出國報告(出國類別：國際會議)

出席 2013 年亞太地區
空間地理資訊在國防及情報應用會議
暨參訪新加坡土地管理局
報告書

服務機關：內政部國土測繪中心
姓名職稱：劉主任正倫
　　　　　林技正文勇
派赴國家：新加坡
出國期間：102 年 9 月 15 日至 9 月 18 日
報告日期：102 年 12 月 12 日

摘 要

本中心辦理全國性測繪業務，掌理事項涵蓋測繪方案、測繪法令及測量基準之研擬；基本測量及應用測量之規劃、推動、測製；全國性地籍測量、地形測量、海洋測量之規劃、設計、推動與管理維護；國土測繪資訊之規劃、建置、管理維護及整合流通應用等。本次「Geospatial Defence & Intelligence APAC 2013」爲亞太地區空間地理資訊在國防及情報應用會議，邀請本中心主任爲 VIP GUEST，並由林技正文勇簡報。

本次會議時間爲 102 年 9 月 17 日至 9 月 18 日，會議地點在新加坡，主要係探討大量高解析度圖資取得及應用於決策分析之方式，討論重點爲即時且不同圖資來源圖資之整合，與本中心建置國土測繪空間資料庫及提供防救災應用上有高度相關性，參加人員針對上開議題簡報臺灣地區現況，並與各與會人員進行學術及實務經驗交流。另配合會議召開行程安排，於 9 月 16 日先參訪新加坡土地管理局(Singapore Land Authority, SLA)，土地管理局隸屬新加坡政府法律部，主要任務是優化土地資源，包含圖資供應、技術及法律、土地測量、空間地理、企業服務與資訊支援等部門。本次行程可藉此了解測繪相關之發展情形並互相交流，對促進國民外交、本中心未來業務推動及研究發展等均有所助益。

關鍵字：e-GPS、影像、SLA、GDI 2013

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壹、緣起及目的

有關「Geospatial Defence & Intelligence APAC 2013」爲亞太地區空間地理資訊在國防及情報應用會議，主辦單位經理 Erwin D.Bermejo 於本(102)年 7 月 16 日以電子郵件邀請本中心主任參加。主辦單位於本年 8 月 20 日以電子郵件正式邀請本中心主任爲 VIP GUEST，及由林技正文勇進行簡報，並負擔會議期間住宿及部分機票費用(如附錄一)。

「Geospatial Defence & Intelligence APAC 2013」會議於 9 月 17 日至 9 月 18 日於新加坡舉行，會議主題是討論有關空間地理資訊在國防及情報上之應用，會議邀請澳洲、紐西蘭、印度、印尼、馬來西亞、菲律賓、泰國、越南、日本、南韓、美國、英國、中東及臺灣等國家及地區與會，包含國防安全機構、國家測繪單位、測繪及製圖單位、警察、GIS 平台與軟體提供者之部門首長及專家，發表其領域之資料應用現況及未來發展。其中美、英及南韓國家地理資訊研究院(National Geographic Information Institute, NGII)爲首次參加，NGII 爲南韓測繪製圖與空間資訊專責機構，與本中心業務職掌相似。

本次會議主要內容爲探討包含多個資料來源如何轉換成單一可讀的資訊，其中涉及大量數據、多種影像來源，考慮地理資訊系統操作便利性、資料安全性及資訊即時性等因素，與如何避免於戰時及災害發生時，因系統功能或效能不佳誤導決策而造成之災難。

考量本次行程機會實屬難得，乃於 9 月 16 日安排參訪新加坡土地管理局(Singapore Land Authority, SLA)，該局的角色著重於土地的發展及監管，在有限土地內發揮無限空間的應用，提供一個有效且可靠的土地管理制度，有效率地管理土地與創造新的商業機會。本次參訪對象爲土地管理局測繪處(Land Survey Division)與地理空間處(Geospitial Division)。

本次會議主題提出有關多影像來源資訊整合、圖資收集及應用與提昇地理資訊系統易用性，和新加坡土地管理局如何使用圖資並發揮最大

價值部分，均與本中心建置國土測繪空間資料庫及成果在防救災之應用習習相關，且可以藉此機會了解其他國家測繪相關業務之發展情形與互相交流，對測繪業務發展、地理資訊應用及促進國民外交均有所助益。

貳、出國行程

一、會議時間、地點及參訪單位

(一)GDI APAC 2013 會議

1.時間：102年9月17日至102年9月18日。

2.地點：新加坡國敦河畔大酒店2樓會議室(Grand Copthorne Waterfront Hotel Singapore)

圖 1：GDI APAC 2013會議舉辦地點

(二)新加坡土地管理局(SLA)

1.時間：102年9月16日

2.地點：新加坡牛頓路稅務大廈＃17-01(55, Newton Road, #17-01, Revenue House, Singapore)

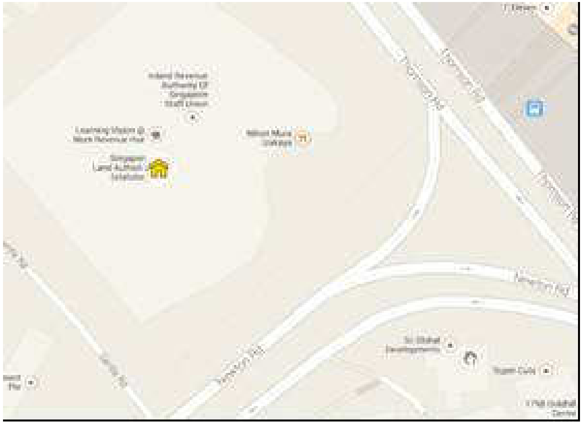

圖 2：新加坡土地管理局地點

二、本次行程

表 1：行程表

日期	預訂行程	任務	停留日數	備考
9/15（日）	桃園－新加坡	啓程、抵達新加坡	1	
9/16（一）	新加坡	拜會新加坡土地管理局 Singapore Land Authority (SLA)	1	
9/17（二）	新加坡	參加「Geospatial Defence & Intelligence APAC 2013」國際會議	1	
9/18（三）	新加坡－桃園	參加「Geospatial Defence & Intelligence APAC 2013」國際會議、返程	1	抵達臺灣

參、會議及參訪重要內容

一、會議辦理單位

本次會議主辦單位及協辦單位如下：

(一)主辦單位：International Quality & Productivity Center(IQPC)

(二)協辦單位：Esri/Singapore

二、會議內容

GDI APAC 2013 第 1 及第 2 天 Conference Day 共有 15 篇文章發表，主要探討主題爲解決資料整合所帶來的挑戰(如附錄二及附錄三):

(一)討論現有系統的可用性。

(二)探索在建立地理空間資料庫時，如何相互連繫的方式。

(三)了解其他地理資訊專家如何進行資料的基準測試。

(四)了解現有符合成本效益的資料類型。

詳細的會議議程與發表之文章如下表：

表 2：GDI APAC 2013會議議程表

Conference Day One TUESDAY,17 SEPTEMBER 2013 2013年9月17日-第1天	
10:00	Registration and Welcome Coffee & Tea 註冊和歡迎茶會
10:50	Welcome Address from the Chairperson 主席致歡迎辭
11:00	Geospatial Information Activities in Taiwan 台灣空間資訊發展現況 林文勇 技正,控制測量課 內政部國土測繪中心,中華民國臺灣
11:40	Information Superiority: GIS - Providing A Vital IT Framework To Achieve Information Advantage 資訊優勢評估：GIS - 提供重要的IT框架來實現資訊優勢 John Day Director Defense Business Development ESRI, USA
12:20	Looking Into the Future: The Road Ahead for Malaysia’s GEOINT 展望未來：馬來西亞GEOINT的未來之路 Brigadier-General Dato’ Zaharin bin Din Director, Defence Geospatial Division DEPARTMENT OF SURVEY AND MAPPING AGENCY (JUPEM), MALAYSIA
13:00	Lunch and Networking Break
13:40	Explaining Technical Strategies for Utilizing Large Amounts of Data 大量數據的技術對策研析 Dr. Lee Sang-Hoon Deputy Director NATIONAL GEOGRAPHIC INFORMATION INSTITUTE, SOUTH KOREA
14:20	Enabling Seamless Communications & Information access across public safety agencies 實現公部門安全機構之間無縫通信與資訊傳遞 Anthony Griffiths Manager Information & Communications Technology Unit, Operational Support and Capability Branch, Fire Division DEPARTMENT OF ENVIRONMENT & PRIMARY INDUSTRIES (DEPI), AUSTRALIA
15:00	Afternoon Tea and Networking Opportunity
15:40	The Use of Geospatial Intelligence in Maritime Surveillance

	地理空間情報應用於海上監視 Dr. Cung Vu Associate Director OFFICE OF NAVAL RESEARCH GLOBAL - SINGAPORE, USA
16:20	Achieving Superior Combat Effectiveness through Enhanced Situational Awareness 利用強化的姿態感知實現卓越的戰鬥力 Maria Fernandez Director AUSTRALIAN GEOSPATIAL-INTELLIGENCE ORGANISATION (AGO), AUSTRALIA
17:00	Conference Closing Remarks by Chairperson
17:10	Cocktail Reception
18:00	End of Conference Day One
	Conference Day Two WEDNESDAY,18 SEPTEMBER 2013 2013年9月18日-第2天
08:30	Registration and Welcome Coffee & Tea
09:10	Assessing the Challenges of Distributed Architectures in Highly Secure Networks 評估在高度安全需求下分散式網路架構的挑戰 Giuseppe Nobile Geospatial Section, Head NATO HEADQUARTERS SITUATION CENTRE, BELGIUM
09:50	Enabling Intelligence Analysis 實現情報分析 James P. Dolan Senior Vice President and General Manager OVERWATCH GEOSPATIAL SOLUTIONS
10:30	Morning Refreshments and Networking Break
11:00	Updating Armed Forces of the Philippine’s Geographic Information System: An Enabling Technology for a Community-Focused Internal Security Operation 更新菲律賓武裝部隊地理資訊系統：推動實現一個以社群爲重點的內部安全操作技術 Maj Constancio M Espina Information System Officer AFP Command Center ARMED FORCES OF THE PHILIPPINES
11:40	Multi-Agency Collaboration: Sharing Geospatial Information Across Agencies to Enhance National Security

	多機構合作：跨機構共享地理空間資訊以強化國家安全 Brett Dixon Business Manager, APAC Defense Team ESRI, SINGAPORE
12:20	Lunch and Networking Break 午餐及休息
13:20	Taking a Technical Look at Data Capture and Intelligence Integration 以技術觀點看數據收集和情報整合 Yong Woong Lee Principal Researcher MINISTRY OF NATIONAL DEFENSE - AGENCY FOR DEFENSE DEVELOPMENT (ADD), SOUTH KOREA
14:00	An Update on the Activities of the Thailand Ministry of Defense 泰國國防部軍事活動更新 Captain Isara Rampaigul Program Director, Military Information and Communication Technology (RTD) ROYAL THAI NAVY
14:40	3D Mapping Applications to Improve Efficiency in Managing the Urban Planning of Vietnam 三維製圖技術應用於改善越南的城市規劃管理效率 Dr. Le Dai Ngoc Head of Mapping & Remote Sensing Department DEFENSE MAPPING AGENCY OF VIETNAM, VIETNAM
15:20	Afternoon Tea and Networking Opportunity 下午茶及訊息互流
15:50	Development of Geospatial Information and Geospatial Intelligence in Indonesia 印尼空間資訊和地理空間情報發展 Brigadier-General Sutrisno Special Advisor for Geo-Intelligence and Geo-Defence GEOSPATIAL INFORMATION AGENCY, INDONESIA
16:30	The Role of Geospatial Information for Disaster Management in Indonesia 印尼地理空間資訊在災害管理中所扮演的角色 Dr. Agus Wibowo Head of Data Division | Geospatial Data Specialist NATIONAL AGENCY FOR DISASTER MANAGEMENT (BNPB), INDONESIA
17:10	Closing Comments End of Conference Day Two

三、參訪新加坡土地管理局(SLA)

新加坡土地管理局（SLA）成立 2001 年 6 月 1 日，是從土地管理局、土地註冊處、調查處和土地支援系統等單位合併，現隸屬法律部(如圖 3)，工作的主要重點是土地資源優化，為新加坡的土地登記機關。負責有關土地及建築物之銷售、租賃、收購、管理分配與開發、提供土地銷售相關訊息及維護國家土地資訊資料庫等，在新加坡土地相關使用方面扮演極重要角色。

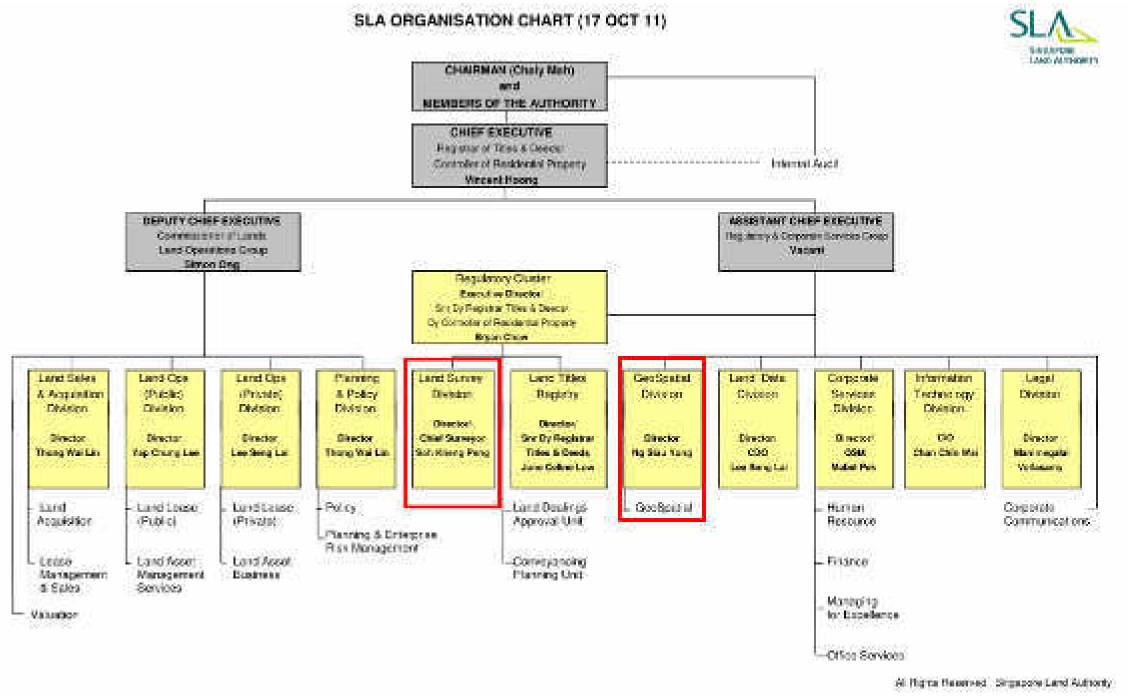
SLA ORGANISATION CHART (17 OCT 11)
SLA SINGAPORE LAND AUTHORITY
CHAIRMAN (Chaly Mah) and MEMBERS OF THE AUTHORITY
CHIEF EXECUTIVE Registrar of Titles & Deeds/ Controller of Residential Property Vincent Hoong
Internal Audit
DEPUTY CHIEF EXECUTIVE Commissioner of Lands Land Operations Group Simon Ong
ASSISTANT CHIEF EXECUTIVE Regulatory & Corporate Services Group Vacant
Regulatory Cluster Executive Director Snr Dy Registrar Titles & Deeds/ Dy Controller of Residential Property Bryan Chew
Land Sales & Acquisition Division Director Thung Wai Lin
Land Ops (Public) Division Director Yap Chung Lee
Land Ops (Private) Division Director Lee Seng Lai
Planning & Policy Division Director Thung Wai Lin
Land Survey Division Director/ Chief Surveyor Soh Kheng Peng
Land Titles Registry Director/ Snr Dy Registrar Titles & Deeds June Colleen Low
GeoSpatial Division Director Ng Siau Yong
Land Data Division Director CDO Lee Seng Lai
Corporate Services Division Director CSM Mabel Pek
Information Technology Division CIO Chan Chiu Mei
Legal Division Director Manimegalai Vellasamy
Land Acquisition
Lease Management & Sales
Valuation
Land Lease (Public)
Land Asset Management Services
Land Lease (Private)
Land Asset Business
Policy
Planning & Enterprise Risk Management
Land Dealings Approval Unit
Conveyancing Planning Unit
GeoSpatial
Human Resource
Finance
Managing for Excellence
Office Services
Corporate Communications
All Rights Reserved Singapore Land Authority

圖 3：新加坡土地管理局組織圖(來源:官網 2011 年 10 月 17 日架構)

本次參訪土地管理局係冀能進一步了解與本中心業務相關之資訊，故於會前以電子郵件連繫時，希望能與地理空間及土地測繪相關部門人員討論。9 月 16 日當日由測繪處處長蘇敬平先生主持會議，會中由測繪處及地理空間處人員進行簡報(人員名單如附錄四)，有關參訪後對新加坡相關業務概述如下：

(一) 土地測量服務

在土地測量服務部分，土地管理局負責全國土地測量系統的管理和維護，包括建立和維護的整合測量網(Integrated Survey Network, ISN)、精密水準點(Precise Leveling Benchmarks, PLBM)、地籍測量成果的檢驗與審核計畫、地圖與記錄之編號分配等工作。土地管理局使用高精度的全球定位系統（GPS）技術，建立主要及輔助等級之 ISN 測量控制點成果，提供測量人員

使用，作爲測量工作的基礎，這方式可以使土地管理局能更快速地取得土地測量資料調查數據與後續資料處理。整合測量網之平面控制網約有 70 餘個主要等級的控制點，大部分是在覆蓋全島的政府單位的屋頂，輔助等級的控制點約有 5000 餘個，位於主要道路的地面以利進行施測，這些控制點都是使用 GPS 技術測設，作爲在新地地籍坐標系統下進行各項土地測繪之基礎。另外精密水準點大約有 600 餘個，位於主要道路上，間距約 1 公里。相關資訊利用控制點子系統(Control Point Sub-System, CPS)進行管理，而查詢則可以利用整合式土地資訊服務(Integrated Land Information Service, INLIS)取得。

新加坡在 2004 年 8 月引入快速及高精度測量方法之地籍坐標系統(SVY21, EPSG:3414)，此爲更準確且一致地籍測量的新定義，藉由確認所有測量界址點坐標，再推導出合法財產的位置，以提昇服務品質。土地管理局還負責分配地段編碼及各階層編號，與維護土地的地段基本系統(Lots Base System, LBS)的清單。依據土地測量法和邊界圖調查法的規定，土地管理局測繪處的首席測量師將檢查地籍測量工作及核准測量計畫，並將土地界線（地籍）資料及計畫等相關電子檔納入管理。

另外新加坡所有的實際測繪業務均由政府機關委託民間測量師辦理，測繪處人員只負責審核，而經了解，大多數測繪處人員均曾在民間擔任過測量師執行過實際測繪業務。

(二)衛星測量相關應用

SiReNT 是新加坡的國家連續運行參考站（CORS）的基礎設施，包括 7 個全球導航系統（GPS/GNSS ）連續運行參考站，作爲高精度 GPS 定位應用。並定義新加坡的官方空間參考框架，並支持公布的地籍系統 SVY21。SiReNT 是一種多用途的定位精度高的基礎設施，同時提供 3 種類型的服務，包括後處理(PP)、即時動態(RTK)和精度要求較低的差分定位(DGPS) ，以適應不同的應用(如圖 4)。

SiReNT 部分與本中心 e-GPS 即時定位服務系統採用相同核心技術，是新加坡一般 GPS 測量作業不可或缺的工具，會中所展示不同年度的使用熱點，每年度均有明顯增加的用戶數，顯示一般測量作業與民眾活動確需此項技術協助。

另設備製造商和經銷商都可以參與 SiReNT 推廣計畫，以證明各型接收儀設備均能充分利用 SiReNT 服務。

SiReNT 是用於高精度定位和 GPS 測量目的的全國性參考站網絡基礎設施。在大地測量的角度來看，SiReNT 是作爲測量和定位活動的國家大地坐標系，它被認爲是新加坡的“零”級大地控制網，是新加坡所有測繪製圖及定位應用的參考框架。SiReNT 基礎設施也是新加坡土地管理局在 2004 年 8 月實施新的 SVY21 地籍測量系統之重要組成部分。在新制度下，測量師都需要使用在 SiReNT 數據建立之整合測量網(Integrated Survey Network, ISN)的控制點，作爲在地籍工作中的測量控制點使用，如此可確保地籍測量成果的一致性。

在新加坡，官方用於地籍測量垂直參考基準是由測繪處建立之精密水準點（PLBMs），爲了能夠將 GPS 測量所得之幾何高轉換成爲一般測量使用之正高，測繪處也建立了新加坡大地起伏模型 SGEOID09，可以將使用 GPS 測量產生之橢球高，轉換成大地水準面的高度(正高)。

(三) 電子地圖及空間資訊處理

在新加坡的數值化道路網、地鐵路網、邊界屬性、公共房屋範圍及工業建築物的核對與管理工作，係由土地管理局地理空間處管理，將這些資訊藉由整合式土地資訊服務(INLIS)、數位化土地資訊授權(Licensing of digitised land information)、製圖及 OneMap 等方式提供一般民眾使用。至於整合式土地資訊服務(INLIS)是種單一服務的入口網(one-stop)，提供有關土地相關之內容，例如道路計畫、測量計畫及屬性邊界等資訊；另外亦提供財產所有物的周邊設施、所有權擁有者、產權交易的歷史等內容。

OneMap 則是一個全國性綜合的線上地理空間資訊平台，提供政府部門及一般民眾可靠、及時與準確的空間定位訊息與服務。OneMap 爲新加坡土地管理局之電子地圖網站，是一個全國性綜合的線上地理空間資訊平台，提供街道訊息資訊並可進行土地位置及學校查詢等查詢服務，亦允許使用者於圖面搜索與導航至想去的地方，如博物館、托兒服務、公園和體育中心等(如圖 5 及圖 6)。會中簡報展示圖資收集資料的流程及分工，原則是以原資料產製單位之圖資爲主，格式採用一般流通之 GIS 或圖檔，文字檔案則依其格式再自行轉檔。該局訂有相關圖資流通交換標準，相關資料經該局檢核後匯入空間資訊資料庫，並

發布圖資並可供其他政府機關及民間引用，促進政府單位及民間公司大量使用相關成果。

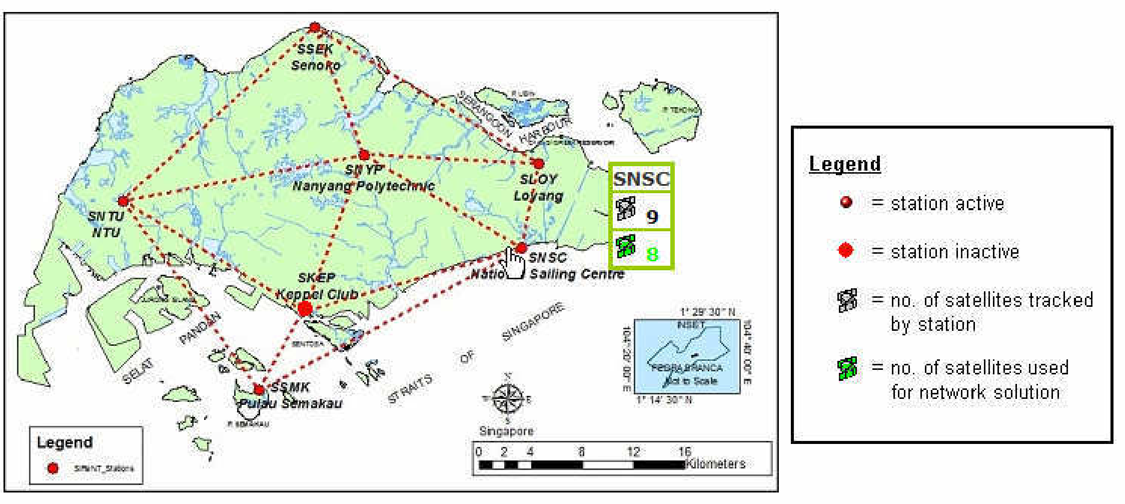
SSEK
Senoko
SNYP
Nanyang Polytechnic
SLOY
Loyang
SNTU
NTU
SNSC
Sailing Centre
SKEP
Keppel Club
SSMK
Pulau Semakau
SNSC
9
8
SELAT
PANDAN
SENTOSA
STRAITS
OF
SINGAPORE
SERANGOON HARBOUR
Singapore
1° 29' 30" N
1° 14' 30" N
104° 20' 00" E
104° 40' 00" E
NSET
PEDRA BRANCA
Not to Scale
0 2 4 8 12 16
Kilometers
Legend
SiReNT_Stations
Legend
● = station active
● = station inactive
= no. of satellites tracked by station
= no. of satellites used for network solution

圖 4：新加坡土地管理局 **SiReNT** 參考站分布圖（來源:官方網站）

Participating Government Agencies
Community Users
Public Services
Mobile Services
Pocket OneMap

圖 5：新加坡土地管理局 One-Map(來源:官方文宣)

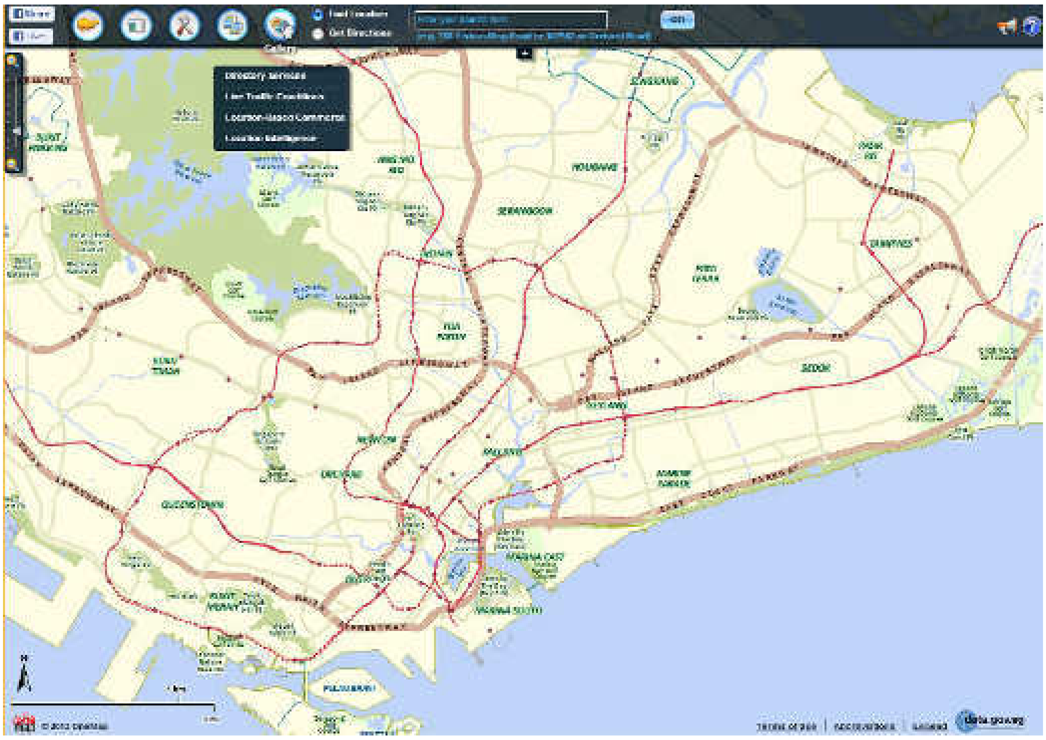
Directory Services
Live Traffic Conditions
Location-Based Commerce
Location Intelligence
Gallery
Find Location
Get Directions

圖 6：新加坡土地管理局 One-Map 系統

四、重要參展廠商

此次會議參展廠商均爲國際知名之 GIS 軟、硬體製造、影像處理及銷售廠商，介紹如下：

esri

1. ESRI(www.esri.com/defense)

地理信息系統（GIS）軟件行業的世界領導者， ESRI 提供國防和情報組織的地理空間應用程序的設計和開發。這些應用包括指揮、控制、通信、計算機和情報(C4I)、情報、監視和偵察(ISR)和決策支持。ESRI 公司的創新服務器、桌面和移動通信技術融合的地理空間數據、創建一個共同的操作畫面、可視覺化和分析複雜的數據集及在相同基準下可互動的環境。

該公司提供關鍵技術，包含美國國防部商業聯合製圖工具包(CJMTK)的程序和北約核心地理服務。 ESRI 的技術可使單一個體或和組織間合作，用以支持分析、建立模型、繪圖和發展產品，並在整個共同體中提

供分享機制。因此，ESRI 軟件爲世界各地的組織形成了一個關鍵的 IT 能力，利用地理空間技術來支持關鍵任務和時間敏感的決策。

2. AGI(http://www.agi.com/)

AGI 在進階的太空、國防和情報應用的發展及部署上，提供經過驗證的軟體，用以協助及時和具成本效益的的任務。 AGI 產品用於建模、工程和空間、網絡空間、飛機、導彈防禦系統、C4ISR 系統與電子系統等領域。使用者可以購買現成的應用，開發工具或交付關鍵性解決方案。

3. BAE(http://www.baesystems.com/gxp)

BAE 是一家全球性的國防及安全公司。BAE 開發的 GXP 爲功能強大的地理空間情報數據軟體，可用於資料管理、影像應用、建立 3 維可視化地理空間成果、影像分析及產製航空影像等。 BAE 是一個值得信賴的公司，供應影像及地理空間產品，並爲國防、情報與商業市場等提供服務。BAE 系統公司在管理，執行、開發其他行業標準及 GIS 工具等，擁有的深入且足夠的經驗，以解決地理空間資料帶來的挑戰，而這經驗的累積需要科學基礎知識、技術及方法。

4. Overwatch(http://www.overwatch.com)

Overwatch 是德事隆公司的一個執行單位，也是地理空間、多源情報分析軟件及解決方案的領導供應商，提供今日美國和國際國防和情報機構，商業服務和學術界等單位之服務。這些解決方案利用感測器數據、影像、光達、視頻和多源數據，提供了先進的分析、開發及規劃能力。該公司的綜合服務部門提供整合，客制化及協作服務，以滿足客戶廣泛且獨特的需求。20 年來 Overwatch 的解決方案所提供的工具，可簡化整合、分析和智能發展，提供決策者、反恐分析師及作戰人員呈現完整的操作畫面，減少決策所需時間。

5. Palantir(http:// www.palantir.com/)

Palantir 是矽谷的一家軟體公司，由史坦福大學計算機科學家於 2004 年成立，建立之軟體平台可對不同資料量的數據進行強大的分析，而將技術商品化的解決方案，已可提供即時的分析和合作功能。

Palantir 的軟體平台被廣泛部署於執法部門、國防、情報、健康及世界各地的金融機構。公司總部設在帕洛阿爾托，在加利福尼亞州、洛杉磯、紐約、華盛頓、渥太華、倫敦、柏林、羅馬、迪拜、新加坡及坎培拉均設有辦事處。

6. Skymap Global(http://www.skymapglobal.com)

公司爲亞洲地區國家安全、國防及執法單位，開發地理空間應用的程式。現正積極部署國家安全，國防和執法機構的指揮及控制、反恐、反情報、情報分析、海上艦船監測及網路風險、近海岸製圖、地形圖測繪、監控組織犯罪、監控欺詐案件、公安、主要事件管理及反洗錢。公司還提供產品，包含全國各地的航空及衛星影像處理、特徵粹取（含 3D）、分析及製圖。

7. MDA(http://www.mdacorporation.com/corporate/index.cfm)

公司於 1969 年由兩位企業家 John MacDonald and Werner Dettwiler 成立，對於客戶提出的複雜需求，提供創新的解決方案。在過去 40 年中，MDA 創建一個高度熟練的組織能力，提供通訊和訊息解決方案，提高全球企業和政府機構的營運表現。

Eternix Ltd.

8. Eternix Ltd(http://www.eternix.co.il/)

公司是一家在開發高性能的可視化產品中技術領先的軟體公司，產品對於進階的地理空間用戶，可實現即時及無需預處理資料，資料幾乎沒有容量及格式的限制。產品家族包括多個應用程序並可擴展與互補。

肆、參與國際會議及參訪心得

一、空間地理資訊已成爲決策分析基礎

近年來空間地理資訊(Geospatial Information, GI)在各國均積極發展，逐步建立完成國家級的空間資料基礎建設(National Spatial Data Infrastructure, NSDI)，在整合各種測繪技術(如 GPS、RS、Photogrammetry)資源上已有一定的成果。隨著引入無人飛行載具(UAV)、機載式攝影機(Airborne camera)、空載光達(Lidar)及各種環境感測器等技術，除可快速更新圖資外，亦可將相關資訊運用於地理資訊系統(GIS)，使國防情報在圖資應用上已由規劃分析，逐步推展到即時性的應用，作爲國防情報及災防的決策基礎。

本次會議由南韓國家地理資訊研究院(NATIONAL GEOGRAPHIC INFORMATION INSTITUTE, NGII)、印尼地理空間資訊局(GEOSPATIAL INFORMATION AGENCY, INDONESIA)等簡報內容顯示，其基礎資訊多已建置完成，現正朝向應用方向邁進。而馬來西亞測繪局(DEPARTMENT OF SURVEY AND MAPPING AGENCY, JUPEM)及澳大利亞地理空間情報組織（AGO）則於簡報中表示 GIS 已可應用於前線之軍事分析及技術指導。

二、運用不同圖資來源，善用工具縮短決策分析時間

GIS 系統對於各國政府單位而言，已不再僅止於資料套疊分析的工作而已，應用於軍事作爲、海上監控及災害搶救等與時間有關係之作業時，資料品質、資料量及更新的頻率都將影響分析方式與決策結果。

以影像資料來源而言，泰國皇家海軍(ROYAL THAI NAVY)及南韓均有衛星運行於太空，自有接收訊號及分析能力，如通訊衛星泰星五號(ThaiCom5)及遙測衛星 THEOS、韓國阿里郎系列的衛星等，可於平時商轉營運及戰時進行策略拍攝，對於製圖所需影像極有幫助。不過對於不同解析力影像、災害發生分析急迫性及建立全區同時期影像基礎等，各國仍有取得不同來源衛星影像之需求。

故結合不同衛星、航拍影像、UAV、LiDAR 及各類感測器以建置同一時期之全面性圖資，已是各國目前努力達成之目標，像是南韓國家地理資訊研究院及印尼國家災害管理局(NATIONAL AGENCY FOR DISASTER MANAGEMENT, BNPB)均是如此，而菲律賓武裝部隊(Armed Forces of the Philippines)更納入社群圖資於快速分析及處理後納入決策分析時應用。

有關 3 維應用部分，泰國皇家海軍於訓練時加入 3D 化擬真模擬，以情境方式訓練減少實際操演之需求，而越南國防測繪局(Defense Mapping Agency of Vietnam)則是針對都會區建立 3 維物件，可協助管理者及計畫者可更精確的進行決策。

至於資料管理方式，政府單位多採用集中收納方式，如泰國國防部、馬來西亞測繪局、南韓國家地理資訊研究院等，另如印尼國家災害管理局、北約組織(North Atlantic Treaty Organization, NATO)則採用分散式架構。以上所述之資料處理，包含影像判識、變遷分析及向量成果套疊，並考量傳遞時的安全性。未來本中心圖資若透過網路傳輸，應納入加解密與使用者身份認證機制，以免資料被截用。

三、組織職責分工明確，有效整合各類圖資及相關應用

本次參與會議之各國代表，多爲負責管理該國測繪與空間資訊圖資之政府機關，其中南韓國家地理資訊研究院、印尼地理空間資訊局(GEOSPATIAL INFORMATION AGENCY, INDONESIA)及馬來西亞測繪局均負有統整 NSDI 的業務，並在資料流通中均有訂定標準，可收納成果並加以應用，簡化資料分享方式。

因各自產生圖資造成資料無法交流，各國都已認知只能存在單一的國家基本圖資。而新加坡土地管理局亦將不同部門建立之圖資予以整合，建立單一窗口提供圖資或服務，並於本年 11 月 1 日進行機關組織調整，使資料處理分析相關單位之互動更爲緊密。

我國這幾年各機關在 NGIS 的發展，都是於其組織職掌下努力建置完整的圖資，對於共同需參考的圖資，近年來經建會已積極整合，簡化資料取得之行政流程，並減少圖資重覆建置情形，利如地籍圖、正射影像、使用分區及電子地圖等，可有效運用圖資，於災防及規劃重大公共建設時，有重要的輔助資源可供參考。

而今適逢我國政府組織再造，惟卻未能像日本、南韓、印尼、馬來西亞及新加坡等，整合各個有關測繪及空間資訊蒐集或建立的相關機關，成爲一個事權統一、資源整合且隸屬部會之單一測繪及空間資訊專責機關，實爲政府組織再造最大憾事。

四、積極參與各項會議，了解國際技術發展情形

國際交流是能快速初步了解其他國家業務推展的方法之一，不同國家因各自需求，會面對挑戰並提出因應之道，若能藉由互動激起新想法，甚或有新作爲，實可促進本身業務之進步。本次會議中本中心對我國 NGIS 之圖資建置、資料應用、NSDI 分工與協同運作方式等內容進行 40 分鐘簡報(如附錄五)，詳述本中心負責建置與維運的基本地形圖、通用版電子地圖、國土利用調查、網路地圖服務、地理空間倉儲及 e-GPS 服務等內容，並藉由莫拉克風災處理之經驗，分享本中心在災防所扮演的角色及其成果，使與會者了解我國在地理空間資訊方面努力的成果。

南韓國家地理資訊研究院、印尼地理空間資訊局及馬來西亞測繪局其組織架構及工作內容與本中心相似，藉由簡報內容及會議期間之溝通，可以了解彼此在技術及行政方面遭遇之問題，及所採取之因應策略，對於我們未來圖資使用上頗有助益。

伍、建議

一、研究發展手持設備應用，普及空間資訊應用領域

由大型主機、桌上型個人電腦及筆記型電腦，甚至現今幾乎人手一機的手持式設備等，不僅東西越製作越輕巧，資料處理能力也越來越強大，資訊隨著網路隨手可得的時代已經來臨，如何利用 GIS 圖資發展與在地空間有關的應用，已是目前最熱門的話題，像是目前交通路線規劃、公車到站訊息及鄰近飲食位置等，均顯示空間、資料與時間之間密不可分的關係。

新加坡 SiReNT 除了於網站提供連續運行參考站分布位置及觀測情形外，亦提供使用者以簡訊方式，了解連續運行參考站運作情形，測量人員於測量作業前即可取得相關資訊了解施測品質。而我們更應善用現有的網路基礎，提供使用者更多且即時的在地資料，像是整合通用版電子地圖、國土利用成果、地籍資料、e-GPS 基準站、GPS 連續站資訊、已知控制點及既有社群資源等圖資，提供點位資訊、到達方式(可否到達及替代路線)、變遷查報及點位放樣規劃等，充份利用手持式設備之優勢，主動在使用者前提供圖形化結果，而不再僅只於選單及文字性敘述。

另外在生活應用上，還應該更進一步針對使用者習慣、所在區域特性、查詢時間及設備種類等，提供客製化的成果，有效減少資料查找及顯示複雜的困擾。

二、推展空間資訊 3 維應用，擴大空間資訊應用效益

本次會議有關 3 維化的應用包含都會區建置及災害分析等，完整的 3 維資料可進行更多的決策分析，亦可將使用者以虛擬方式帶至現場，像是親臨其境一般，伴隨著 DEM、LiDAR、近景攝影、UAV 等技術普及與資料精度逐步提昇，重建現場原貌的結果也將越來越貼近現實，目前國內現正致力於收集及建置圖資，再利用網路技術將圖資展示於 GIS 圖台。

3 維成果於都會區之應用，現於建築相關法規中已應用於高樓建築天際線(如

太陽光遮蔽)等問題，以提昇一般大眾之居住品質。而對於衛星控制測量作業時，常因透空或點位間通視等問題，影響觀測品質或選點作業之困擾，應可善用相關圖資進行分析，納入內業作業規劃時參考。

而資料之呈現方式，隨著抬頭式設備的發展(如 Google 眼鏡或汽車配備)，本次已看到有將 3 維化之成果應用於第 1 線軍事作戰人員，因可於抬頭式設備內標註實際空間位置、屬性、方向或其測量成果，使現有圖資不再需要置於圖台，可有效減少傳遞之資料量，滿足快速反應之需求。

三、持續進行空間圖資整合，健全空間資訊流通管道

本次出國參訪過程中，了解其他國家空間資訊收集及應用的發展方向，其中集中收納資料的單位，本身均有負責產製部分圖資的作業，再輔以彙整轄下所屬圖資並於加值後提供各界使用。本中心負責建置及維護通用版電子地圖、基本地形圖、國土利用調查(監測)、加值地籍圖成果及平面及高程控制點等，並已建立完善之整合流通倉儲服務系統整合圖資並提供圖資，近來更強化與民眾互動改進圖資內容，使成果與現地情形相符，避免資料誤用而造成困擾，若無相關技術及處理能力，恐造成民眾不便或影響對政府施政品質之觀感。

另不論成果儲存屬集中式或分散式管理，資訊操作者所需的都是真實的資料，如正射影像或國土利用調查成果等，是可作爲資料分析使用而非僅止於底圖或圖磚(WMS 或 WMTS)。惟若要快速提供向量資料(如 WFS 等)，要配合的軟硬體與網路環境勢必需要進行調整。在這全面迎向"BIG DATA"及雲端操作的時代，如何善用工具發揮效用，就更需多與國際交流、收集國外相關作法、了解廠商最新技術及相關研究成果了。

國內近年來整合各項圖資，於基礎圖資採用本中心之通用版電子地圖已爲常態，惟因成果之更新頻率頗高，如何確保資料品質及快速反應現況，實爲現有圖資供應上重大的挑戰。若資料流通供應係將實體圖資交付其他單位供應，恐有不了解資料特性，造成資料誤用情形等題，實宜由產製單位負責提供完整圖資，再以網路方式取用即可，亦可避免圖資版次不一之困擾。

四、整合 GPS 連續追蹤站，維護國家大地基準框架

由本次會議可知，各國均於國家空間資料基礎建設(NSDI)已有之基礎建置相關圖資，實需仰賴穩定的坐標系統框架，新加坡於2004年起利用統一之坐標系統，應用 GPS 技術快速測設各類點位資料。因我國地處地殼板塊運動活躍地區，點位相對關係隨時間改變而有變化，需依靠如 GPS 連續觀測之長期資料來維護。本中心建置完成之 e-GPS 即時動態定位系統已納入內政部及本中心點位，配合近年來積極與各機關合作，現已和經濟部水利署、經濟部中央地質調查所及中央研究院地球科學研究所等單位建立合作關係，可長期解算成果並計算速度場等成果。另亦洽取交通部中央氣象局已納爲一等衛星控制點之觀測資料，對維護我國大地基框架之穩定性極有幫助。未來應充分運用 GPS 長期觀測資料，嘗試建立具時序性的現代化國家坐標系統，有效維護穩定的國家坐標系統框架。

陸、會議及參訪相關照片

4th Annual
GDI APAC 2013:
Geospatial Defence &
Intelligence APAC 2013
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OVERWATCH
BAE SYSTEMS
MDA
agi
Media Partners
Researched and Developed by

圖 7：Conference Day會場入口

Australian
Geospatial-Intelligence
Organisation

圖 8：Conference Day會場1

圖 9：Conference Day 會場 2

esri
Multi-Int Fusion

圖 10：會議展覽現場 Esri 公司展示情形

OVERWATCH
DELIVERING UNDERSTANDING
• REMOTEVIEW GEOINT LEADERSHIP
• 3D GEOINTELLIGENCE
• CLOUD BASED SOLUTIONS
• MULTI-INT DATA FUSION
• IMINT AND GIS INTEGRATION
• AUTOMATED FEATURE EXTRACTION
• GEOSPATIAL DATA MANAGEMENT & INTEGRATION

圖 11：會議展覽現場 Overwatch 公司展示情形 1

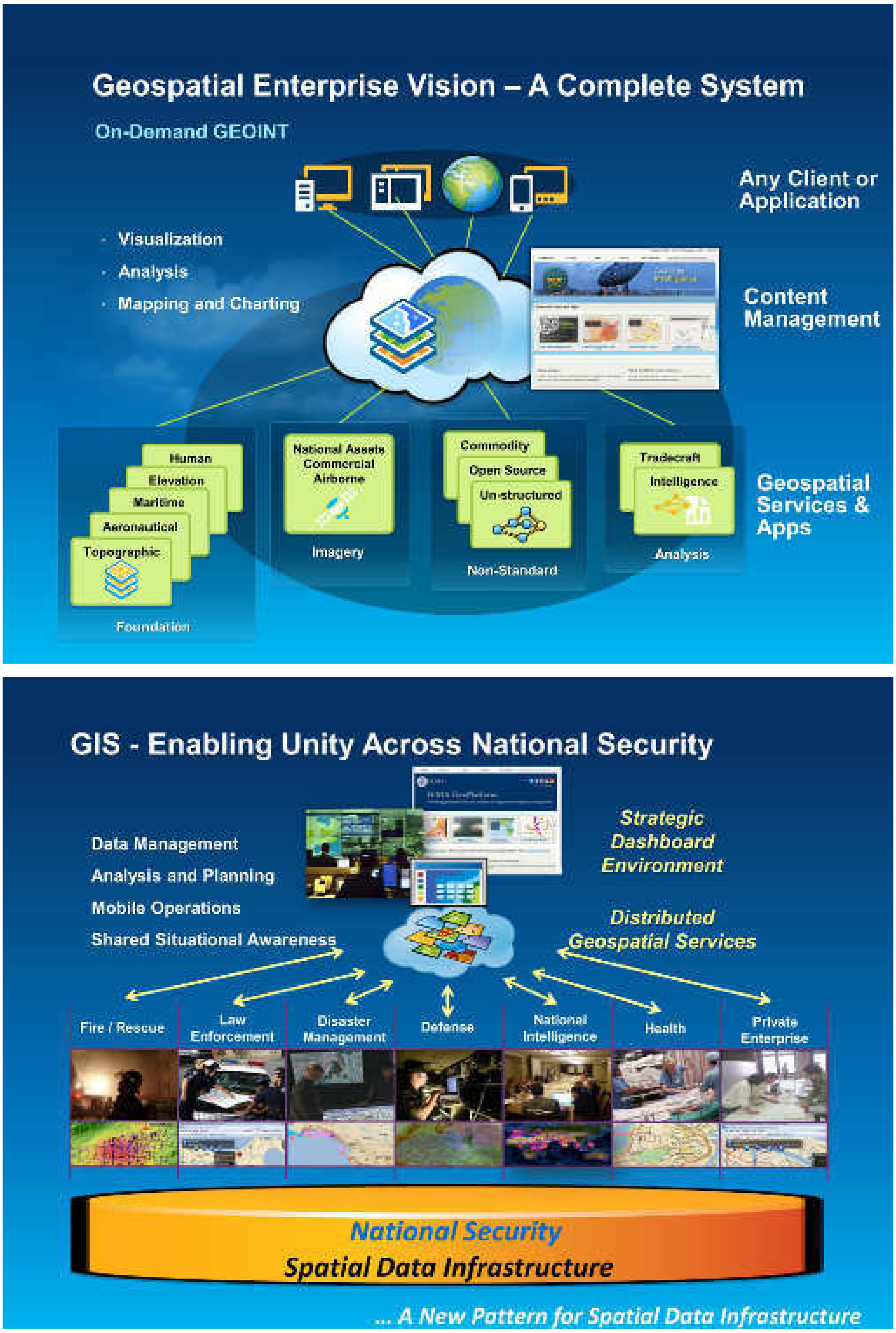
圖 12：會議展覽現場 Overwatch 公司展示情形 2

Upcoming Events
Search and Rescue 2013
Defence

圖 13：GDI APAC 2013 主席致歡迎辭

National Geographic Information System (NGIS) in Taiwan
Incorporate
Every topic maps can overlap with graphics for spatial data access, process and analyze.

圖 14：本中心林技正文勇會場簡報情形



Geospatial Enterprise Vision – A Complete System

On-Demand GEOINT

- Visualization
- Analysis
- Mapping and Charting

Any Client or Application
Content Management
Geospatial Services & Apps
Human
Elevation
Maritime
Aeronautical
Topographic
Foundation
National Assets
Commercial
Airborne
Imagery
Commodity
Open Source
Un-structured
Non-Standard
Tradecraft
Intelligence
Analysis

GIS - Enabling Unity Across National Security

- Data Management
- Analysis and Planning
- Mobile Operations
- Shared Situational Awareness

Strategic Dashboard Environment
Distributed Geospatial Services
Fire / Rescue
Law Enforcement
Disaster Management
Defense
National Intelligence
Health
Private Enterprise
National Security
Spatial Data Infrastructure

... A New Pattern for Spatial Data Infrastructure

圖 15：Esri 商業國防發展部門主管 John Day 簡報(截錄)

圖 16：馬來西亞測繪機構國防地理資訊部門首長簡報情形

GRAND COPTHORNE

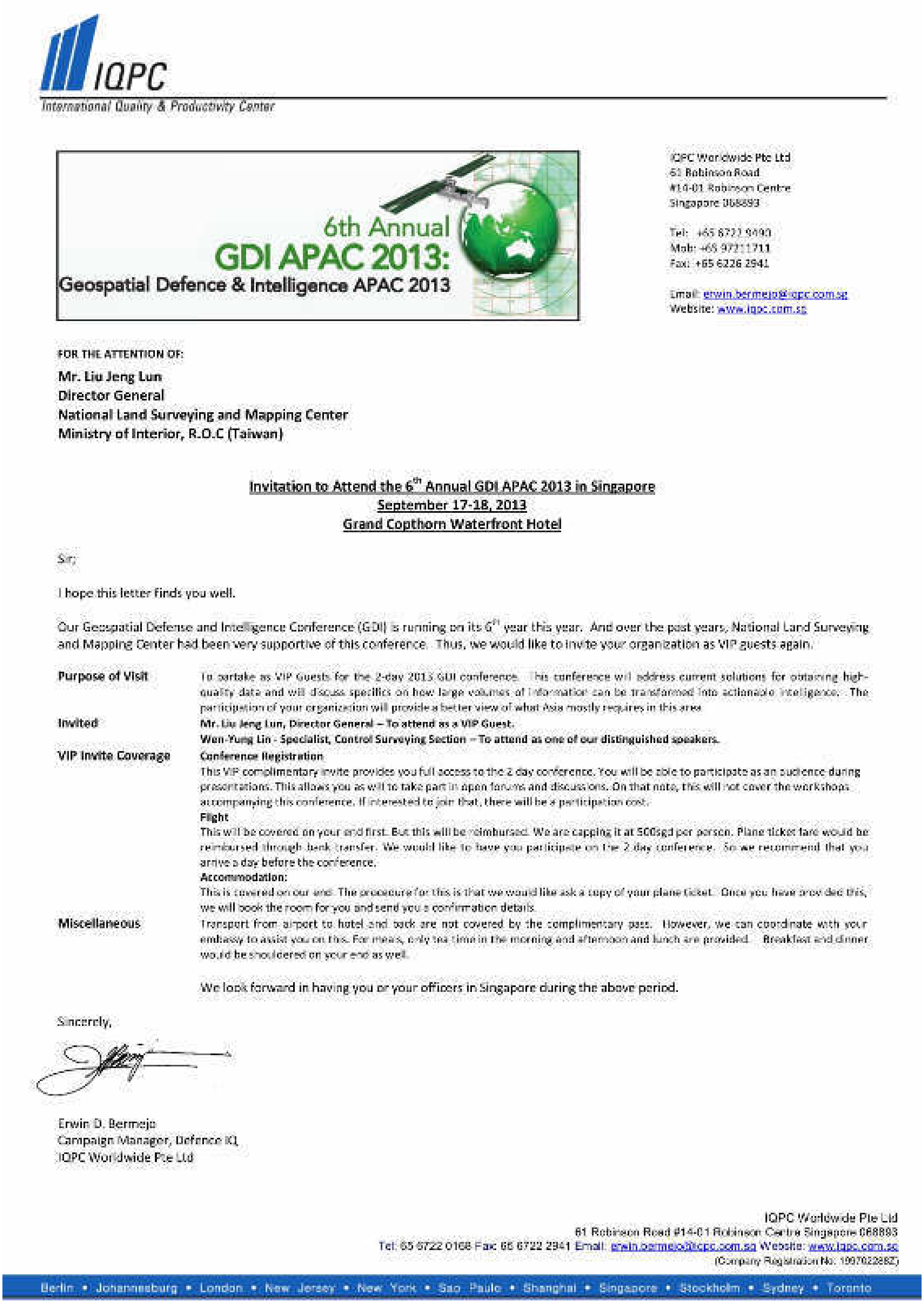
圖 17：南韓 NGII 部門首長簡報情形

SLA
SINGAPORE
LAND AUTHORITY

圖 18：新加坡土地管理局參訪會後合影

柒、附錄

附錄一：主辦單位邀請函



IQPC
International Quality & Productivity Center

6th Annual
GDI APAC 2013:
Geospatial Defence & Intelligence APAC 2013

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Website: www.iqpc.com.sg

FOR THE ATTENTION OF:

Mr. Liu Jeng Lun
Director General
National Land Surveying and Mapping Center
Ministry of Interior, R.O.C (Taiwan)

Invitation to Attend the 6th Annual GDI APAC 2013 in Singapore
September 17-18, 2013
Grand Copthorn Waterfront Hotel

Sir;

I hope this letter finds you well.

Our Geospatial Defense and Intelligence Conference (GDI) is running on its 6th year this year. And over the past years, National Land Surveying and Mapping Center had been very supportive of this conference. Thus, we would like to invite your organization as VIP guests again.

Purpose of Visit	To partake as VIP Guests for the 2-day 2013 GDI conference. This conference will address current solutions for obtaining high-quality data and will discuss specifics on how large volumes of information can be transformed into actionable intelligence. The participation of your organization will provide a better view of what Asia mostly requires in this area.
Invited	**Mr. Liu Jeng Lun, Director General – To attend as a VIP Guest.** **Wen-Yung Lin - Specialist, Control Surveying Section – To attend as one of our distinguished speakers.**
VIP Invite Coverage	**Conference Registration** This VIP complimentary invite provides you full access to the 2 day conference. You will be able to participate as an audience during presentations. This allows you as will to take part in open forums and discussions. On that note, this will not cover the workshops accompanying this conference. If interested to join that, there will be a participation cost. **Flight** This will be covered on your end first. But this will be reimbursed. We are capping it at 500sgd per person. Plane ticket fare would be reimbursed through bank transfer. We would like to have you participate on the 2 day conference. So we recommend that you arrive a day before the conference. **Accommodation:** This is covered on our end. The procedure for this is that we would like ask a copy of your plane ticket. Once you have provided this, we will book the room for you and send you a confirmation details.
Miscellaneous	Transport from airport to hotel and back are not covered by the complimentary pass. However, we can coordinate with your embassy to assist you on this. For meals, only tea time in the morning and afternoon and lunch are provided. Breakfast and dinner would be shouldered on your end as well.

We look forward in having you or your officers in Singapore during the above period.

Sincerely,

Erwin D. Bermejo
Campaign Manager, Defence IQ
IQPC Worldwide Pte Ltd

IQPC Worldwide Pte Ltd
61 Robinson Road #14-01 Robinson Centre Singapore 068893
Tel: 65 6722 0168 Fax: 65 6722 2941 Email: erwin.bermejo@iqpc.com.sg Website: www.iqpc.com.sg
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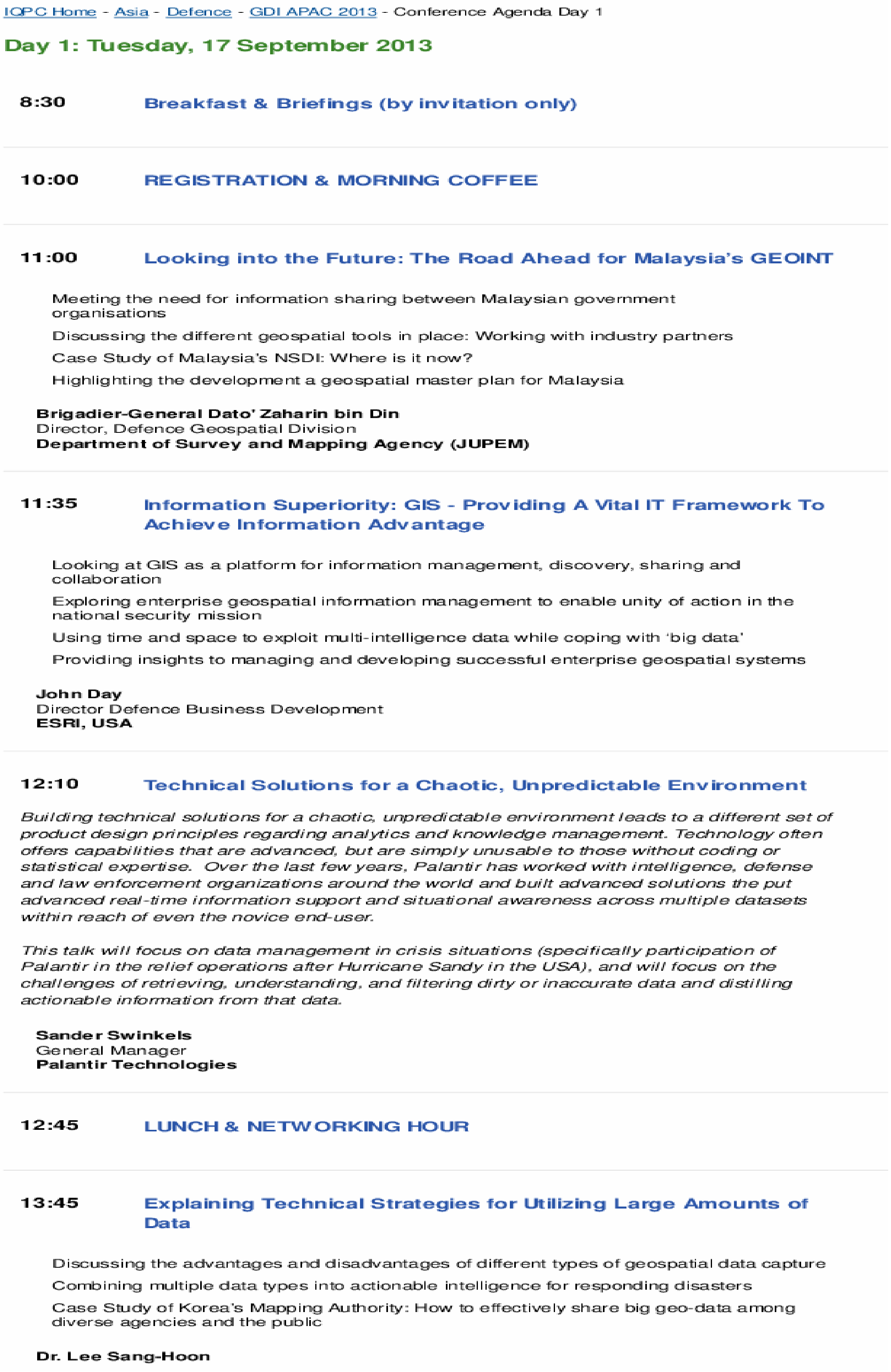
附錄二：GDI APAC 2013 會議議程



IQPC Home - Asia - Defence - GDI APAC 2013 - Conference Agenda Day 1

Day 1: Tuesday, 17 September 2013

8:30 Breakfast & Briefings (by invitation only)

10:00 REGISTRATION & MORNING COFFEE

11:00 Looking into the Future: The Road Ahead for Malaysia's GEOINT

- Meeting the need for information sharing between Malaysian government organisations
- Discussing the different geospatial tools in place: Working with industry partners
- Case Study of Malaysia's NSDI: Where is it now?
- Highlighting the development a geospatial master plan for Malaysia

Brigadier-General Dato' Zaharin bin Din
Director, Defence Geospatial Division
Department of Survey and Mapping Agency (JUPEM)

11:35 Information Superiority: GIS - Providing A Vital IT Framework To Achieve Information Advantage

- Looking at GIS as a platform for information management, discovery, sharing and collaboration
- Exploring enterprise geospatial information management to enable unity of action in the national security mission
- Using time and space to exploit multi-intelligence data while coping with 'big data'
- Providing insights to managing and developing successful enterprise geospatial systems

John Day
Director Defence Business Development
ESRI, USA

12:10 Technical Solutions for a Chaotic, Unpredictable Environment

Building technical solutions for a chaotic, unpredictable environment leads to a different set of product design principles regarding analytics and knowledge management. Technology often offers capabilities that are advanced, but are simply unusable to those without coding or statistical expertise. Over the last few years, Palantir has worked with intelligence, defense and law enforcement organizations around the world and built advanced solutions the put advanced real-time information support and situational awareness across multiple datasets within reach of even the novice end-user.

This talk will focus on data management in crisis situations (specifically participation of Palantir in the relief operations after Hurricane Sandy in the USA), and will focus on the challenges of retrieving, understanding, and filtering dirty or inaccurate data and distilling actionable information from that data.

Sander Swinkels
General Manager
Palantir Technologies

12:45 LUNCH & NETWORKING HOUR

13:45 Explaining Technical Strategies for Utilizing Large Amounts of Data

- Discussing the advantages and disadvantages of different types of geospatial data capture
- Combining multiple data types into actionable intelligence for responding disasters
- Case Study of Korea's Mapping Authority: How to effectively share big geo-data among diverse agencies and the public

Dr. Lee Sang-Hoon

Deputy Director
NATIONAL GEOGRAPHIC INFORMATION INSTITUTE, SOUTH KOREA

14:20 **Enhancing ISR and GEOINT Capabilities and Capacity for Coalition Operations**

Ensuring adequate collection, processing, exploitation and dissemination (PED) for Intelligence, Surveillance and Reconnaissance (ISR) capabilities fielded in joint missions

Refining the CONOPS and developing innovative tactics, techniques and procedures (TTPs) to ensure rapid delivery of intelligence to operational forces

Overcoming data sharing issues

14:55 **Enabling Seamless Communications & Information Access across Publis Safety Agencies**

Explaining how geospatial tools are being used to fight out-of-control wildfires in Australia

Sharing data across departments and field offices: Why is this important and how is it being accomplished?

Discussing different software and how each enhances management's ability to build a disaster relief strategy

Anthony Griffiths
Manager Information & Communications Technology Unit, Operational Support and Capability Branch, Fire Division
DEPARTMENT OF ENVIRONMENT & PRIMARY INDUSTRIES (DEPI), AUSTRALIA

15:30 **Afternoon Tea & Networking Opportunity**

16:00 **The Use of Geospatial Intelligence in Maritime Surveillance**

Overcoming technical challenges in maritime data collection

Utilising business processing tools for data mining and utilisation

Discussing specific case studies in which GIS assisted with maritime operations

Dr. Cung Vu
Associate Director
OFFICE OF NAVAL RESEARCH GLOBAL- SINGAPORE, USA

16:35 **Achieving Superior Combat Effectiveness through Enhanced Situational Awareness**

5

Benefiting from timely and relevant distribution of information across Defence information networks

Deploying of web-based geospatial dissemination services to improve Australian Defence Force (ADF) combat effectiveness

Describing how GIS can enable navigation systems, command support systems, surveillance systems, weapons platforms and mission planning systems

Maria Fernandez
Director
AUSTRALIAN GEOSPATIAL-INTELLIGENCE ORGANISATION (AGO), AUSTRALIA

17:10 **The Role of Geospatial Information for Disaster Management in Indonesia**

Rapid Mapping Strategies: Which technologies are being employed for the most up-to-date and accurate picture of a disaster area

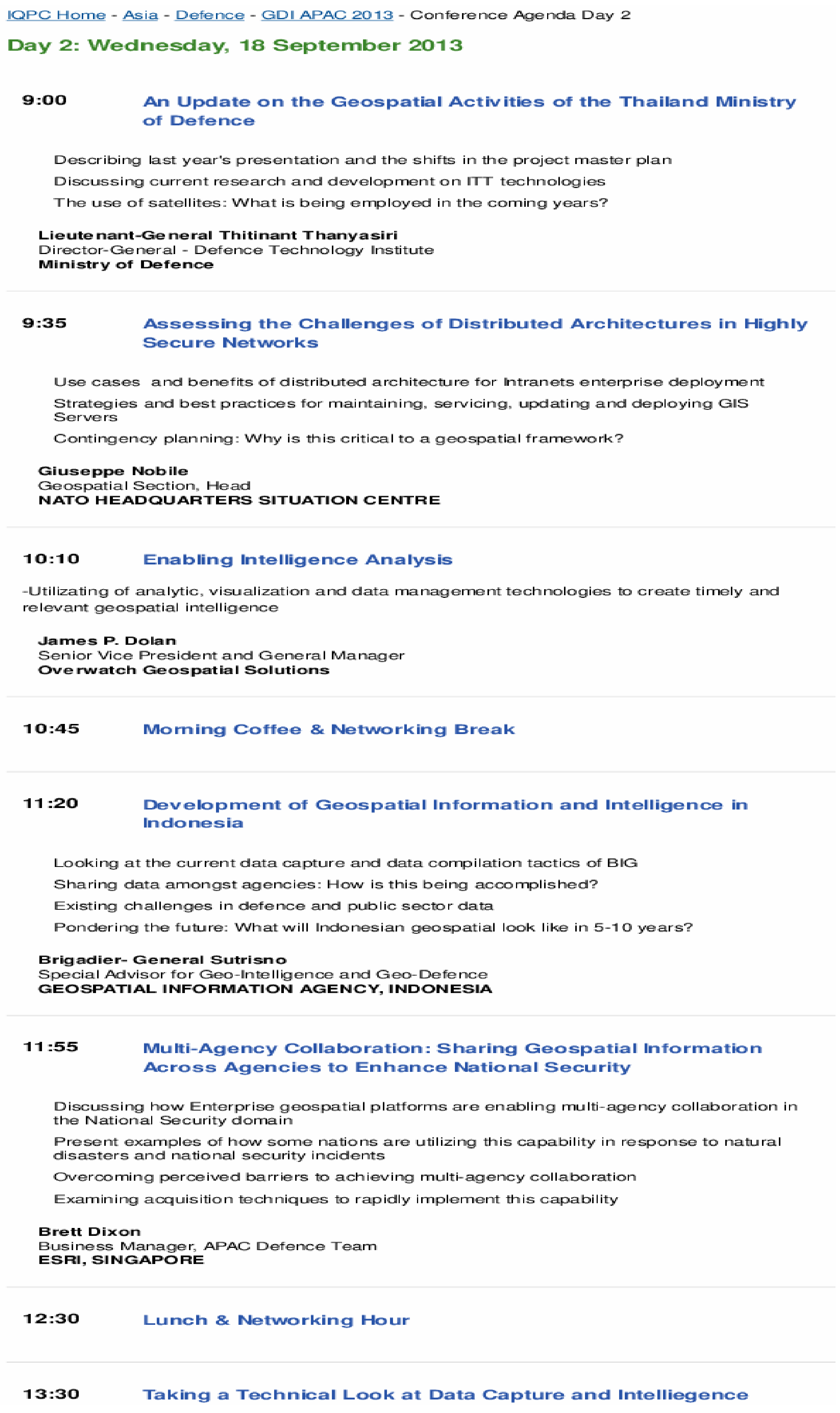
Combining hazard maps and daily disaster maps to form a risk map

Strategies for coordinating different data sources into one usable format

Sharing data amongst agencies: Is Indonesia leading the way in doing this?

Dr. Sutopo Purwo Nugroho
Head of Data, Information and Public Relations
NATIONAL AGENCY FOR DISASTER MANAGEMENT (BNPB), INDONESIA

17:45 **Closing Comments & End of Conference Day One**



IQPC Home - Asia - Defence - GDI APAC 2013 - Conference Agenda Day 2

Day 2: Wednesday, 18 September 2013

9:00 **An Update on the Geospatial Activities of the Thailand Ministry of Defence**

Describing last year's presentation and the shifts in the project master plan

Discussing current research and development on ITT technologies

The use of satellites: What is being employed in the coming years?

Lieutenant-General Thitinant Thanyasiri
Director-General - Defence Technology Institute
Ministry of Defence

9:35 **Assessing the Challenges of Distributed Architectures in Highly Secure Networks**

Use cases and benefits of distributed architecture for Intranets enterprise deployment

Strategies and best practices for maintaining, servicing, updating and deploying GIS Servers

Contingency planning: Why is this critical to a geospatial framework?

Giuseppe Nobile
Geospatial Section, Head
NATO HEADQUARTERS SITUATION CENTRE

10:10 **Enabling Intelligence Analysis**

-Utilizating of analytic, visualization and data management technologies to create timely and relevant geospatial intelligence

James P. Dolan
Senior Vice President and General Manager
Overwatch Geospatial Solutions

10:45 **Morning Coffee & Networking Break**

11:20 **Development of Geospatial Information and Intelligence in Indonesia**

Looking at the current data capture and data compilation tactics of BIG

Sharing data amongst agencies: How is this being accomplished?

Existing challenges in defence and public sector data

Pondering the future: What will Indonesian geospatial look like in 5-10 years?

Brigadier- General Sutrisno
Special Advisor for Geo-Intelligence and Geo-Defence
GEOSPATIAL INFORMATION AGENCY, INDONESIA

11:55 **Multi-Agency Collaboration: Sharing Geospatial Information Across Agencies to Enhance National Security**

Discussing how Enterprise geospatial platforms are enabling multi-agency collaboration in the National Security domain

Present examples of how some nations are utilizing this capability in response to natural disasters and national security incidents

Overcoming perceived barriers to achieving multi-agency collaboration

Examining acquisition techniques to rapidly implement this capability

Brett Dixon
Business Manager, APAC Defence Team
ESRI, SINGAPORE

12:30 **Lunch & Networking Hour**

13:30 **Taking a Technical Look at Data Capture and Intelliegence**

Integration

Discussing the advantages and Disadvantages of different types of data capture

Combining multiple data types into actionable intelligence

Sharing data amongst agencies: What strategies can be employed to provide a user-friendly experience?

Yong Woong Lee
Principal Researcher
MINISTRY OF NATIONAL DEFENSE - AGENCY FOR DEFENCE DEVELOPMENT (ADD), SOUTH KOREA

14:05 Geospatial Data Creation and Sharing- A Gateway to National Development of Bangladesh

- Creation of geospatial data at SOB and its potential uses.
- Governments' initiative in promoting use of Geospatial data among stakeholders and its challenges.
- Present trends of Geospatial communities and software dependence in Bangladesh.
- Challenges in Geospatial data sharing and its probable solution.
- Impact of GIS database of SOB in national development works.

Colonel Mohmudun Nabi PSC
Director
Survey of Bangladesh (SOB)

Major Md Zamil Hossain Munshi
Deputy Director & In-Charge, GIS unit
Survey of Bangladesh (SOB)

14:40 3D Mapping Applications to Improve Efficiency in Managing the Urban Planning of Vietnam

Looking at the current geospatial infrastructure in Vietnam Discussing the need to have a joint mapping toolkit

Applying specific geospatial tools to local requirements: What are the challenges and benefits?

Future civilian and military roadmap for geospatial technology development in Vietnam

Dr. Le Dai Ngoc
Head of Mapping & Remote Sensing Department
DEFENCE MAPPING AGENCY OF VIETNAM, VIETNAM

15:15 Afternoon Tea & Networking Opportunity

15:45 Concerning Progressive Geospatial Information Activities in Taiwan

Discussing the current activities of Geospatial Information in Taiwan

Working with multiple agencies: What are the best practice techniques?

Combining multiple data types to form a common operating map

What is the future for Taiwan's Geospatial Information?

Wen-Yung Lin
Specialist, Control Survey Section
NATIONAL LAND SURVEYING AND MAPPING CENTRE, TAIWAN ROC

16:15 Updating Armed Forces of the Philippine's Geographic Information System: An Enabling Technology for a Community-Focused Internal Security Operation

Discussing current capabilities for data collection

How is this being employed for the benefit of the community as well as the military?

Contemplating improvement measures: What can we expect in the coming years?

Maj Constancio M Espina
Information System Officer AFP Command Center
Armed Forces of the Philippines

16:50 Closing Comments & End of Conference Day Two

附錄三：GDI APAC 2013 簡報人員簡歷

Speaker Information

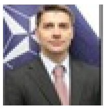
Maria Fernandez Director **AUSTRALIAN GEOSPATIAL-INTELLIGENCE ORGANISATION (AGO), AUSTRALIA**

Brigadier- General Sutrisno Special Advisor for Geo-Intelligence and Geo-Defence **GEOSPATIAL INFORMATION AGENCY, INDONESIA**

Lieutenant-General Thitinant Thanyasiri Director-General - Defence Technology Institute Ministry of Defence

Brigadier-General Dato' Zaharin bin Din Director, Defence Geospatial Division Department of Survey and Mapping Agency (JUPEM)

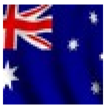
Dr. Le Dai Ngoc Head of Mapping & Remote Sensing Department DEFENCE MAPPING AGENCY OF VIETNAM, VIETNAM



Giuseppe Nobile Geospatial Section, Head NATO HEADQUARTERS SITUATION CENTRE

Giuseppe Nobile has been working at NATO Headquarters in Brussels (Belgium) for more than 10 years as Senior Geographic Officer and Head of the Geospatial Section.He holds an Associate Degree in Computer Studies and a Bachelor of Science in Information Systems Management at University of Maryland (USA). He is also currently finalizing (October 2013) a Master on Geopolitics EconomicGlobalization and International Institutions from the University of Teramo in Italy.

In his work as Head of the Geospatial Section at NATO Headquarters in Brussels(Belgium), he faces everyday challenges associated with servicing a community of more than 5000 potential users with the constraints of an highly secure Intranet as the one used by NATO.



Anthony Griffiths Manager Information & Communications Technology Unit, Operational Support and Capability Branch, Fire Division **DEPARTMENT OF ENVIRONMENT & PRIMARY INDUSTRIES (DEPI), AUSTRALIA**

Dr. Cung Vu Associate Director OFFICE OF NAVAL RESEARCH GLOBAL-SINGAPORE, USA
CungVu is a chemical engineer with 30 years of experience in industries, academia and government, was listed in Who's Who in Science and Engineering and has thirty eight world-wide patents issued and four technical papers published.
Dr.Vu currently serves as Associate Director at the Office of Naval Research Global in Singapore. In this capacity he acts as a technical broker linking the Office of Naval Research (ONR), the Naval Research Enterprise with international scientific community. He identifies emerging and disruptive technologies in order to avoid naval technical surprise. He provides ONR forward presence with global innovators and technologists.
Previously, Dr. Vu served as Chief Science and Technology Advisor at the National Maritime Intelligence-Integration Office (NMIO) where he advised the Director of NMIO on the implications of new and emerging technologies in the maritime domain. He fostered engagement and information sharing amongst the NMIO stakeholders (Federal, State, Local US Government, Academia, Private sector, ForeignPartners, etc.), focusing on areas of Science and Technology. He also leads a community of interest on Emerging and Disruptive Technologies under the charter of the Global Futures Forum, coordinated by the Department of State with members from over 50 countries to provide cultural/social context and allow them to anticipate responses to emerging and disruptive technological issues from different parts of the world. He was Branch Chief, Advanced Technologies of the Defense Warning Office overseeing strategic assessments on emerging technologies with the intent of precluding technological surprise.

John Day Director Defence Business Development ESRI, USA

Mr. Day is a former British Army officer with over 30 years of experience in military engineering and geospatial technology including counter-terrorism activities in Northern Ireland, maneuver warfare in West Germany, and geospatial support in the NATO Corps headquarters in Bosnia. Since joining Esri he has been advising the US Defense and Intelligence Community on how commercial GIS technologies and solutions translate to defense and intelligence systems. Mr. Day led Esri's activities with the Commercial Joint Mapping Toolkit, to provide geospatial tools for US C2I programs. In 2003 he was appointed as Director of Esri's Defense Business Development, managing relationships with Esri's global defense and intelligence customers. Mr. Day has a master's degrees in Engineering from Cambridge University, England and GIS from Edinburgh University, Scotland.

Dr. Lee Sang-Hoon Deputy Director **NATIONAL GEOGRAPHIC INFORMATION INSTITUTE, SOUTH KOREA**

Dr. Sanghoon Lee is currently the Team-leader of International Cooperation Team and the Deputy Director of Planning and Policy Division at National Geographic Information Institute (NGII), Republic of Korea. He obtained his M.Sc. and Ph.D. in Geographic information & Geomatics from the Seoul National University in 2002 and 2010, respectively. Prior to joining NGII, He held senior scientist position of Korea Institute of Construction Technology (KICT) to work extensively on R&D including spatial data-mining, geo-semantics, ubiquitous-based GIS,GI for disaster management, and SDI standard & policy development for 14 years. .

Sander Swinkels General Manager **Palantir Technologies**

Maj Constancio M Espina Information System Officer AFP Command Center **Armed Forces of the Philippines**

James P. Dolan Senior Vice President and General Manager **Overwatch Geospatial Solutions**

Major Md Zamil Hossain Munshi Deputy Director & In-Charge, GIS unit **Survey of Bangladesh (SOB)**

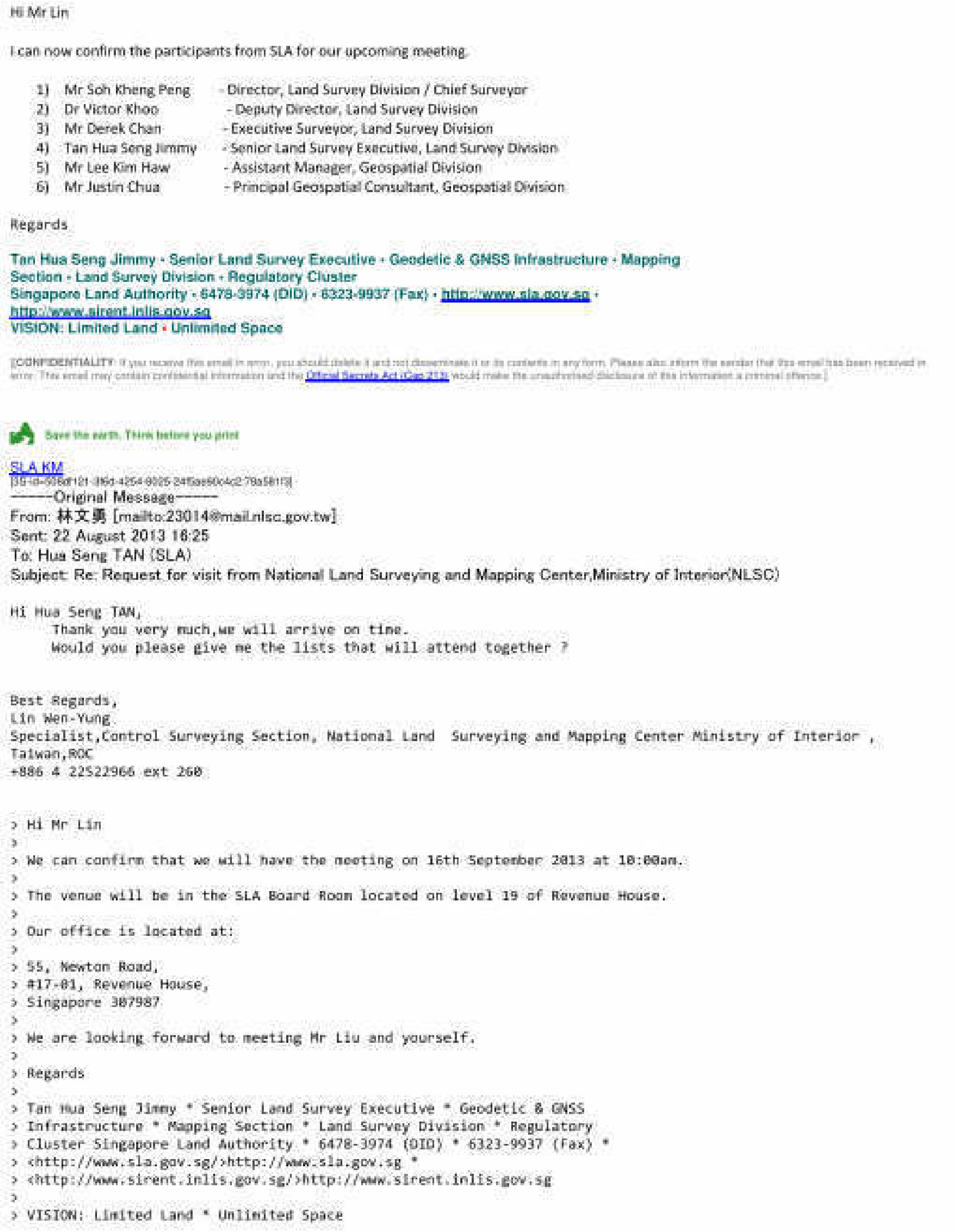
Dr. Sutopo Purwo Nugroho Head of Data, Information and Public Relations **NATIONAL AGENCY FOR DISASTER MANAGEMENT (BNPB), INDONESIA**

Dr. Sutopo was born at Boyolali, Central Java at 07 October 1969. He completed his primary school to high school at his city that is Boyolali, Central Java.Then he moved to Yogyakarta to continue his university graduate at Geography departement of Gadjah Mada University and finished his university studies at 1993. In 1994 he worked as researcher at Agency for Technology Assessment and Application (BPP Teknologi). He finished his MSc and PhD at Bogor Agricultural Institute (IPB) in the field of hydrology. From 2010 to now he is working at National Agency for Disaster Management (BNPB) as Head of Data, Information and Public Relations.

Brett Dixon Business Manager, APAC Defence Team **ESRI, SINGAPORE**

Yong Woong Lee Principal Researcher **MINISTRY OF NATIONAL DEFENSE - AGENCY FOR DEFENCE DEVELOPMENT (ADD), SOUTH KOREA**

附錄四：新加坡土地管理局與會人員簡歷及相關電子郵件



Hi Mr Lin

I can now confirm the participants from SLA for our upcoming meeting.

1)	Mr Soh Kheng Peng	- Director, Land Survey Division / Chief Surveyor
2)	Dr Victor Khoo	- Deputy Director, Land Survey Division
3)	Mr Derek Chan	- Executive Surveyor, Land Survey Division
4)	Tan Hua Seng Jimmy	- Senior Land Survey Executive, Land Survey Division
5)	Mr Lee Kim Haw	- Assistant Manager, Geospatial Division
6)	Mr Justin Chua	- Principal Geospatial Consultant, Geospatial Division

Regards

Tan Hua Seng Jimmy • Senior Land Survey Executive • Geodetic & GNSS Infrastructure • Mapping Section • Land Survey Division • Regulatory Cluster
Singapore Land Authority • 6478-3974 (DID) • 6323-9937 (Fax) • http://www.sla.gov.sg •
http://www.sirent.inlis.gov.sg
VISION: Limited Land • Unlimited Space

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Save the earth. Think before you print

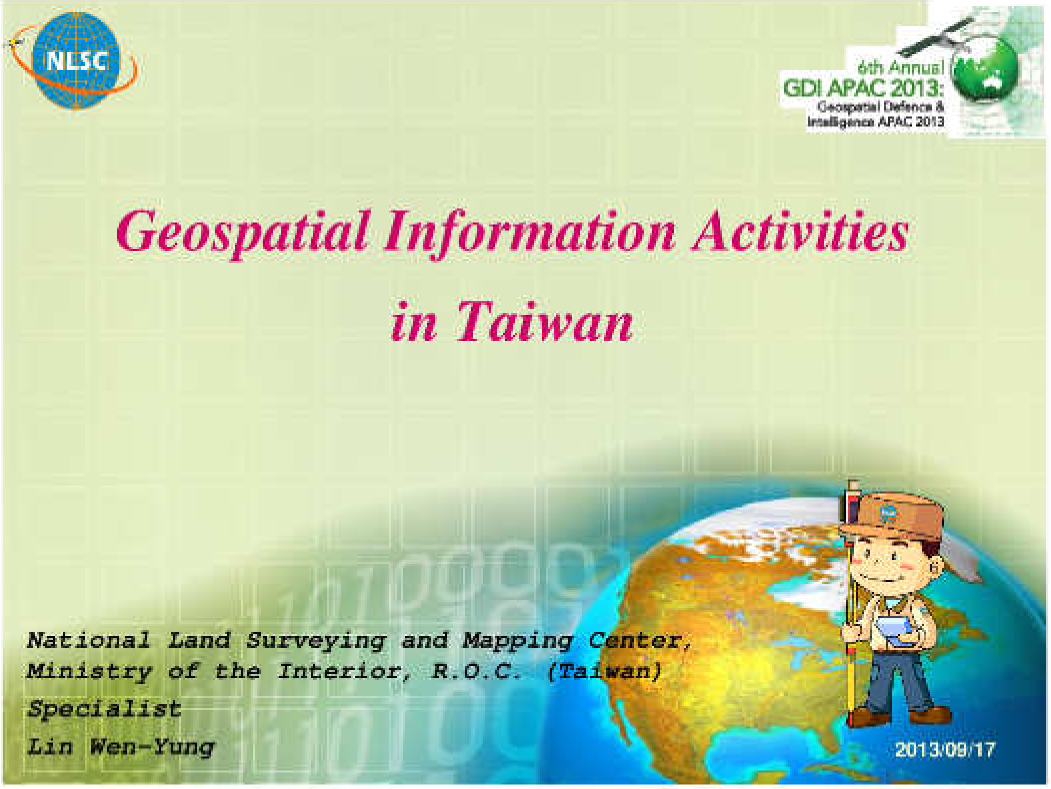
SLA KM
[illegible]
-----Original Message-----
From: 林文勇 [mailto:23014@mail.nlsc.gov.tw]
Sent: 22 August 2013 16:25
To: Hua Seng TAN (SLA)
Subject: Re: Request for visit from National Land Surveying and Mapping Center,Ministry of Interior(NLSC)

Hi Hua Seng TAN,
Thank you very much,we will arrive on time.
Would you please give me the lists that will attend together ?

Best Regards,
Lin Wen-Yung
Specialist,Control Surveying Section, National Land Surveying and Mapping Center Ministry of Interior ,
Taiwan,ROC
+886 4 22522966 ext 260

> Hi Mr Lin
>
> We can confirm that we will have the meeting on 16th September 2013 at 10:00am.
>
> The venue will be in the SLA Board Room located on level 19 of Revenue House.
>
> Our office is located at:
>
> 55, Newton Road,
> #17-01, Revenue House,
> Singapore 307987
>
> We are looking forward to meeting Mr Liu and yourself.
>
> Regards
>
> Tan Hua Seng Jimmy * Senior Land Survey Executive * Geodetic & GNSS
> Infrastructure * Mapping Section * Land Survey Division * Regulatory
> Cluster Singapore Land Authority * 6478-3974 (DID) * 6323-9937 (Fax) *
> <http://www.sla.gov.sg/>http://www.sla.gov.sg *
> <http://www.sirent.inlis.gov.sg/>http://www.sirent.inlis.gov.sg
>
> VISION: Limited Land * Unlimited Space

附錄五：GDI APAC 2013 本中心簡報內容

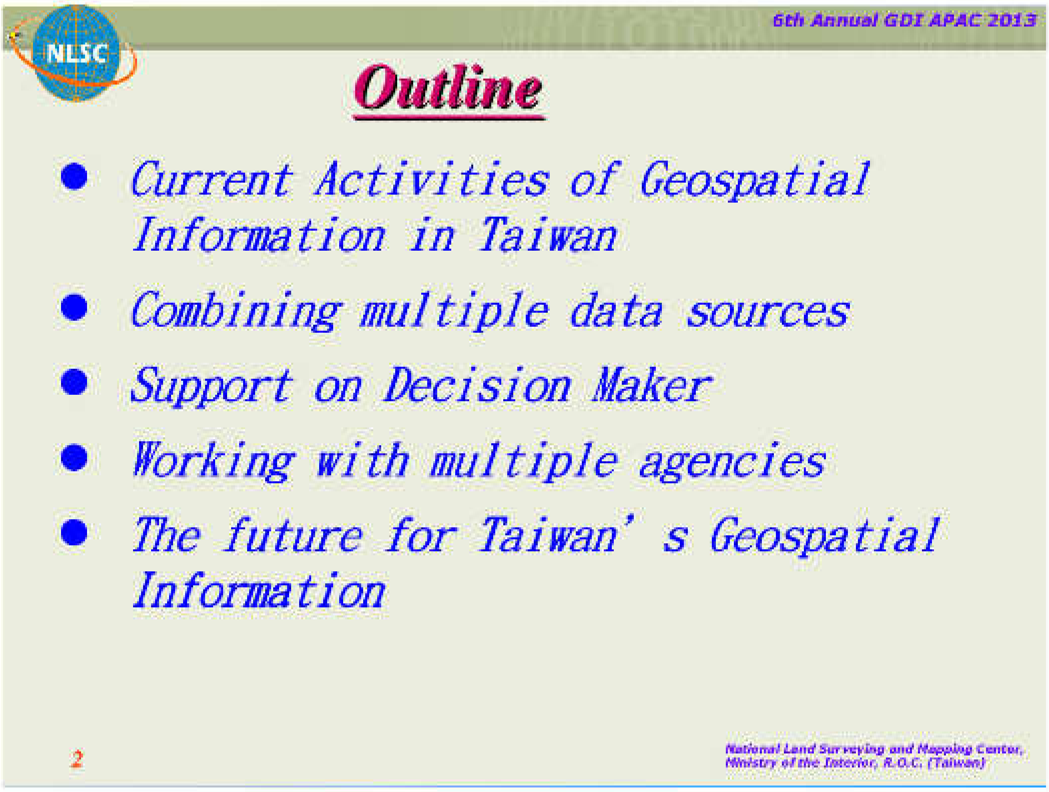


6th Annual
GDI APAC 2013:
Geospatial Defence &
Intelligence APAC 2013

Geospatial Information Activities in Taiwan

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)
Specialist
Lin Wen-Yung

2013/09/17



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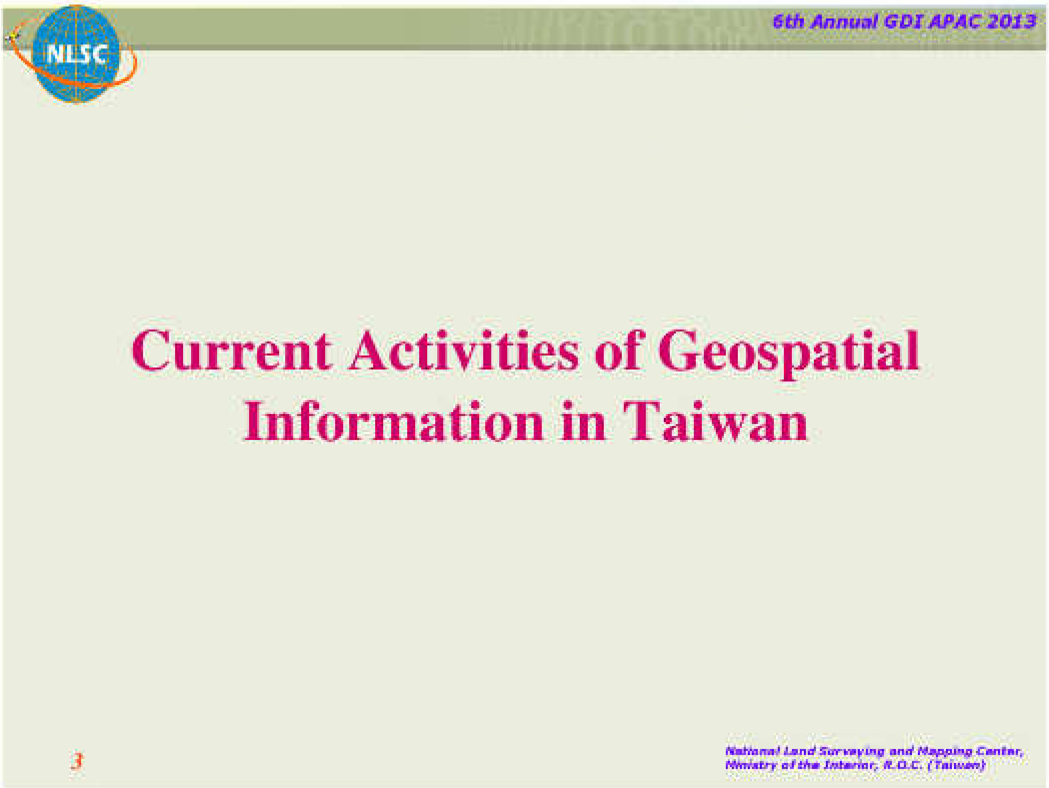
Outline

- Current Activities of Geospatial Information in Taiwan
- Combining multiple data sources
- Support on Decision Maker
- Working with multiple agencies
- The future for Taiwan’s Geospatial Information

2

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)



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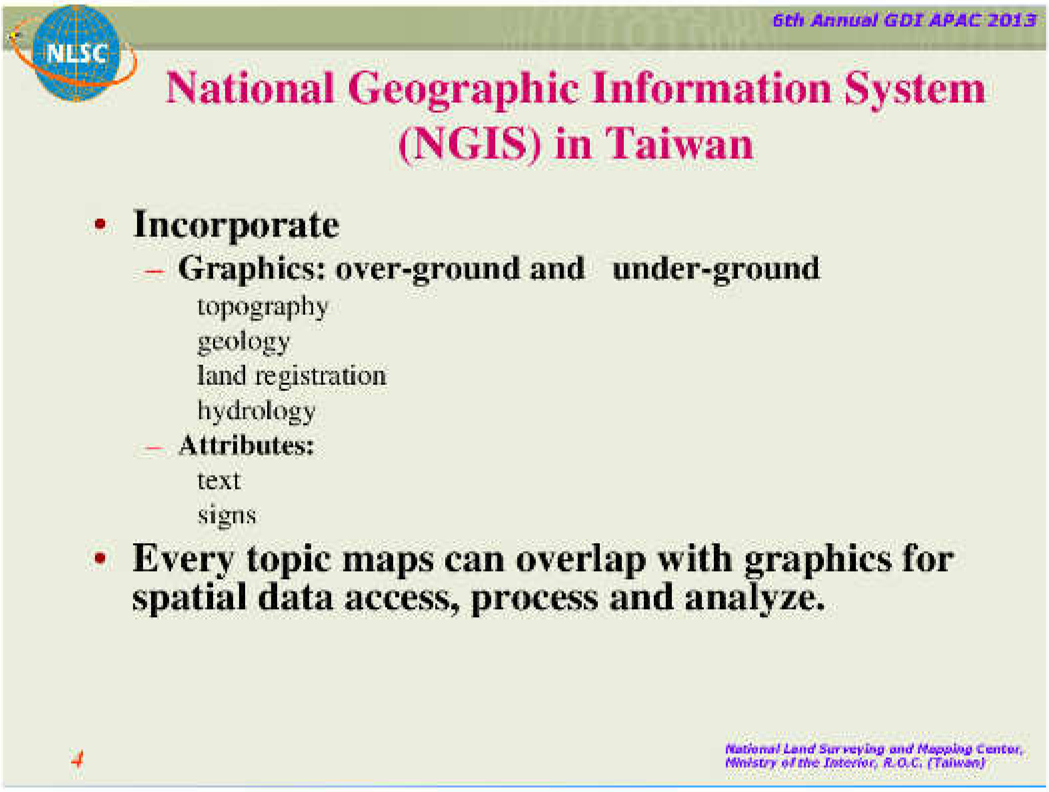
Current Activities of Geospatial Information in Taiwan

3

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)



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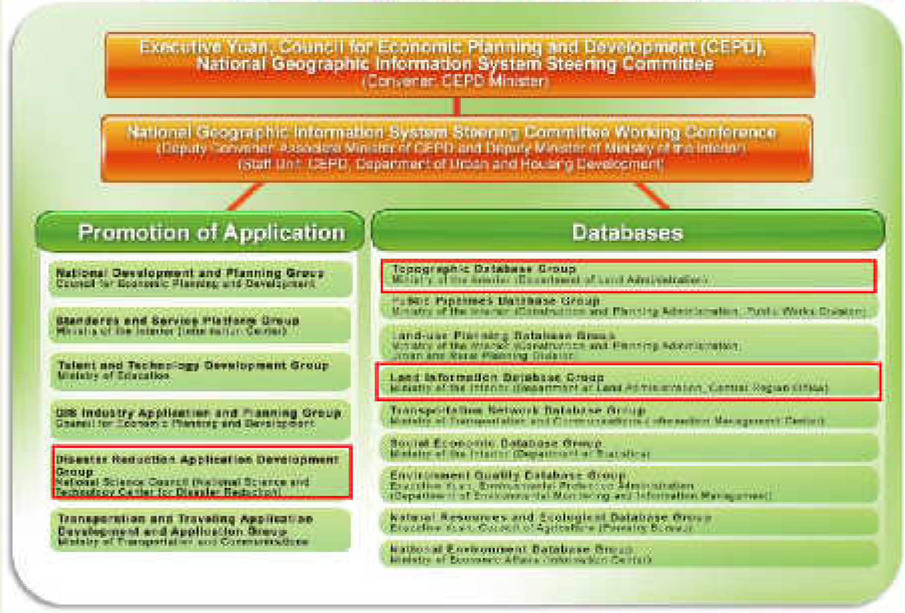
National Geographic Information System (NGIS) in Taiwan

- **Incorporate**
  - **Graphics: over-ground and under-ground**
    - topography
    - geology
    - land registration
    - hydrology
  - **Attributes:**
    - text
    - signs
- **Every topic maps can overlap with graphics for spatial data access, process and analyze.**

4

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)

NGIS Organizational Structure



Executive Yuan, Council for Economic Planning and Development (CEPD),
National Geographic Information System Steering Committee
(Convener: CEPD Minister)

National Geographic Information System Steering Committee Working Conference
(Deputy Convener: Associate Minister of CEPD and Deputy Minister of Ministry of the Interior)
(Staff Unit: CEPD, Department of Urban and Housing Development)

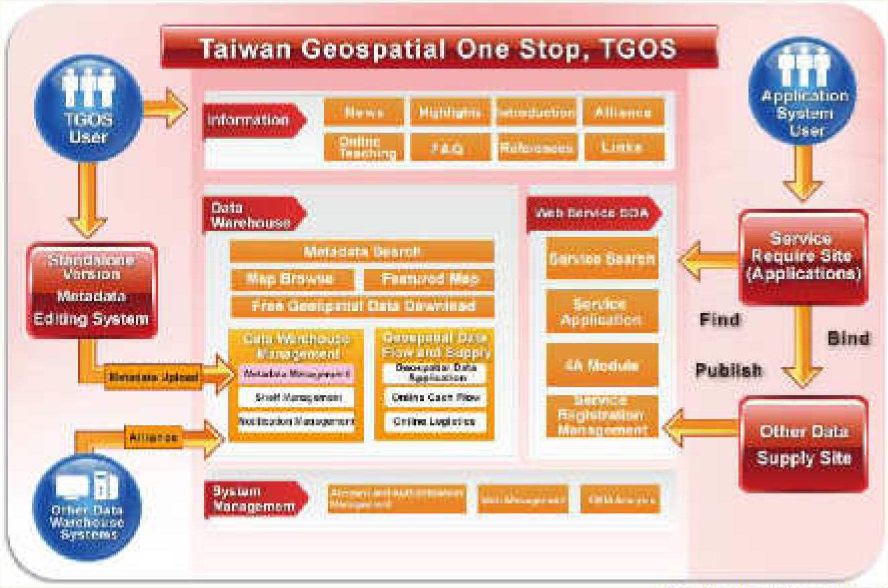
Promotion of Application

- **National Development and Planning Group**
  Council for Economic Planning and Development
- **Standards and Service Platform Group**
  Ministry of the Interior (Information Center)
- **Talent and Technology Development Group**
  Ministry of Education
- **GIS Industry Application and Planning Group**
  Council for Economic Planning and Development
- **Disaster Reduction Application Development Group**
  National Science Council (National Science and Technology Center for Disaster Reduction)
- **Transportation and Traveling Application Development and Application Group**
  Ministry of Transportation and Communications

Databases

- **Topographic Database Group**
  Ministry of the Interior (Department of Land Administration)
- **Public Pipelines Database Group**
  Ministry of the Interior (Construction and Planning Administration, Public Works Division)
- **Land-use Planning Database Group**
  Ministry of the Interior (Construction and Planning Administration, Urban and Rural Planning Division)
- **Land Information Database Group**
  Ministry of the Interior (Department of Land Administration, Central Region Office)
- **Transportation Network Database Group**
  Ministry of Transportation and Communications (Information Management Center)
- **Social Economic Database Group**
  Ministry of the Interior (Department of Statistics)
- **Environment Quality Database Group**
  Executive Yuan, Environmental Protection Administration (Department of Environmental Monitoring and Information Management)
- **Natural Resources and Ecological Database Group**
  Executive Yuan, Council of Agriculture (Forestry Bureau)
- **National Environment Database Group**
  Ministry of Economic Affairs (Information Center)

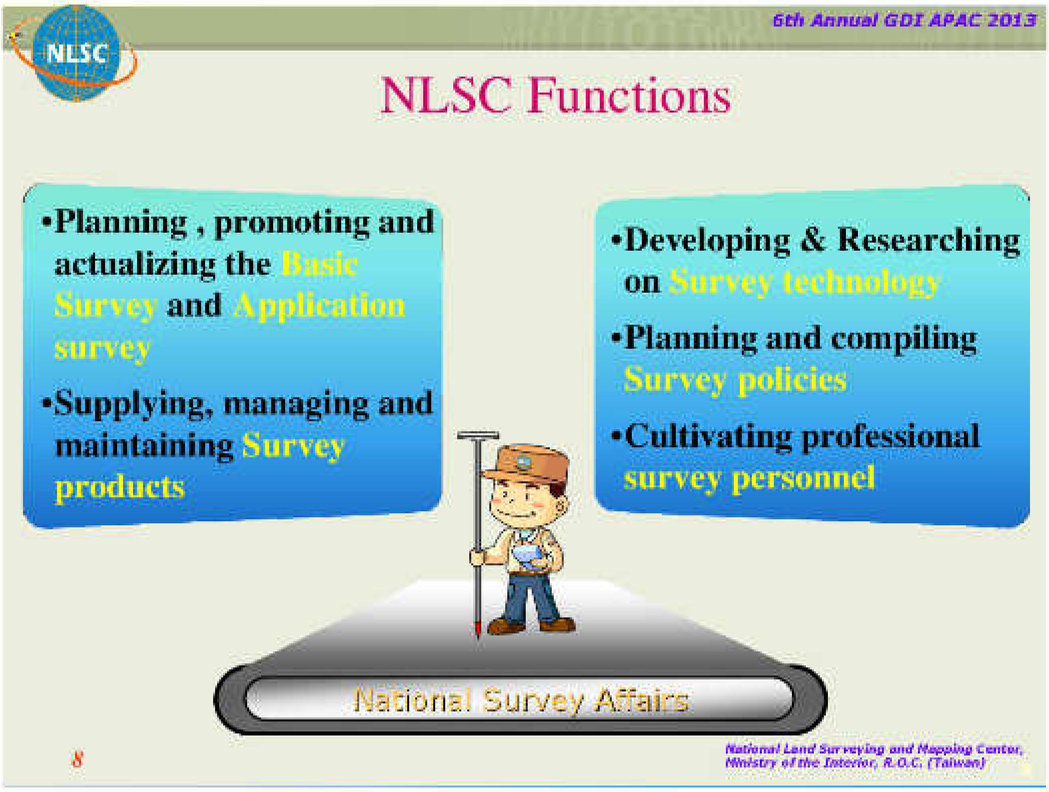
Taiwan Geospatial One Stop(TGOS) -MOI



Taiwan Geospatial One Stop, TGOS

TGOS User
Information
News
Highlights
Introduction
Alliance
Online Teaching
FAQ
References
Links
Data Warehouse
Metadata Search
Map Browse
Featured Map
Free Geospatial Data Download
Data Warehouse Management
Metadata Management
Staff Management
Notification Management
Geospatial Data Flow and Supply
Geospatial Data Application
Online Cash Flow
Online Logistics
Web Service SOA
Service Search
Service Application
4A Module
Service Registration Management
System Management
Account and Authorization Management
Unit Management
GIS Analysis
Standalone Version Metadata Editing System
Metadata Upload
Alliance
Other Data Warehouse Systems
Application System User
Service Require Site (Applications)
Find
Bind
Publish
Other Data Supply Site

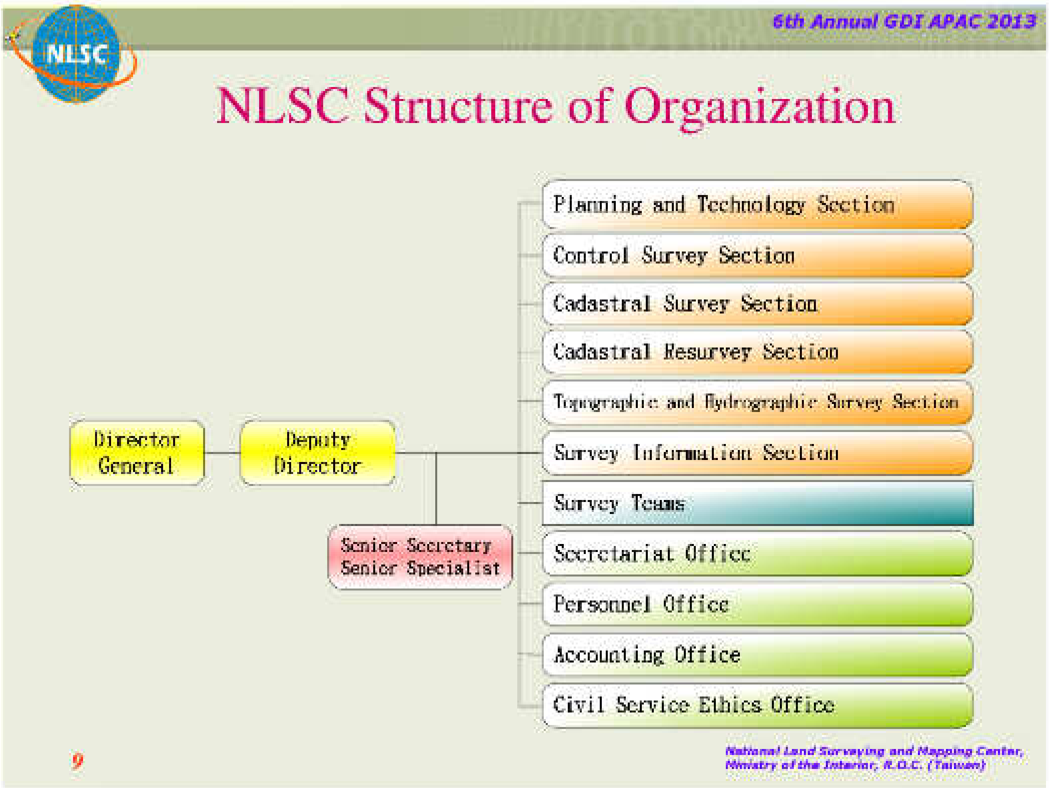
What is National Land Surveying and Mapping Center (NLSC) doing ?



NLSC Functions

- Planning , promoting and actualizing the Basic Survey and Application survey
- Supplying, managing and maintaining Survey products
- Developing & Researching on Survey technology
- Planning and compiling Survey policies
- Cultivating professional survey personnel

National Survey Affairs



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NLSC Structure of Organization

Director General

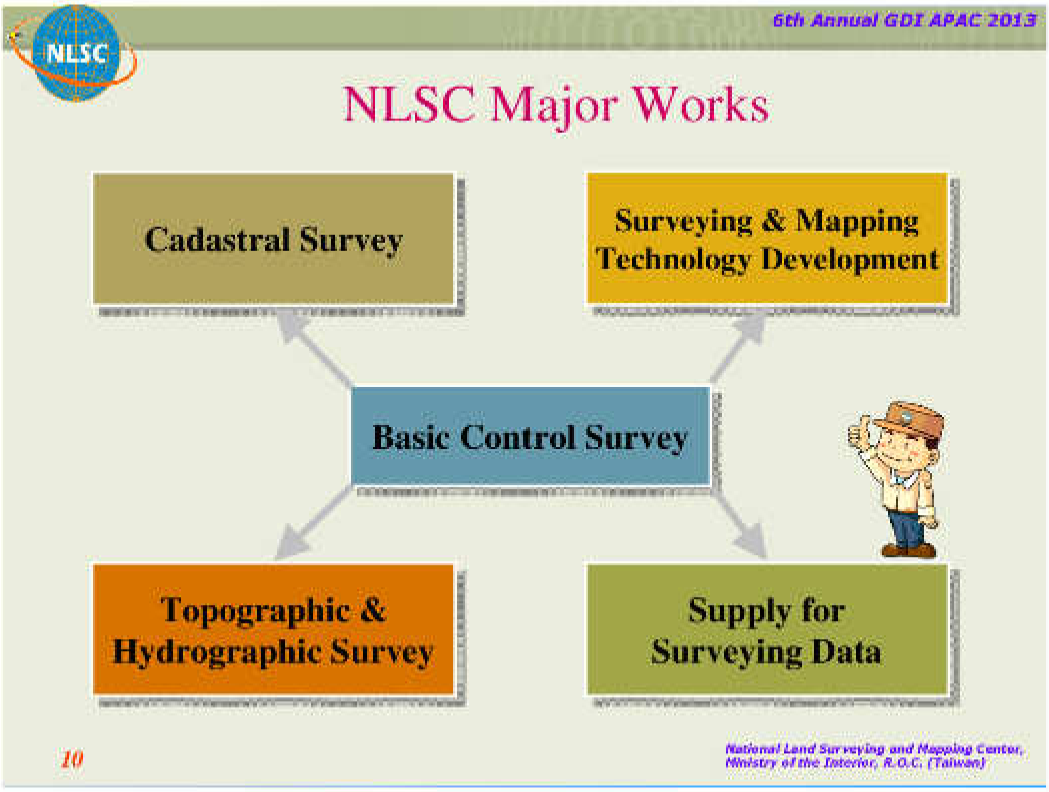
Deputy Director

Senior Secretary
Senior Specialist

- Planning and Technology Section
- Control Survey Section
- Cadastral Survey Section
- Cadastral Resurvey Section
- Topographic and Hydrographic Survey Section
- Survey Information Section
- Survey Teams
- Secretariat Office
- Personnel Office
- Accounting Office
- Civil Service Ethics Office

9

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)



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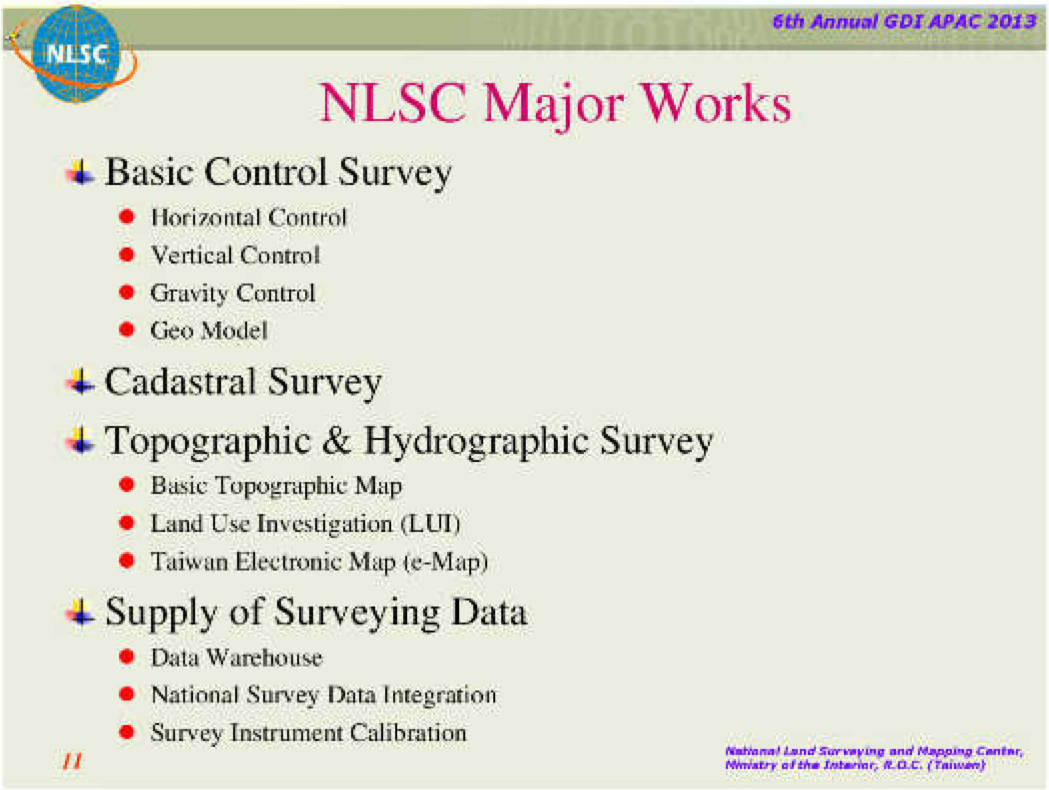
NLSC Major Works

Basic Control Survey

- Cadastral Survey
- Surveying & Mapping Technology Development
- Topographic & Hydrographic Survey
- Supply for Surveying Data

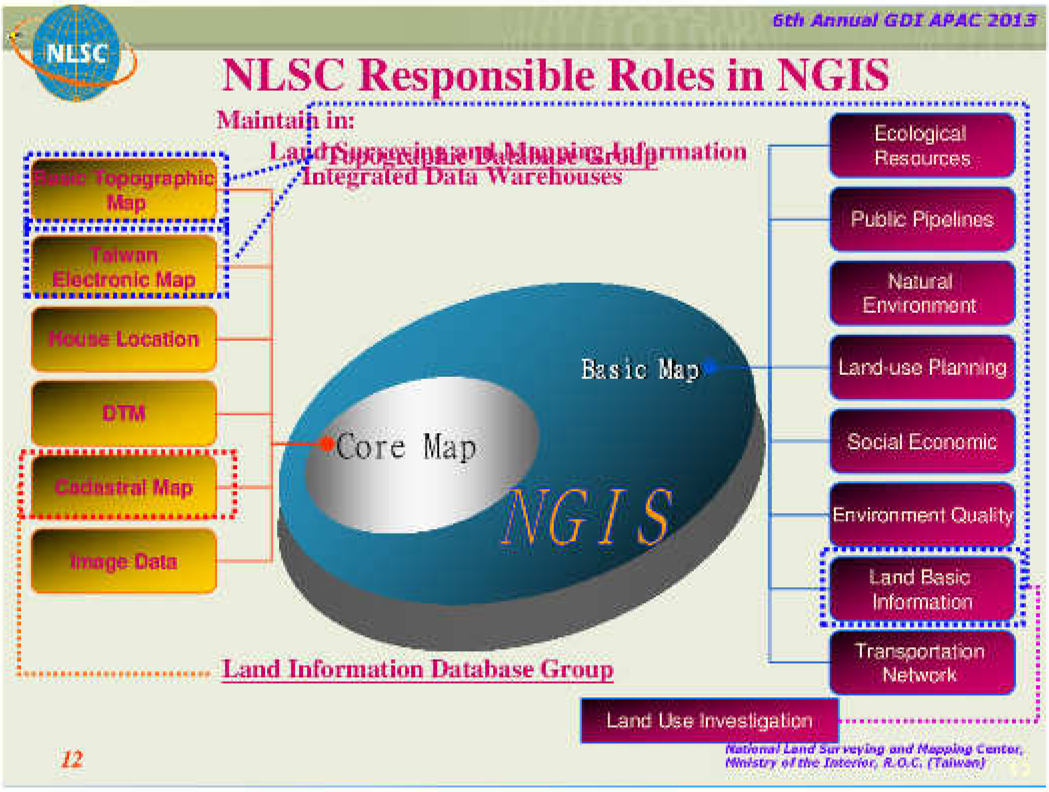
10

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)



NLSC Major Works

- Basic Control Survey
  - Horizontal Control
  - Vertical Control
  - Gravity Control
  - Geo Model
- Cadastral Survey
- Topographic & Hydrographic Survey
  - Basic Topographic Map
  - Land Use Investigation (LUI)
  - Taiwan Electronic Map (e-Map)
- Supply of Surveying Data
  - Data Warehouse
  - National Survey Data Integration
  - Survey Instrument Calibration



NLSC Responsible Roles in NGIS

Maintain in:

Land Surveying and Mapping Information Integrated Data Warehouses

Topographic Database Group

Basic Topographic Map

Taiwan Electronic Map

House Location

DTM

Cadastral Map

Image Data

Land Information Database Group

Ecological Resources

Public Pipelines

Natural Environment

Land-use Planning

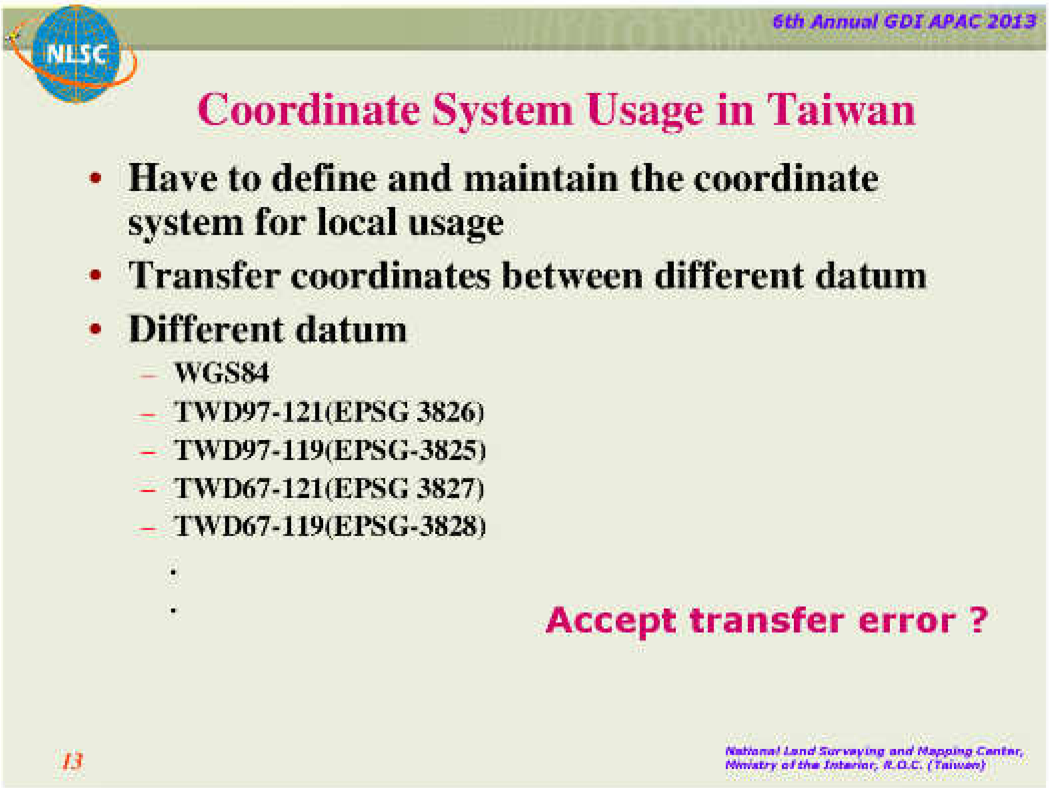
Social Economic

Environment Quality

Land Basic Information

Transportation Network

Land Use Investigation



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Coordinate System Usage in Taiwan

- Have to define and maintain the coordinate system for local usage
- Transfer coordinates between different datum
- Different datum
  - WGS84
  - TWD97-121(EPSG 3826)
  - TWD97-119(EPSG-3825)
  - TWD67-121(EPSG 3827)
  - TWD67-119(EPSG-3828)

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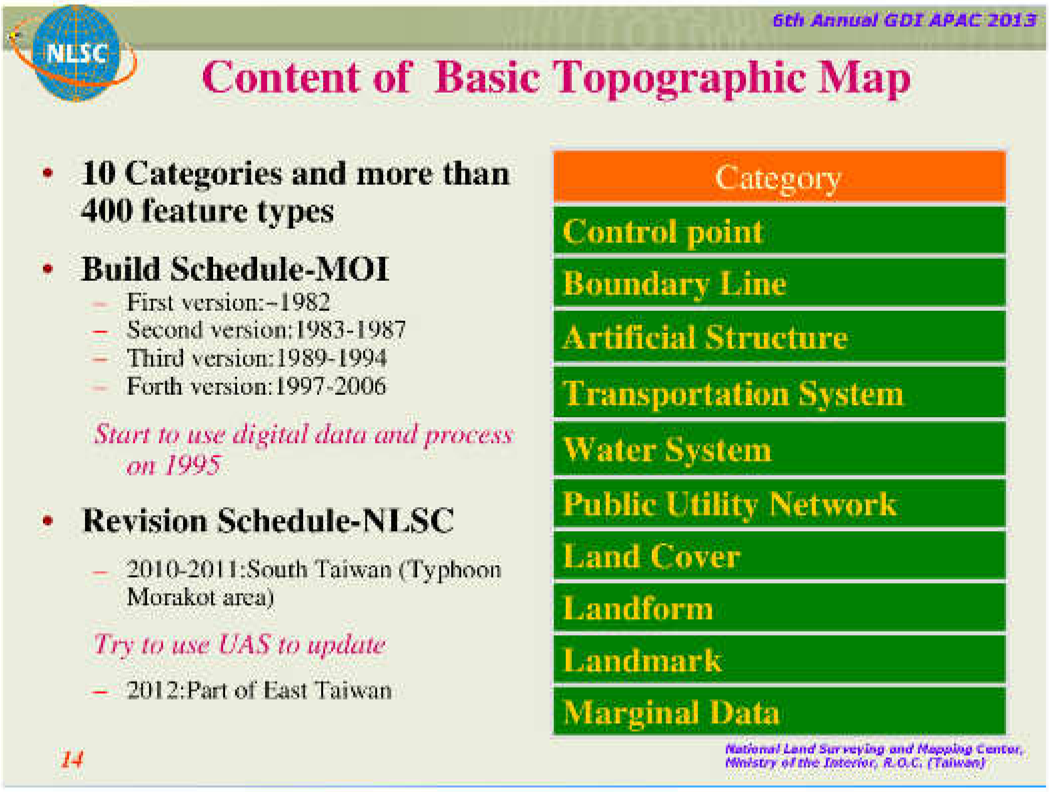
Accept transfer error ?

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)

13



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Content of Basic Topographic Map

- 10 Categories and more than 400 feature types
- Build Schedule-MOI
  - First version:~1982
  - Second version:1983-1987
  - Third version:1989-1994
  - Forth version:1997-2006

Start to use digital data and process on 1995

- Revision Schedule-NLSC
  - 2010-2011:South Taiwan (Typhoon Morakot area)

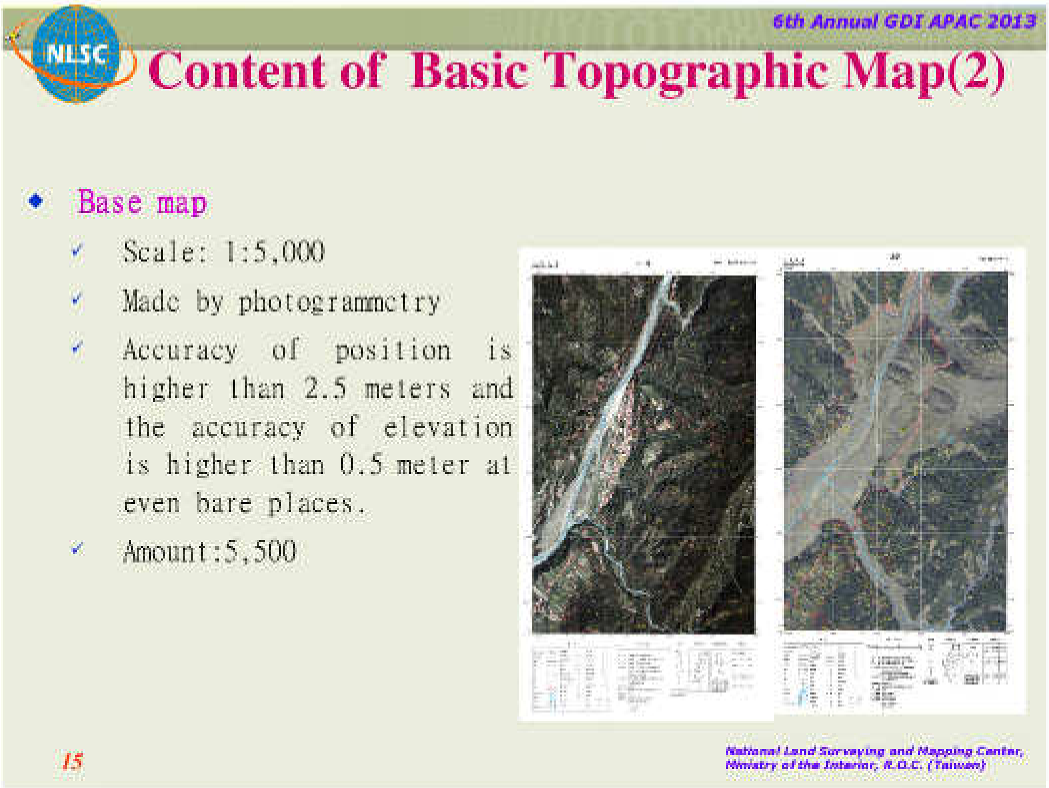
Try to use UAS to update

  - 2012:Part of East Taiwan

Category
Control point
Boundary Line
Artificial Structure
Transportation System
Water System
Public Utility Network
Land Cover
Landform
Landmark
Marginal Data

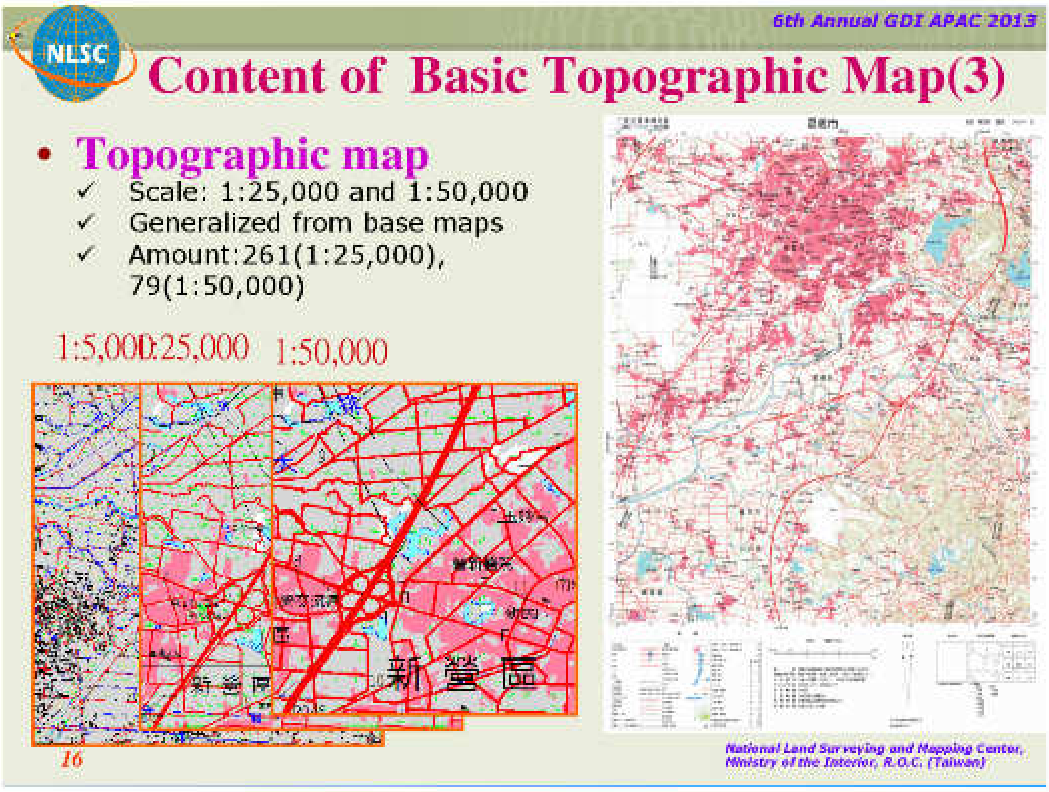
National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)

14



Content of Basic Topographic Map(2)

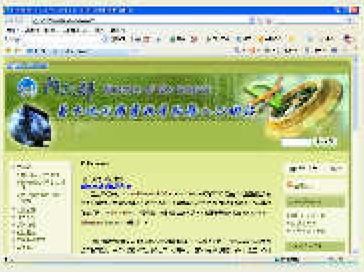
- Base map
  - ✓ Scale: 1:5,000
  - ✓ Made by photogrammetry
  - ✓ Accuracy of position is higher than 2.5 meters and the accuracy of elevation is higher than 0.5 meter at even bare places.
  - ✓ Amount:5,500

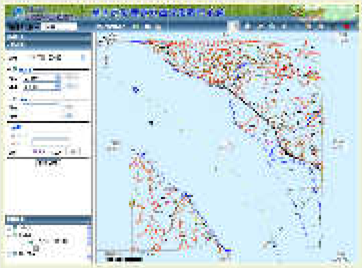


Content of Basic Topographic Map(3)

- Topographic map
  - ✓ Scale: 1:25,000 and 1:50,000
  - ✓ Generalized from base maps
  - ✓ Amount:261(1:25,000), 79(1:50,000)

Basic Topographic Map WebSite





228.9
225.7
221.9
台

http://bmap.nlsc.gov.tw/

Land Use Investigation(LUI)

Why the land use status change?

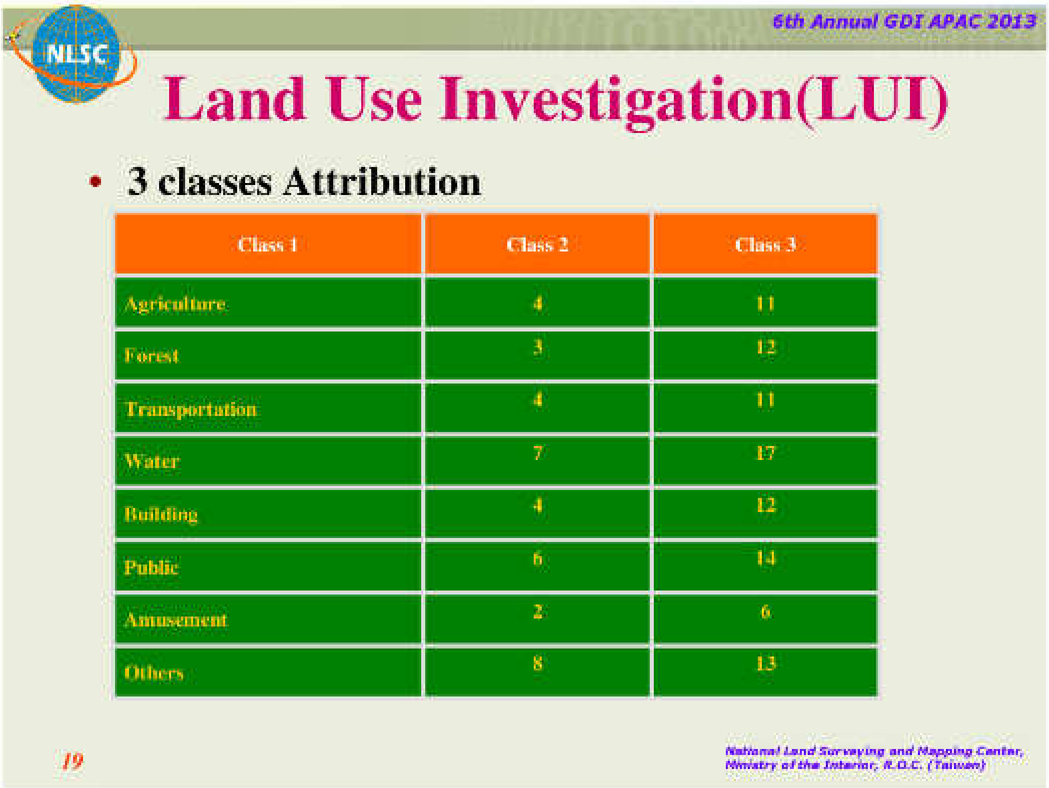
Human activities

- Transportation construction
- **Large-scale development**
- **Policies**

Disasters

- 1st to 3rd order classification

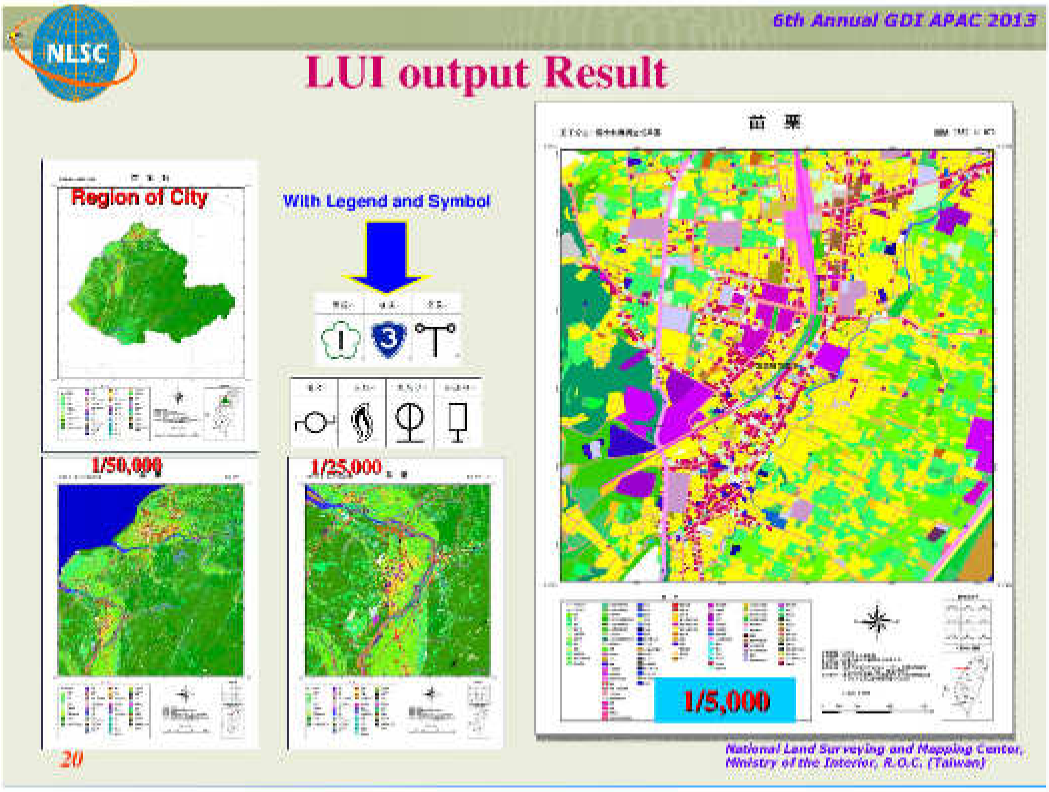
The former Taichung airport redevelopment plan



Land Use Investigation(LUI)

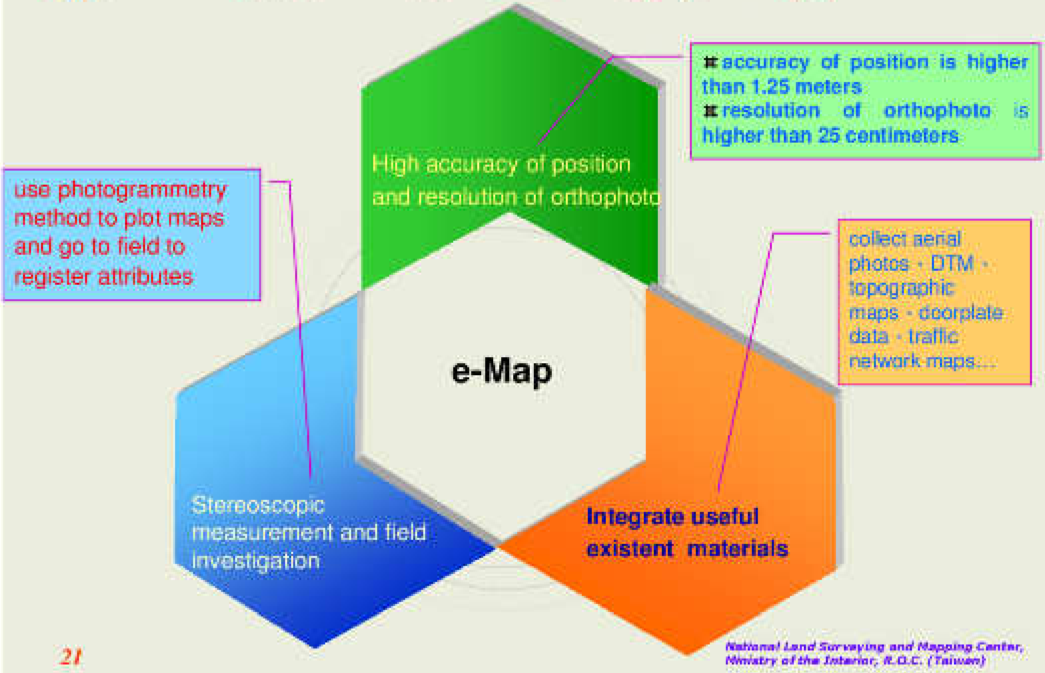
- 3 classes Attribution

Class 1	Class 2	Class 3
Agriculture	4	11
Forest	3	12
Transportation	4	11
Water	7	17
Building	4	12
Public	6	14
Amusement	2	6
Others	8	13


Region of City
With Legend and Symbol
1/50,000
1/25,000
苗 栗
1/5,000

LUI output Result

Taiwan Electronic Map (e-Map)



e-Map
High accuracy of position and resolution of orthophoto
Integrate useful existent materials
Stereoscopic measurement and field investigation

- accuracy of position is higher than 1.25 meters
- resolution of orthophoto is higher than 25 centimeters

use photogrammetry method to plot maps and go to field to register attributes

collect aerial photos、DTM、topographic maps、doorplate data、traffic network maps…

Content of e-Map

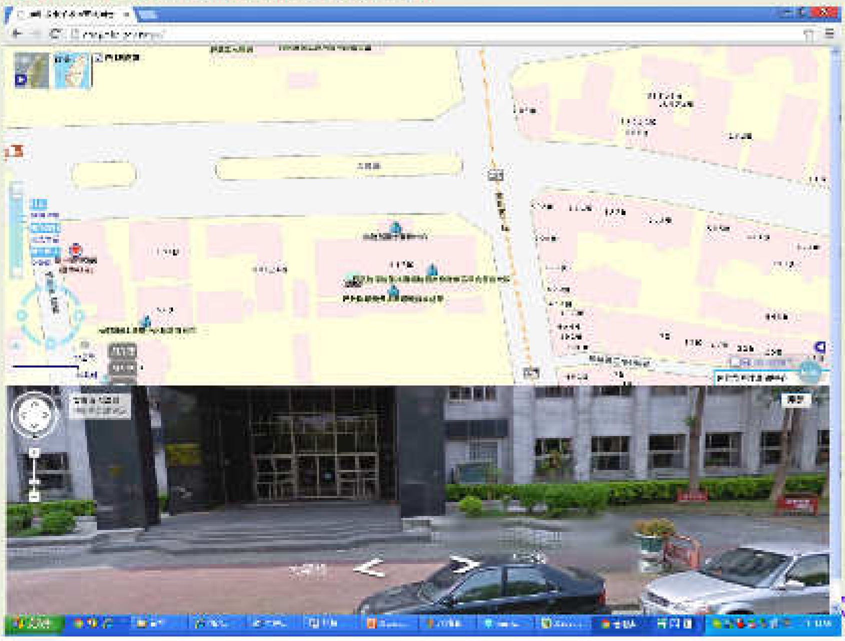
- **10 categories and 23 layers**

category	layer	type
Road	road midline	line
	road node	point
	plane road	area
	stereo road	area
	tunnel	area
	road separated line	line
	road annotation	point
Railroad	Taiwan railway	line
	Taiwan height speed rail	line
	MRT	line
	railroad annotation	point

category	layer	type
Waterway	river	area
	catchment midline	midline
	lake	area
	river annotation	point
Administrative boundary	county or city boundary	area
	town or district boundary	area
Block	block	area
Building	building	area
Landmark		point
Control point		point
Doorplate		point
Colored orthophoto		raster

e-Map Web Site

入口網站：http://emap.nlsc.gov.tw/



e-Map Update Strategy

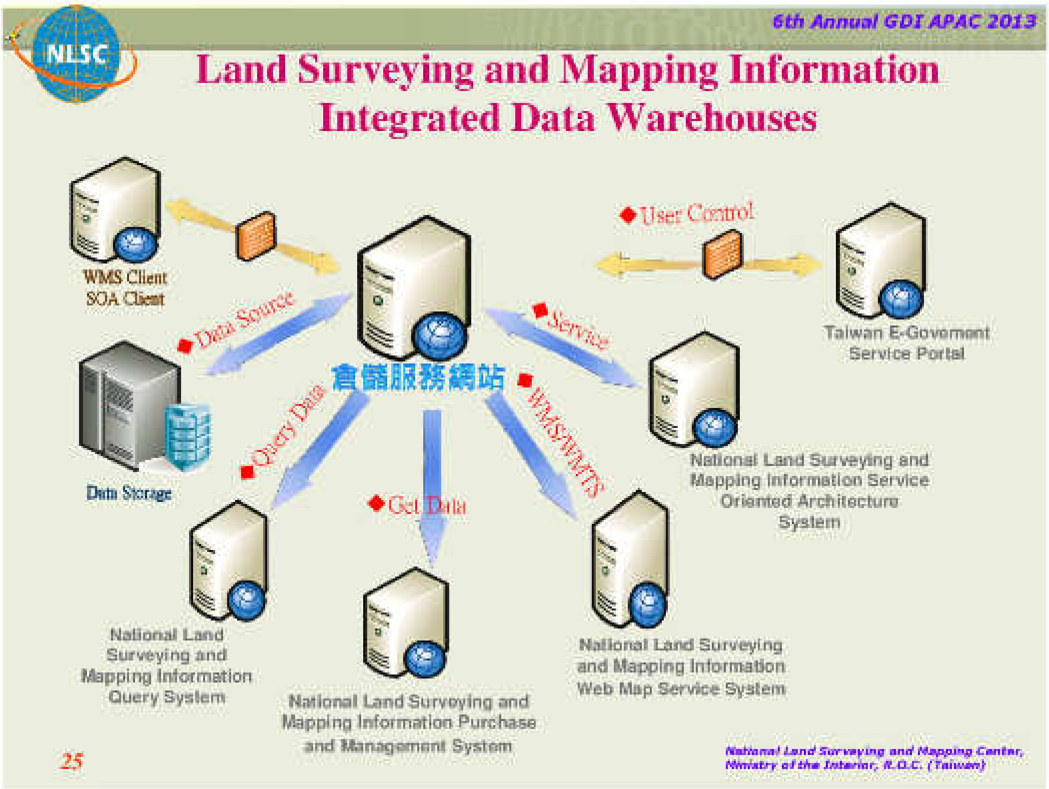
Update Strategy

2-year cycle

※Base on Updated Orthophoto Image

※Update Methods
Study of integrating UAS, MMS
Speed up the update frequency
especially on road, landmark and building layers

※Cooperation
Resources sharing
Find the changed area



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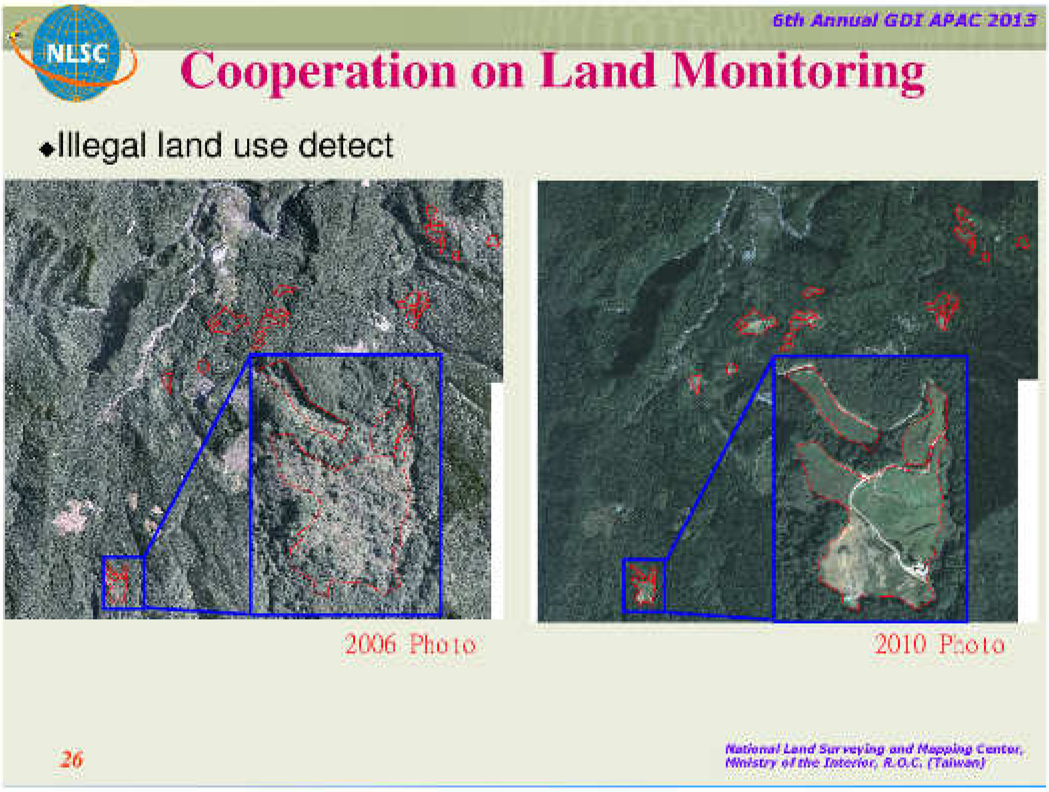
Land Surveying and Mapping Information Integrated Data Warehouses

NLSC
WMS Client
SOA Client
◆User Control
Taiwan E-Govement Service Portal
◆Data Source
◆Service
倉儲服務網站
Data Storage
◆Query Data
◆WMS/WMTS
◆Get Data
National Land Surveying and Mapping Information Service Oriented Architecture System
National Land Surveying and Mapping Information Query System
National Land Surveying and Mapping Information Purchase and Management System
National Land Surveying and Mapping Information Web Map Service System

25

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)



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Cooperation on Land Monitoring

- Illegal land use detect

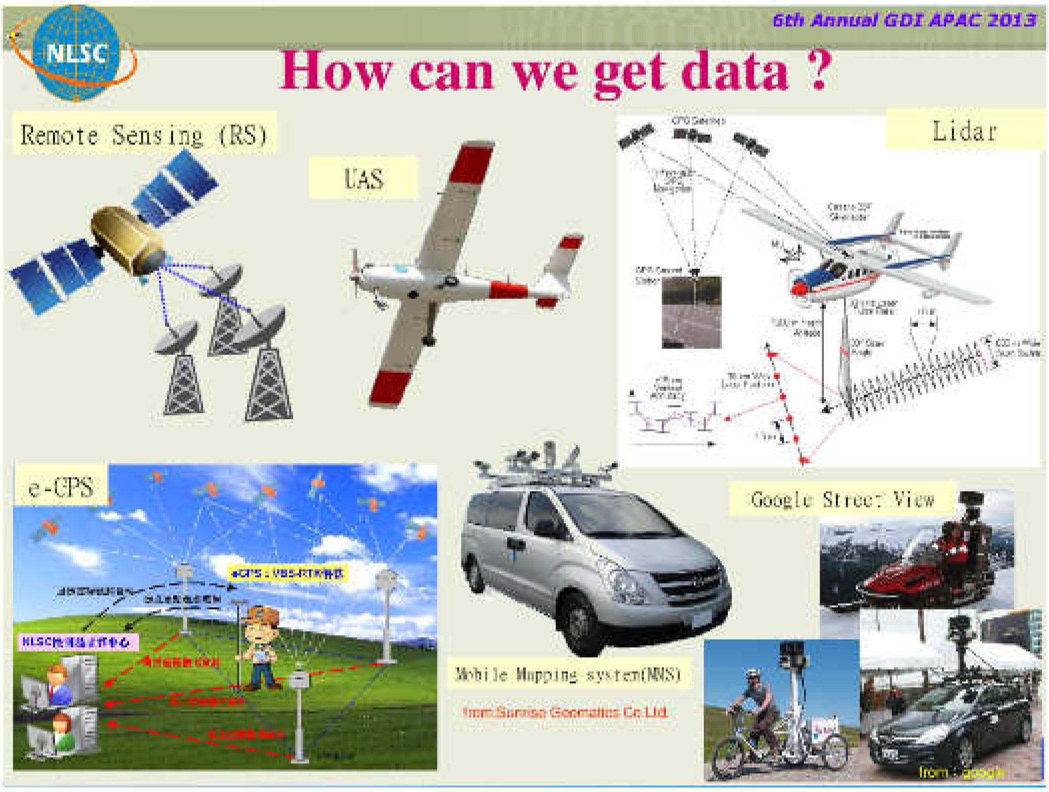
2006 Photo

2010 Photo

26

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)

Combining multiple data sources



How can we get data ?

Remote Sensing (RS)

UAS

Lidar

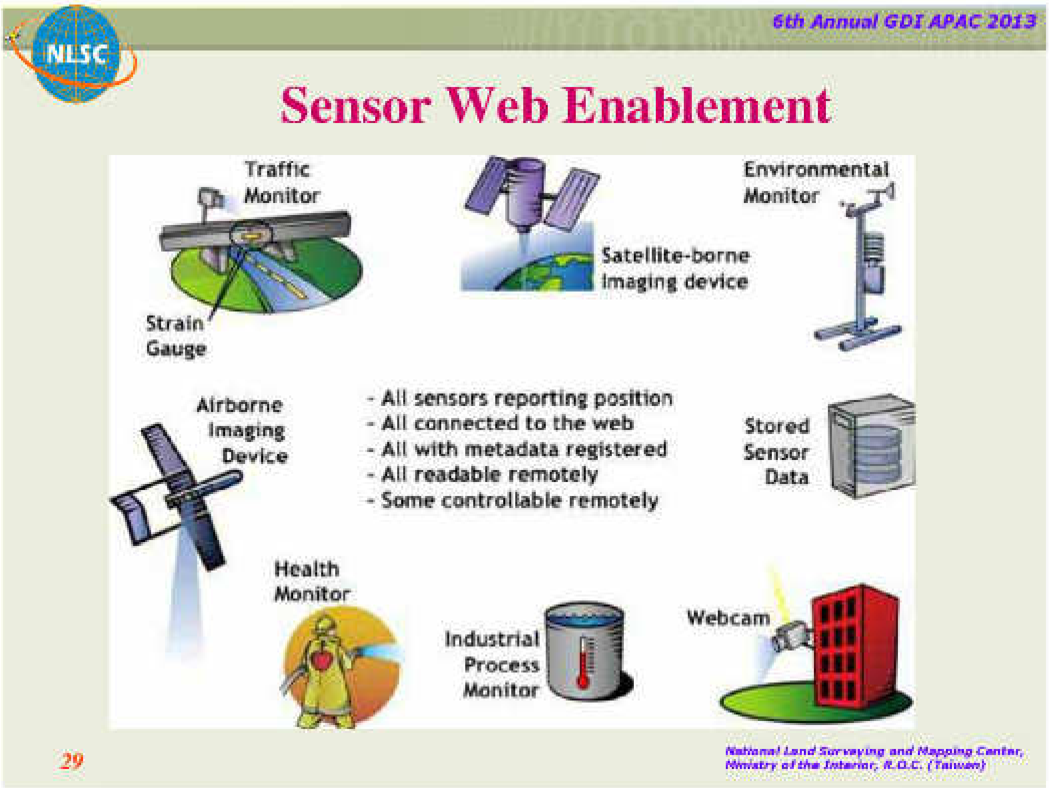
e-GPS

Mobile Mapping system(MMS)

from:Sunrise Geomatics Co.Ltd

Google Street View

from : google



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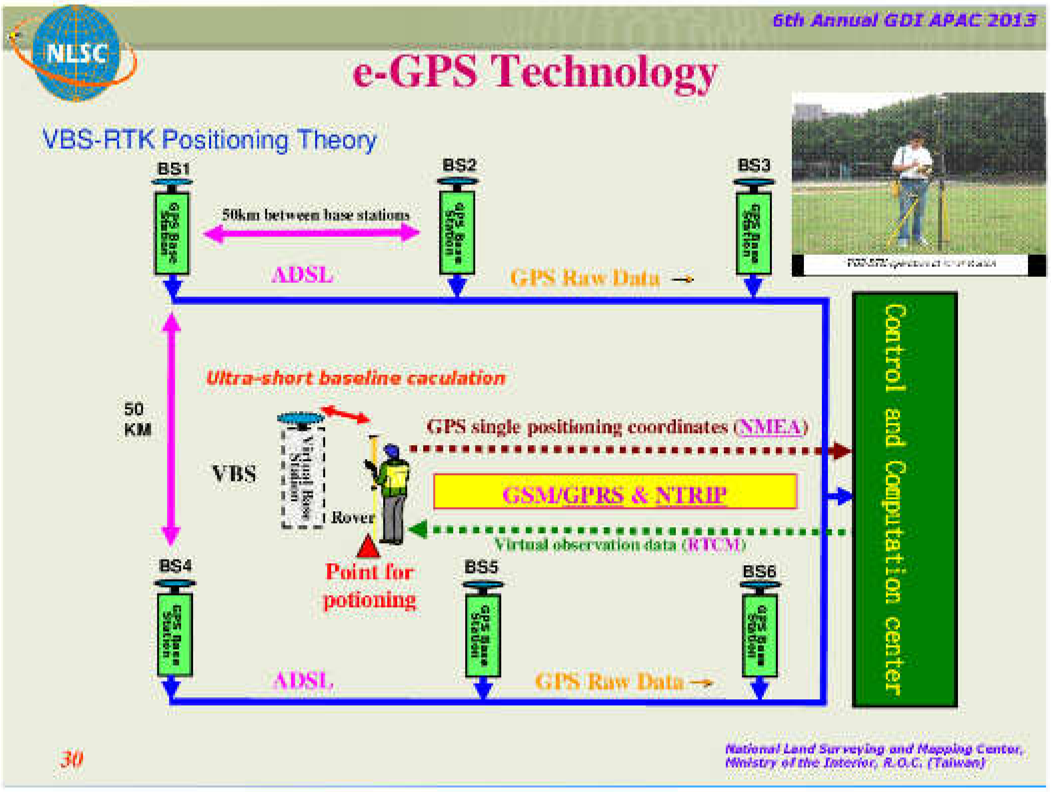
Sensor Web Enablement

- All sensors reporting position
- All connected to the web
- All with metadata registered
- All readable remotely
- Some controllable remotely

NLSC
Traffic Monitor
Strain Gauge
Satellite-borne Imaging device
Environmental Monitor
Airborne Imaging Device
Stored Sensor Data
Health Monitor
Industrial Process Monitor
Webcam

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)



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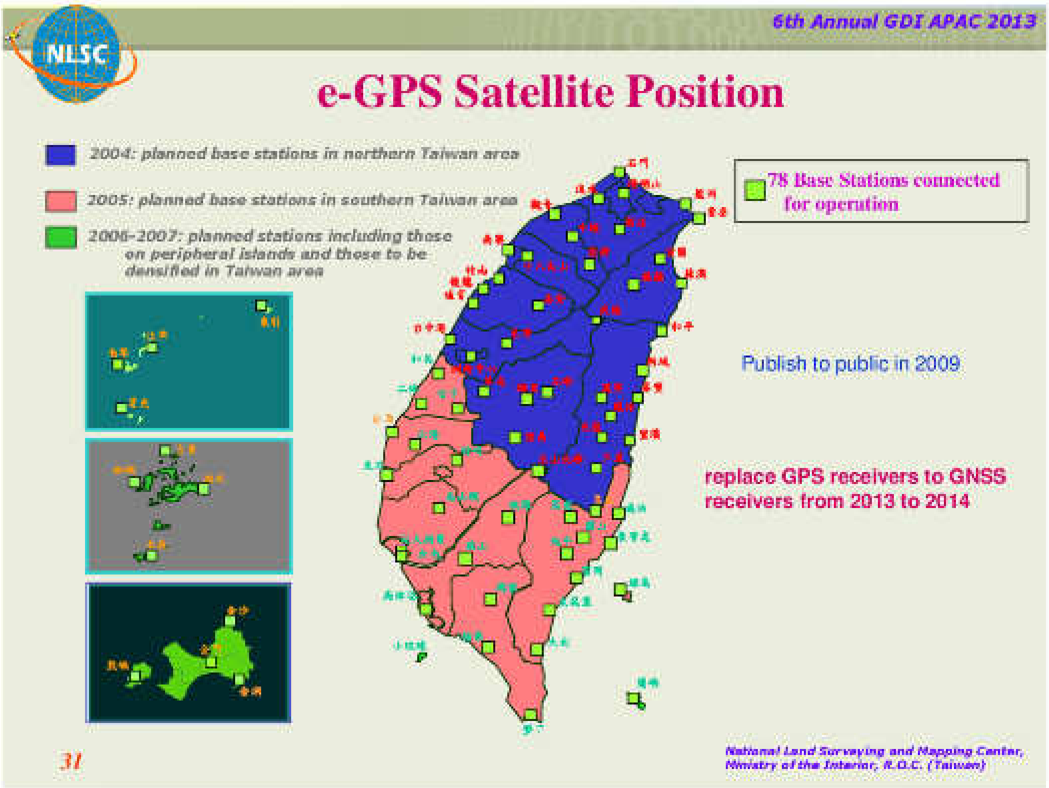
e-GPS Technology

VBS-RTK Positioning Theory

NLSC
BS1
BS2
BS3
GPS Base Station
50km between base stations
ADSL
GPS Raw Data →
50 KM
Ultra-short baseline caculation
GPS single positioning coordinates (NMEA)
VBS
Virtual Base Station
Rover
GSM/GPRS & NTRIP
Virtual observation data (RTCM)
Point for potioning
BS4
BS5
BS6
ADSL
GPS Raw Data →
Control and Computation center

National Land Surveying and Mapping Center,
Ministry of the Interior, R.O.C. (Taiwan)



e-GPS Satellite Position

🟦 2004: planned base stations in northern Taiwan area

🟥 2005: planned base stations in southern Taiwan area

🟩 2006-2007: planned stations including those on peripheral islands and those to be densified in Taiwan area

🟩 78 Base Stations connected for operation

Publish to public in 2009

replace GPS receivers to GNSS receivers from 2013 to 2014

31

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)

Photos taken by UAV (1)

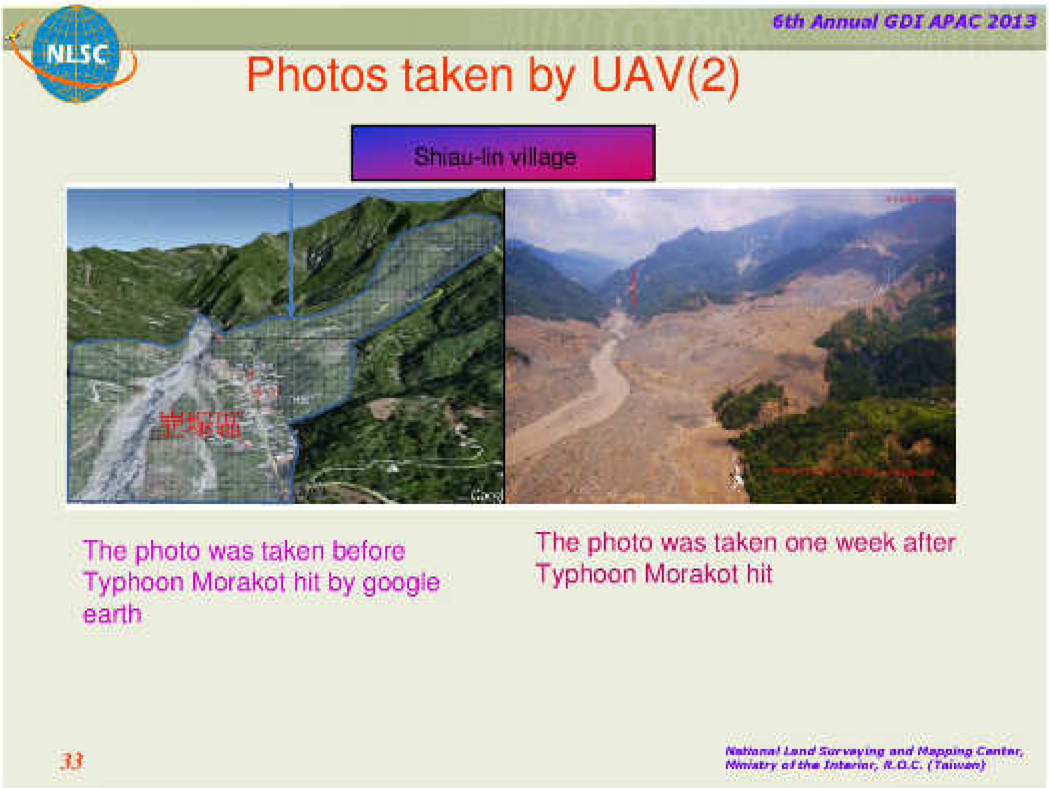
Suang-yuan bridge

Pindong county flood

Photos were taken on the next day after Typhoon Morakot hit

32

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)



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Photos taken by UAV(2)

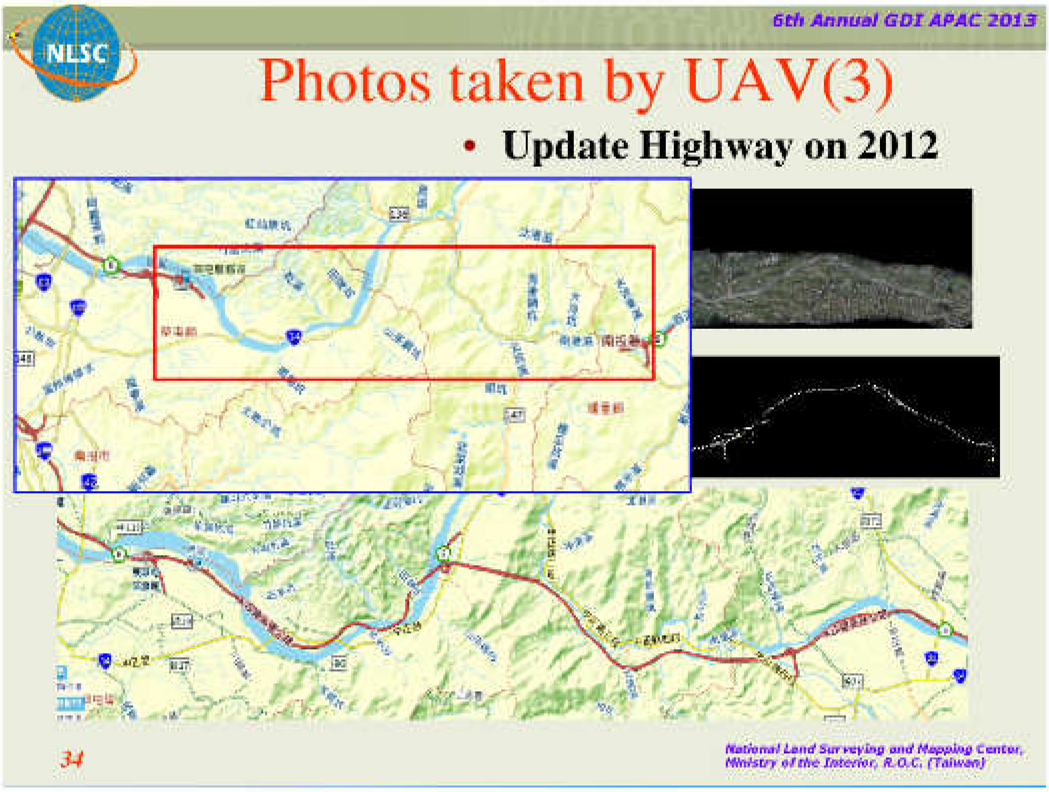
Shiau-lin village

The photo was taken before Typhoon Morakot hit by google earth

The photo was taken one week after Typhoon Morakot hit

33

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)



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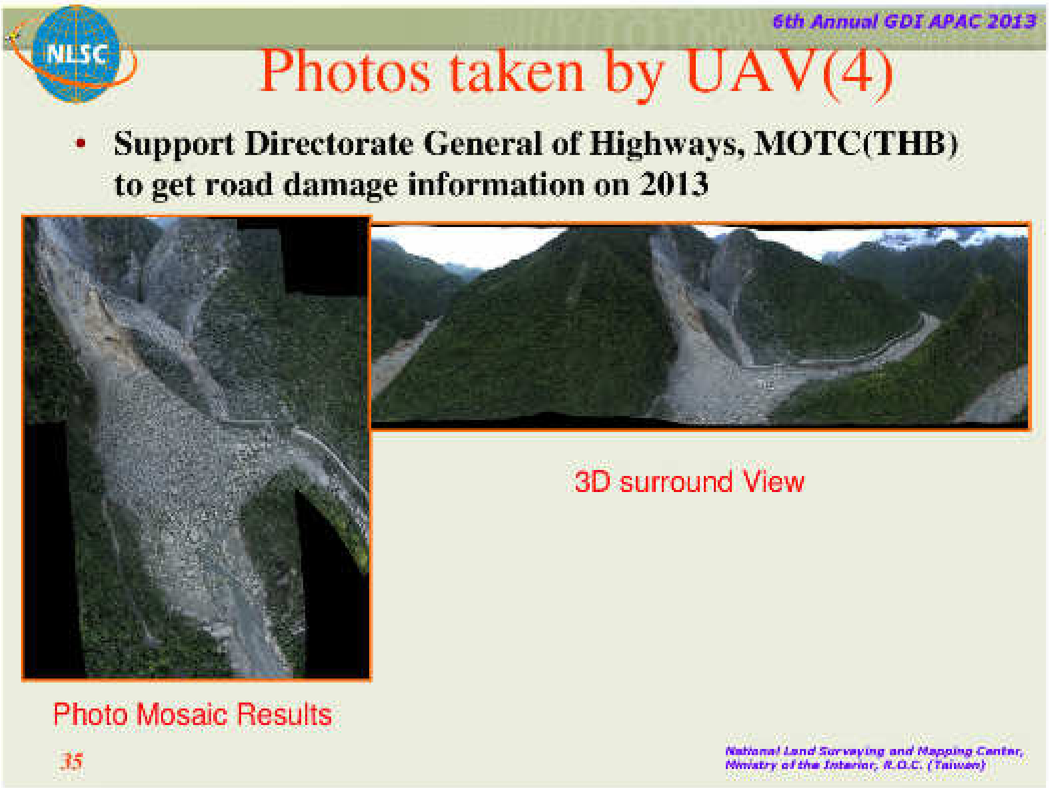
Photos taken by UAV(3)

- Update Highway on 2012

34

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)

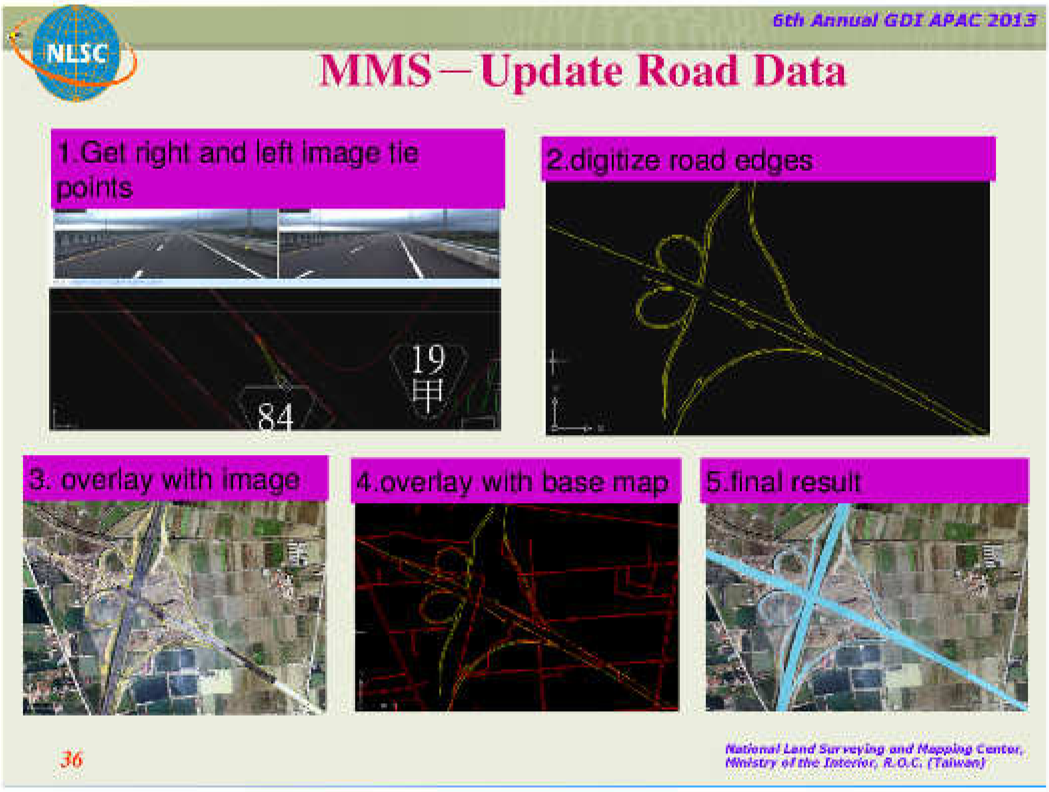


Photos taken by UAV(4)

- **Support Directorate General of Highways, MOTC(THB) to get road damage information on 2013**

3D surround View

Photo Mosaic Results



MMS－Update Road Data

1.Get right and left image tie points

2.digitize road edges

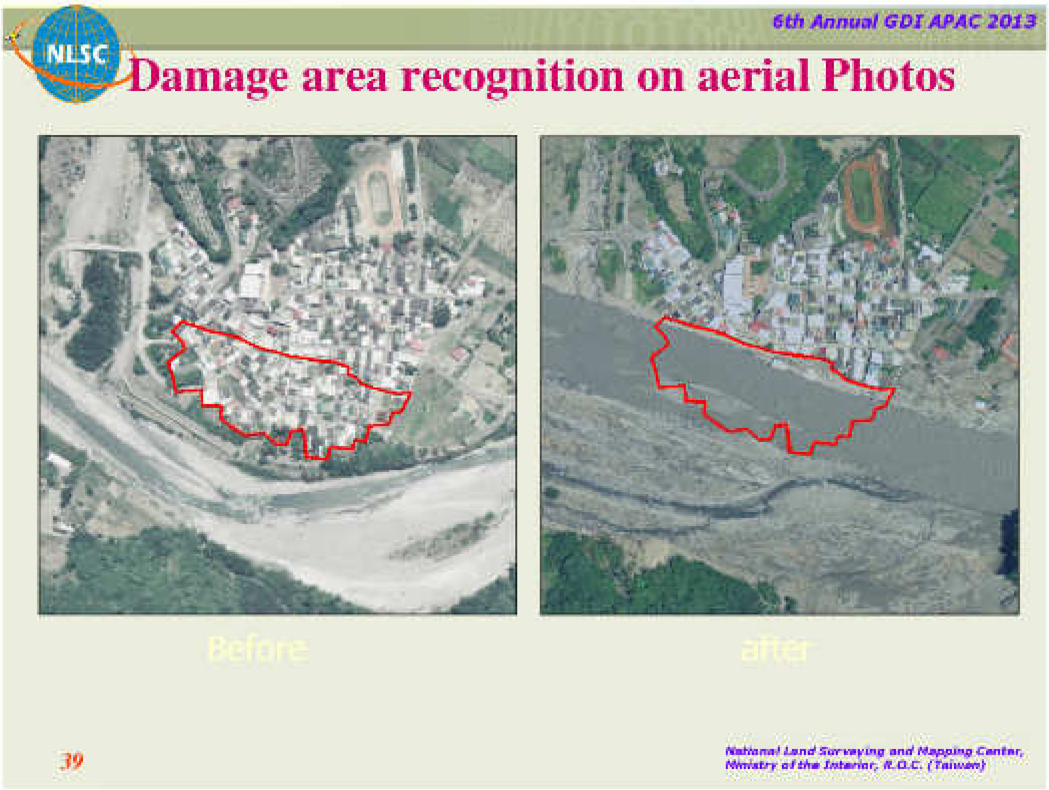
3. overlay with image

4.overlay with base map

5.final result

Support on Decision Maker

Disaster- Typhoon Morakot



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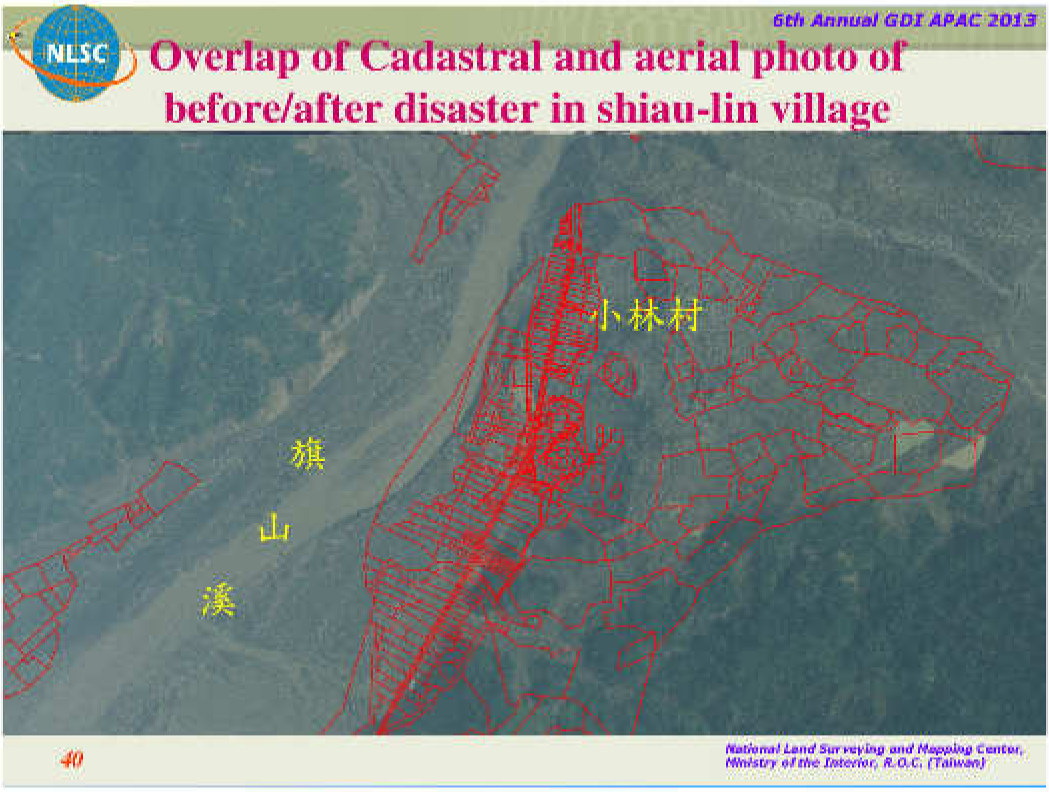
Damage area recognition on aerial Photos

39

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)



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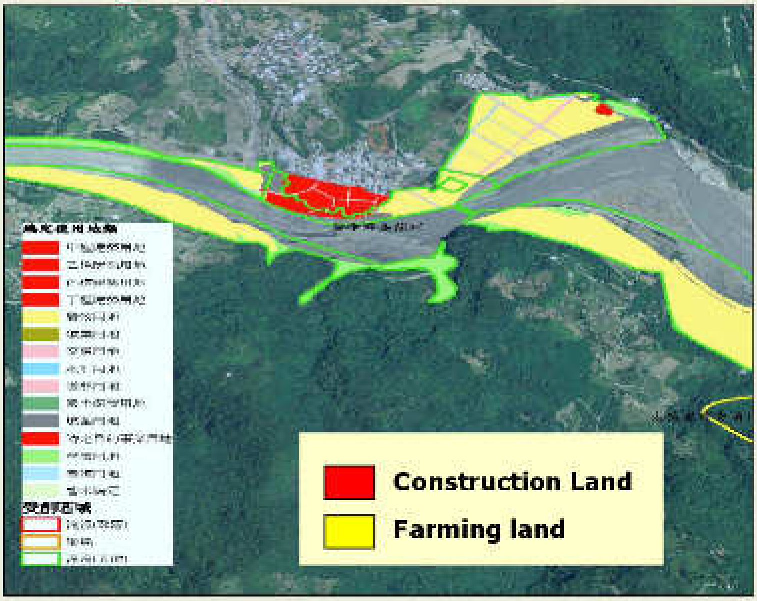
Overlap of Cadastral and aerial photo of before/after disaster in shiau-lin village

40

National Land Surveying and Mapping Center, Ministry of the Interior, R.O.C. (Taiwan)

Zoning maps and Land use restricted maps



SafeTaiwan-THB

倉儲模式

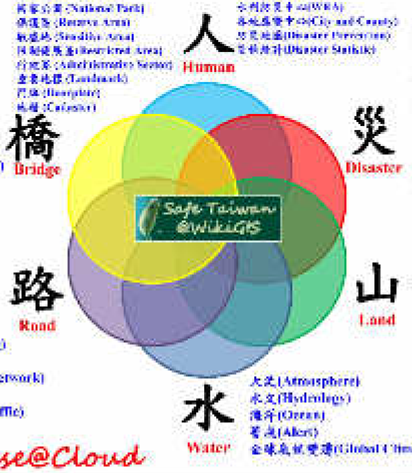
GeoWarehouse Model

Remodel
as you want

交通部(MOTC)
公路總局(THB)
鐵路局(TRA)
高工局(Freeway)
營建署(CPA)
縣市政府(City and County)
橋梁與隧道(Bridge and Tunnel)

平時(Peacetime)
國土規劃(National Development)
都市計畫(Urban Planning)
土地利用(Land Use)
國家公園(National Park)
保護區(Reserve Area)
敏感區(Sensitive Area)
限制發展區(Restricted Area)
行政區(Administrative Sector)
重要地標(Landmark)
門牌(Doorplate)
地籍(Cadastre)

災時(Disaster Happening)
中央災害應變中心(CEOC)
土石流防災中心(SWCB)
公路防災中心(THB)
水利防災中心(WRA)
各地應變中心(City and County)
防災地圖(Disaster Prevention)
災情統計(Disaster Statistic)



風災(Typhoon)、水災(Flood)
震災(Earthquake)
旱災(Drought)、寒害(Cold Damage)
土石流災害(Debris Flow)
地質災害(Geological Hazard)
火災(Fire)、爆炸(Explosion)
核災(Nuclear Disaster)
公用氣體與油料管線(Gas & Fuel)
輸電線路災害(Power Line)、礦災(Mine)
空難(Air Crash)、海難(Shipwreck)
陸上交通事故(Traffic Accident)
森林火災(Forest Fire)
毒性化學物質災害(Toxic Chemical)
全球災害警示(Global Disaster Alert)

國道(National Highway)
省道(Provincial Highway)
縣道(County Highway)
鄉道(Village Street)
高鐵(High Speed Rail)
臺鐵(Taiwan Railway)
北捷(TRTC)、高捷(KRT)
飛航(Flight)、海運(Shipping)
電力網路(Power Network)
電信網路(Communication Network)
交通阻斷(Traffic Block)
即時交通資訊(Real-time Traffic)

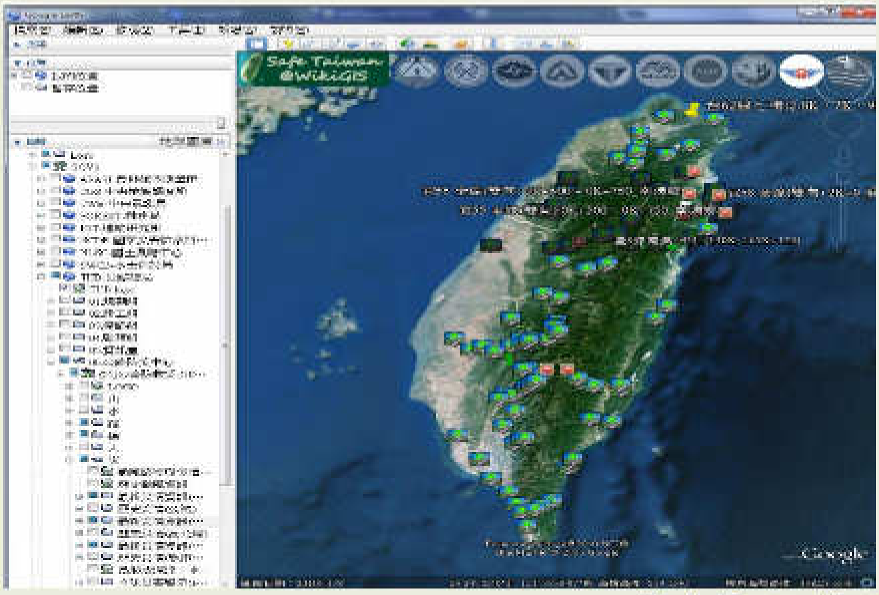
地貌(Landform)
地形(Terrain)
地質(Geology)
地震(Earthquake)
海嘯(Tsunami)
火山(Volcano)
電子地圖(E-Map)

大氣(Atmosphere)
水文(Hydrology)
海洋(Ocean)
警戒(Alert)
全球氣候變遷(Global Climate Change)

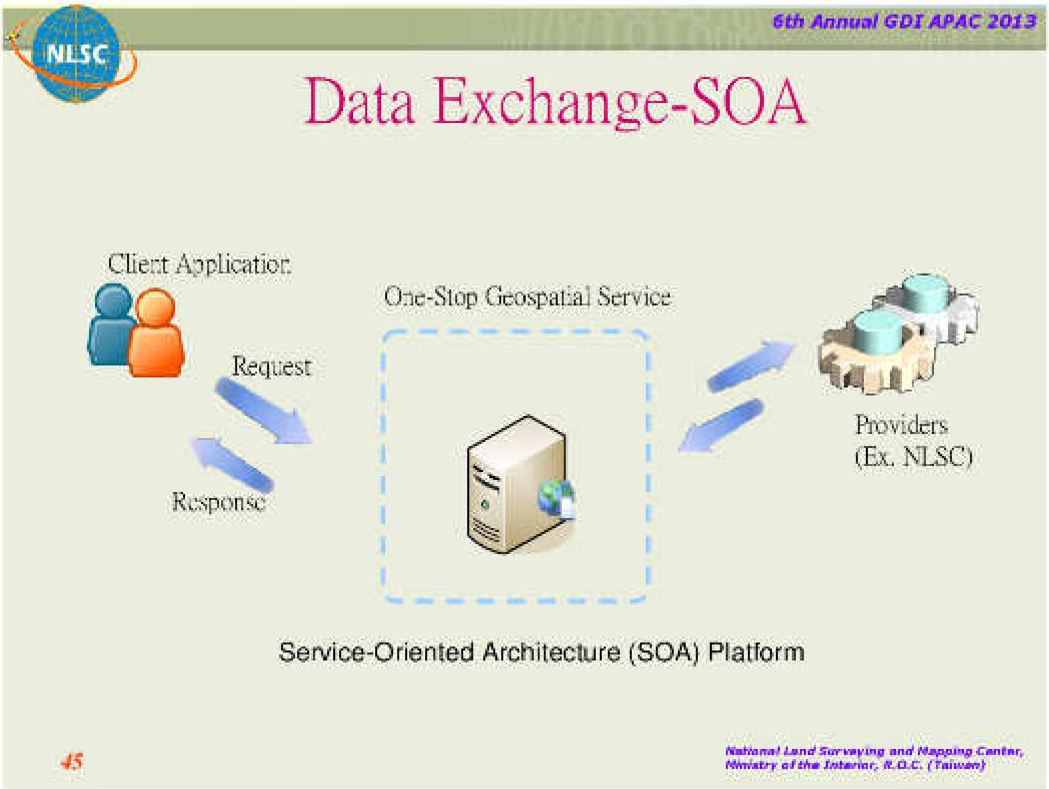
GeoWarehouse@Cloud

Designed by Chen Shao-Chang

SafeTaiwan-THB



Working with multiple agencies



Data Exchange-SOA

Client Application

Request

Response

One-Stop Geospatial Service

Providers
(Ex. NLSC)

Service-Oriented Architecture (SOA) Platform

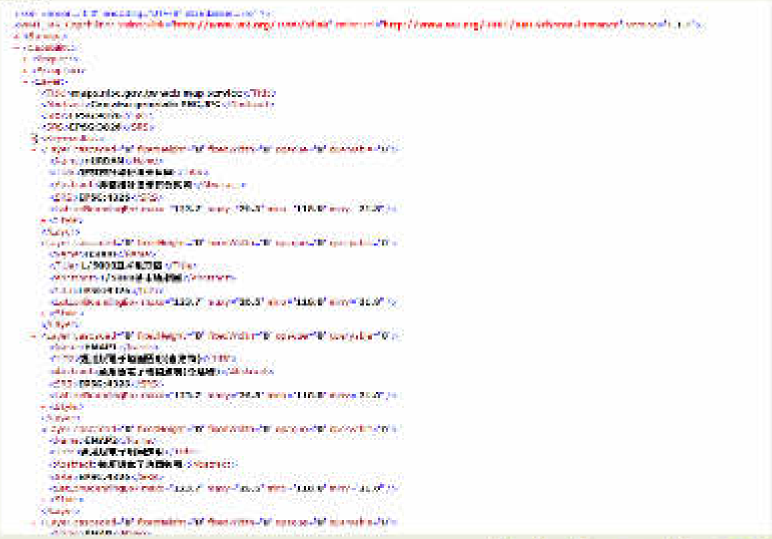
Data Exchange-Real Data

- **Usually common file format**
  - **ESRI -ShapeFile**
  - **AutoCAD-DXF**
  - **Microstation-DGN**
  - **Mapinfo-Tab/MID, MIF**
  - **Text-XML, CSV**

Encoding Problem

Data Exchange-Web Enhance

- **NLSC-WMS**



NLSC Data Query and Supply System

SPOT

Ortho Photo

Administrative boundary

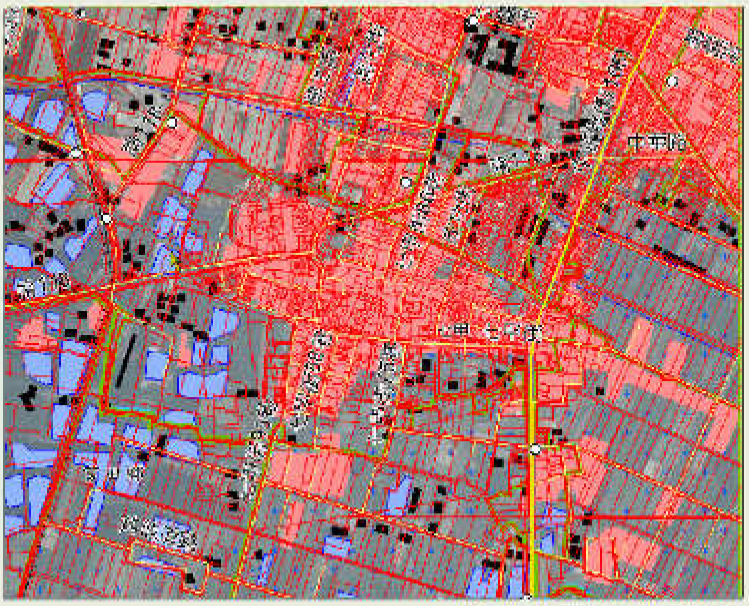
Control data

Land section data

Transportation Network

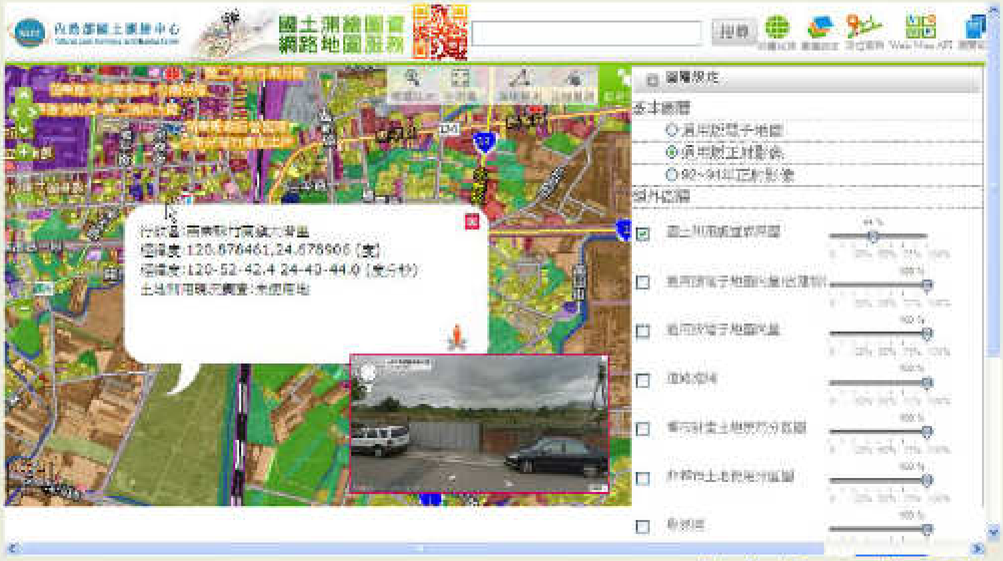
Topographic map

Cadastral Map



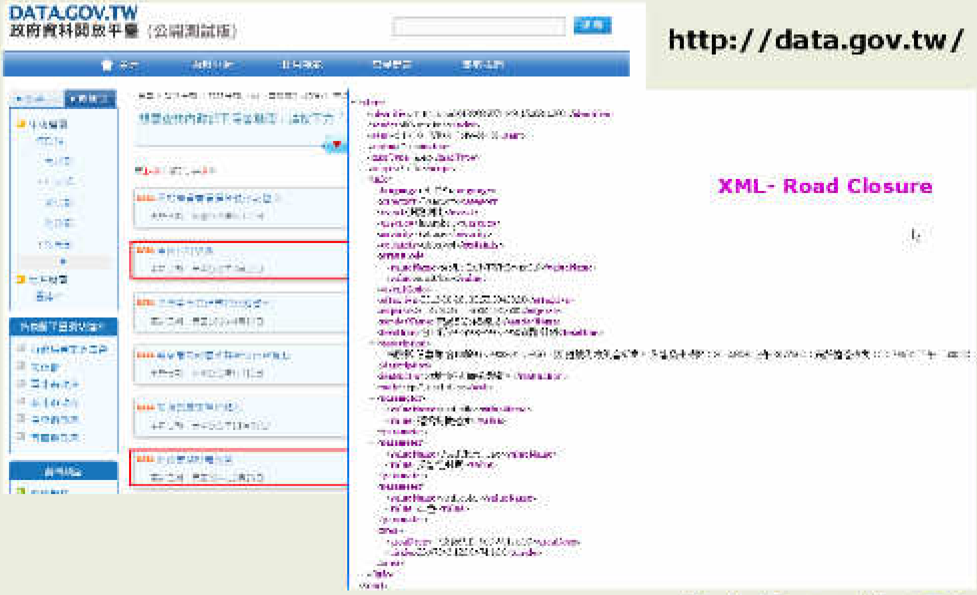
National Land surveying and mapping information web map system

- http://maps.nlsc.gov.tw/



The future for Taiwan's Geospatial Information

Open Data



DATA.GOV.TW
政府資料開放平臺（公開測試版）

http://data.gov.tw/

XML- Road Closure

TGOS Cloud

- Will be available in 2014 for G2G,G2B and G2C

Integrate and use various governmental achievements map data, providing regularly updated information.

Provides a standardized tile cache, various agencies can use it directly

Provides fast and stable network map component (TGOS MAP API) for Web and mobile usage

What should we do?

- Support OGC Standard-WMS,WMTS,WFS….
- Decision Make support-SOA……
- Make the Data up to date

  Get Images as soon as possible when disaster happens
- Mobile Solution

6th Annual
GDI APAC 2013:
Geospatial Defence &
Intelligence APAC 2013

Thanks for your attention