which can be utilized in diverse jurisdictions to support sustainable development (Figure 1). This will be done through an understanding of the technical, jurisdictional, institutional, legal and land policy

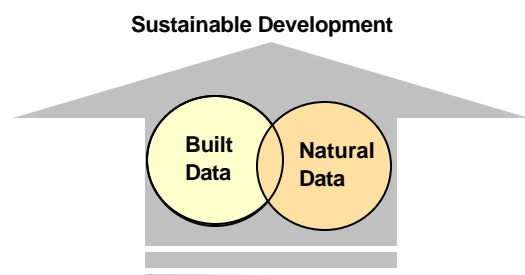


Figure 1: Integration of datasets to facilitate sustainable development

perspective surrounding built and natural environmental datasets, within the context of a National SDI.

The work on this project began in July 2005 through an overview of the history and application of these two datasets as well as the overall relations within the context of National SDI initiatives. Work on the project is well on the way and will continue till the end of 2007 and will contribute to meeting four main aims which include:

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- 1 Investigate the problems and issues in integrating data in National SDIs within Asia-Pacific case study countries, through an analysis of:
 - a) History of integration of cadastral and topographic mapping and related National SDI initiatives.
 - b) Capacity for and policies relating to data integration of cadastral and topographic datasets.
 - c) Institutional support for and barriers against data integration of cadastral and topographic datasets.

 - 2 Develop a framework model and associated tools for the integration of built and natural environmental datasets at a national level, through the development of National SDIs.
 - d) Investigate interoperability issues of national topographic datasets and state/territory cadastral (and other relevant) datasets and develop a methodology to prioritise SDI datasets.
 - e) Develop a justification and strategy to integrate these datasets in support of sustainable development.

 - 3 Identify the benefits of the integration framework model for developed and transitional countries in the Asia-Pacific region, with reference to case study countries.

 - 4 Undertake a publication strategy.
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Seven case studies will be undertaken within both developed and transitional countries in the Asia-Pacific region in order to gain a broad focus of research. These include New Zealand, Japan, Thailand, Malaysia, Brunei, Indonesia and Australia. As part of the investigation two local-state pilot studies are currently being conducted in Australia in order to identify the issues and development of a model and associated guide lines for the use in the international case study countries. Based on the results of the pilot projects, the research team will develop a template and associated guidelines to engage the other international case study countries in the implementation of this project.

The progress of this project is continuously monitored and results communicated among member of PCGIAP and presented through the PCGIAP meetings and in particular discussed within the WG3 meetings.

6. International Workshop on Integration of Natural and Built Environment Datasets in the context of National SDI Initiatives

As part of data integration project an International Workshop is being conducted as part of the 17th UNRCC-AP in Thailand in September 2006. The Workshop will review the national administration of SDI and data integration within countries (especially those within the Asia and Pacific regions) based on a common template which will be distributed soon. This template aims to identify problems, issues, similarities and differences in spatial data infrastructures; institutional

arrangements; current data integration methods; technology and human resource and capacity building in data integration and also to share the experiences of others in this area. This will lead to the development of a model and framework for integration of different datasets, and in particular these two forms of data capable of being used in diverse jurisdictions in support of sustainable development.

Further information on the integration project can be found at the dedicated project website http://www.geom.unimelb.edu.au/research/SDI_research/Integrated/ or through the PCGIAP-WG3 web page. Information regarding the Workshop can also be found on the project webpage by clicking on the link at the top of the webpage. This is a dedicated website for the Integration project and this upcoming workshop. All of the outcomes of the workshop and details of the integration project will be available on this website which will be continuously updated.

After the Workshop a short report will be presented at the 17th UNRCC-AP Conference.

7. International Short Course on “Developing SDIs: from concept to reality”

Following the recommendation of Resolution 5 (Capacity Building) of the 16th UNRCC-AP, and the endorsement of the 9th PCGIAP meeting, 14-18 July 2003, Okinawa, Japan, an International Short Course on SDI was run in conjunction with the Executive Board meeting of the PCGIAP by the Centre for SDIs and Land Administration, the University of Melbourne, Australia from 19-21 November, 2003.

RESOLUTION 5 – “Capacity Building”, 16th UNRCC-AP: Okinawa, Japan

The Conference,

Noting the results of the Development Needs Questionnaire undertaken by PCGIAP that indicated the need to provide for capacity building for spatial data infrastructure (SDI) development in Member Nations,

Further noting that capacity building is a concept that involves the development of both human and social capital and includes both capacity assessment and capacity development at three levels – societal, organizational and individual,

Recalling resolutions 2 and 5 from the 7th UNRCC for the Americas, as they relate to institutional strengthening and capacity building,

Further recalling the MOU between PCGIAP and PCIDEA,

Recognising the discussion of the need for capacity building at the 16th UNRCC-AP,

Acknowledging the difficulties being faced by Member Nations in assessing and developing their capacity for creating and maintaining SDIs,

Recommends that

- Working Group 4 redefine its scope of work and develop a Work Plan to be presented to the 10th PCGIAP meeting in India in 2004,

- Working Group 4 establish strategic linkages with other agencies and organizations involved in capacity building and identify opportunities to cooperate with capacity building meetings of organizations and institutions with whom PCGIAP has or should create strategic linkages,
- PCGIAP endorse ***the short course on Spatial Data Infrastructures (SDI) to be run in conjunction with the Executive Board meeting of the PCGIAP by the Centre for Spatial Data Infrastructures and Land Administration, the University of Melbourne, Australia on 19-21 November, 2003*** and assist in exploring options to support attendance by Member Nations and representatives from other regions, and
- PCGIAP
 - Endorse and support the convening, with the support of the United Nations, within available resources, of an inter-regional workshop to be hosted by the Government of Mexico in Aguas Calientes, in October 2004 to determine policies and programmes for educational, training and professional capacity building that will ensure the development of appropriate land administration systems and associated spatial data infrastructures, and
 - Consider the outcome of the resolutions of the inter-regional workshop for inclusion in the implementation of the Working Group 4 Work Plan.

The SDI Short Course was designed by the Centre and 24 people attended from seven countries, who were both suppliers and users of spatial data. The focus of the course was on 'Developing Spatial Data Infrastructures'. It introduced the concept and hierarchical nature of SDIs as well as discussing some SDI applications, issues and challenges for future SDI initiatives. The structure over the three days was based on the book '*Developing Spatial Data Infrastructures: from concept to reality*', Taylor and Francis, UK, edited by Prof Ian Williamson, Dr Abbas Rajabifard and Mrs Mary-Ellen F. Feeney, all from the Centre for SDIs and Land Administration Taylor and Francis, UK.

The course provided an understanding of the concept and application of SDI, with a range of speakers giving different perspectives to the concept of SDIs. The practical sessions and discussions throughout the course allowed participants to share knowledge, and were a good opportunity to discover the other participants use and understanding of SDIs in their different jurisdictions and organisations.

The key issues that were highlighted concerned data availability, accessibility, and applicability as well as the importance of partnerships among of stakeholders and securing funding for the development, and of ensuring SDIs were user driver, interoperable and integratable. The course finished with a group discussion on the future directions and the key challenges for SDI development.

8. Participation and Presentation at Other Conferences

➤ 8th UNRCC-Americas Conference, June 26- July 1, 2005, New York

WG3 was represented at the 8th UNRCC-Americas Conference in June 2005 in New York through Dr Abbas Rajabifard (Research Coordinator of WG3) being invited to give a

presentation on the work of WG3 and in particular the project on the integration of built and natural environmental datasets within National SDI initiatives. It was found that there are similarities between issues and interests identified in both regions and in particular the Americas are interested to be involved in the work being undertaken by PCGIAP-WG3 on the integration of built and natural environmental datasets. This includes participation in the international workshop planned for September 2006 as part of the next UNRCC-AP Conference and PCGIAP Annual Meeting in Thailand.

➤ **GSDI-8 Conference and FIG Working Week 2005, Cairo, Egypt**

The 8th International Conference of GSDI and FIG Working week were conducted jointly from 16 to 21 April 2005 in Cairo, Egypt. Prof Ian Williamson, Chair of WG3 and Dr Abbas Rajabifard, Research Coordinator WG3 attended and represented PCGIAP at this conference. Both Dr Rajabifard and Prof Williamson attended the GSDI Board and Council meetings on behalf of PCGIAP, in which Dr Rajabifard gave a PCGIAP report. Dr Rajabifard also presented a joint paper titled "Making the SDI concept relevant to Asia-Pacific Countries – The PCGIAP Experience" outlining some of the experiences of the PCGIAP.

Around 900 people from almost 80 countries attended the event from 16-21 April including technical exhibit, sessions, councils and board meetings. A separate full report about the conference has been submitted to this 11th PCGIAP meeting.

➤ **Coastal Zone Asia and Pacific Conference 2004, Brisbane, Australia**

The WG3-Research Coordinator, Dr Abbas Rajabifard participated and presented a report about WG3 activities and introduced PCGIAP to the Coastal Zone community at the International Coastal Zone Asia and Pacific (CZAP) Conference, in September 2004 in Brisbane, Australia. This publicised the activities of WG3, in particular the activities on marine SDI and marine cadastre and identified the important organisations within our region which WG3 can collaborate with.

The conference outlined the need for a more effective response to coastal management, including the need for sharing and adopting good practical and feasible integrated coastal management programs. The conference brought together researchers, practitioners, educators, communities, industries, government and non-government groups with a strong emphasis on the development of national and regional strategies for integrated coastal management. There was also a strong emphasis on building collaborative linkages between agencies, programs and professionals, a point which we believe PCGIAP can contribute to.

9. Future Workplan

The workplan for the next 3 years is as follows:

No	Activities/Steps	Date
1	International Workshop on the Integration of Built (Cadastre) and Natural environmental (Topo) datasets within the context of National SDI initiatives	Sept 2006 12th PCGIAP Meeting
2	Work on Data Integration Project as part of the Integration of Built and Natural Environmental datasets in the context of National SDI initiatives	2006-2007
3	Preparation and conduction of international case studies on Data Integration	Oct. 2006-June 2007
4	Initiation and Work on Spatially Enabling Governmnets Project	2007-2009
5	Report on outcomes of WG3 activities (including analysis of current projects, recommendations, future plan, etc.)	PCGIAP Meeting