

# Survey and Analysis of the Asian Remote Sensing Market Aerial and Spaceborne

Study Period 2006-2016



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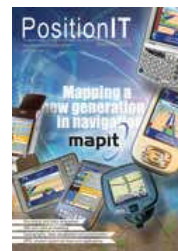
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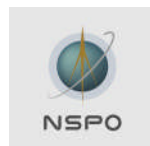
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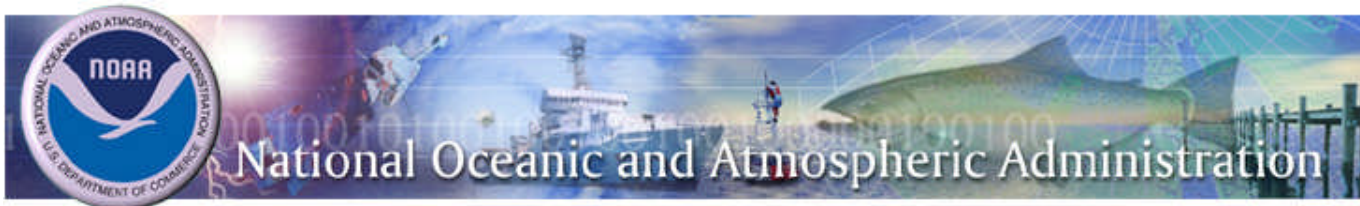


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**Background Cover:** Hubei Province, China - High resolution image of the Three Gorges Dam taken by DigitalGlobe's QuickBird - Acquisition Date: October 24, 2003 – ***Imagery Courtesy of DigitalGlobe***  
**First Side Image:** Shanghai, China – High resolution image in Shanghai taken by DigitalGlobe's Quickbird – Acquisition Date: June 5, 2005 – ***Imagery Courtesy of DigitalGlobe***  
**Second Side Image:** River Brahmaputra, Delta Region at Tongi Bangladesh, 56 Meter, ResourceSat 1 – Acquisition Date: December 4, 2006 – ***Imagery Courtesy of NRSA/ISRO***



# NOAA's Satellite and Information Service

## *Survey and Analysis of the Asian Remote Sensing Market Aerial and Spaceborne*

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[www.globalinsights.com](http://www.globalinsights.com)

Prepared By:

**Global Marketing Insights, Inc.**

6801 Brecksville Road, Ste 206

Independence, Ohio 44131

Phone: 216.525.0600

Fax: 216.525.0601

[www.globalinsights.com](http://www.globalinsights.com)

Soft copies of this study available at [Global Marketing Insights, Inc. website](http://Global Marketing Insights, Inc. website) and the NOAA website at [www.licensing.noaa.gov](http://www.licensing.noaa.gov). For information concerning the study please contact Global Marketing Insights, Inc. at the above number or email: [info@globalinsights.com](mailto:info@globalinsights.com)

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The hope is that the results of this study will inform and provide input for discussion concerning the remote sensing industry. It is the largest Asian focused remote sensing study completed to date, studying ten-year trends providing business information and current statistical information. It also provides a representative sample of the Asian remote sensing community regarding:

- Technical Trends
- Political, Economic, Environmental Trends
- Revenue Trends
- Imagery Usage
- Specific Views into Asian Satellite and Government Remote Sensing Sectors

Eight sectors of the Asian Remote Sensing community were studied and many of these inputs are included in this report.

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# 1 Executive Summary- Asian Aerial and Spaceborne Study Overview

In September 2004, the National Oceanic and Atmospheric Administration (NOAA's Satellite and Information Service) contracted with Global Marketing Insights, Inc. to provide a comprehensive review of the international remote sensing market for aerial and spaceborne sensors based upon specific requirements. By 15 August 2005, 1,437 online surveys and two hundred fifty (250) personal interviews had been completed. These on-line surveys and interviews provided a valid sample from the following eight remote sensing project sectors:

- Aerial Film
- Aerial Digital
- Aerial Sensor
- Satellite
- Software/Hardware
- Commercial End User
- Government End User
- Academic End User

The survey results represented global input, with the largest number of respondents from the US, Canada, and Europe (hereafter referred to as the **Western Study**).

In November 2006, Global Marketing Insights, Inc. concluded the Asian market study which produced four hundred eight (408) completed online survey respondents and fifty (50) interviews. The Asian and Australasian Countries (hereafter referred to as the **Asian Study**) targeted by the survey included China, Japan, Russia, Mongolia, Hong Kong, Singapore, South Korea, Brunei, Philippines, Nepal, India,

Bhutan, Bangladesh, Myanmar, Laos, Thailand, Taiwan, Cambodia, Vietnam, Malaysia, Indonesia, Sri Lanka, and Australia with the response rates listed in Table 1 in the Appendix. This report summarizes the findings of the Asian Study as required by NOAA and provides some comparison to the findings of the Western Study.

## Respondent Overview

There was quite a difference between the Western and Asian respondents' experience levels. Over half of the Asian respondents possessed less than ten (10) years of professional experience, whereas over half of the Western respondents possessed greater than sixteen (16) years of experience. The Asian professional position selections were also aligned with their years of experience, with again almost half of the Asian respondents in Technical Analyst and GIS Analyst positions, compared to over half of the respondents in the Western Study being CEO/Presidents and GIS managers.

The study comparisons point out the age differences between a somewhat younger remote sensing Asian workforce than the Western workforce respondents. The main selection of analytical professional positions by the Asian respondents is in line with the years of experience percentages. This response was influenced by a high level of participation from the Indian Hardware/Software Sector.

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This sector had a much higher response rate than the Western Study Hardware/Software Sector, demonstrating a greater focus in the geospatial technology areas in the Asian marketplace. See Figures 1 and 2 in the Appendix for a detailed breakdown of the Asian Study respondents experience and professional position selections from Asia.

The Government and Commercial Sectors provided the highest number of responses in both the Western and Asian studies. However, the Asian responses in the Satellite and Hardware/ Software Sectors were double those of the same sectors in the Western Study. The large response from the Satellite Sector in Asia supports their ever-growing presence in satellite and remote sensing technical development arenas. Based on the Asian interviews, the strength of the Asian participation in the Satellite and Hardware/Software Sectors is due to the strong technical focus of the Asian marketplace on developing satellites and related technologies. During the coming decade, 47 percent of the planned launches will be by Asian countries, whereas less than 10 percent of the planned launches will be US-based (Stoney, 2004). For example, in 2005 China launched the microsatellite Beijing-1, which monitors environmental factors in preparation for the 2008 Beijing Olympic Games and is part of the Disaster Monitoring Constellation (DMC). With two payloads, Beijing-1 is the most advanced of the DMC constellation. One payload provides a mid-resolution (32 meters) with an ultra-wide 600km (375 mile) imaging swath; the other provides high resolution (4

meters) panchromatic images of a 24km swath.

A strong response from the Hardware/Software Sector and the personal interviews in that sector supported the Asian capability of, and high levels of interest in, continuing to provide outsourcing capacity to the rest of the world.

Compared to the Western Study, there was a much lower response from the Asian Aerial Sectors. This lack of input could be indicative of the high level of Asian government management of the aerial remote sensing industry. See Figure 3 in the Appendix to review the detailed responses by sector.

In addition to providing extensive technical and business information, the Asian respondents selected *technical, political, economic, and environmental trend* information that they felt would have the greatest impact on their businesses in the coming decade.

#### Technical Trends

The Western respondents most frequently mentioned *technical advances* centered around improvements on existing technology, rather than the development of new technologies. This included the "Integration of Existing Technologies," which for purposes of this study is defined as the integration of presently independent and/or semi-independent technologies to generate a geospatial product. However, the Asian respondents ranked "Technology Integration" third, selecting "Greater Ground Resolution" as their first choice for what they believe will most impact their use of remote sensing data.

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This choice was followed closely by “Improved Airborne GPS Units.” “Greater Ground Resolution” was the number one selection by the Asian Satellite and all End User Sectors.

The Western Study Government respondents selected “Technology Integration” and “Greater Ground Resolution” as having the greatest impact on their use of remote sensing data in the future, while the Asian Government respondents selected “Improved Airborne GPS” and “Greater Ground Resolution,” with “Technology Integration” ranking fifth in their selections. The “Improved Airborne GPS” selection by the Asian government respondents is not unusual, given their high level of involvement in aerial acquisitions in their countries.

The Western Study respondents in the Satellite Sector also selected “Technology Integration” and “Greater Ground Resolution” as having the greatest impact on their businesses. Asian Satellite Sector respondents chose “Greater Ground Resolution” and “Improved DEMs and Ground Control” as their top selections.

The Aerial Industry in the Western Study also selected “Technology Integration” as the main trend impacting them technically. The Asian Aerial Sector respondents were focused in the next five years on “Better Processing Software, Improved IMU Units, and Stereo Imagery.” The Asian Aerial Sensor respondents were the only group selecting “Technology Integration” as having a near-term technical impact on their business.

### Political, Economic and Environmental Trends

Respondents in both the Western and Asian studies were asked to select *Political, Economic, and Environmental Trends* that will impact their businesses during the next decade. Western Study respondents selected “National Defense/Homeland Security” as the main impact on their usage of remote sensing data (primarily influenced by the US and Canadian responses). This is not an unusual response, given not only the surge of interest in geographic information systems (GIS) and the corresponding demand for the data needed to populate these databases, but also the influence of counter terrorism programs in the US and the increase of data usage supported by online mapping services such as Google Earth, and Microsoft Virtual Earth.

Overall, Asian respondents selected “Remote Sensing Data Becoming a Commodity” as the main trend which would impact their use of remote sensing data, with one major exception. None (0%) of the Asian Satellite respondents selected “Remote Sensing Data Becoming a Commodity.” The Asian Satellite Sector respondents chose “National Defense/Homeland Security” as the top trend impacting their future. Keep in mind that in the Western Study, “Remote Sensing Data Becoming a Commodity” ranked in the top four selections by both data users and data producers, demonstrating their awareness that this trend, if realized, could have a dramatic impact on the commercial end-users and the Hardware/Software value added sector, due to data becoming more standardized and easier to purchase at -

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lower prices. This same trend may cause concern over their profit margins in future years to the data providers.

Ranking third in the Asian Study and fifth in the Western Study is "Global Warming," supporting what we are seeing in worldwide legislative bodies that are mandating and funding remote sensing applications focused on global warming applications. "Required Cadastral Mapping," which is greatly influenced by the European Union's country admission requirements, ranked third in the Western Study.

It is interesting that in the Aerial Sectors for both the Western and Asian studies, one of their main selections of a high impact trend was "Outsourcing/Privatization." During the past year in the West, outsourcing their data processing and value-added services has become more common as aerial mapping companies have looked for new ways to remain competitive. Wages in Asian countries are lower than in the US, Europe and Canada, and with the ability to electronically transfer large volumes of data quickly, it has become increasingly attractive to establish overseas operations. The selection of this trend in both studies demonstrates its impact on both the Western and the Asian Aerial businesses.

Another key selection by the Aerial Sectors in both studies was the "Open Skies Initiative." The Open Skies Treaty signed (in Helsinki, Finland in 1992) by a number of countries allows the operation of aircraft and sensors, without undue hardship, in the airspace of another nation in order to monitor various types of military activity.

### Data Usage Comparisons

*Satellite Data Usage:* Generally, remote sensing data usage selections were very similar between the Western and Asian respondents. The data usage comparison points out the higher level of usage of spaceborne instruments in Asia, with over 80 percent of the respondents selecting satellite data, compared to 68 percent of the respondents in the Western Study selecting satellite data usage.

Asia's highest use of satellite imagery is in the mid-resolution category with Landsat 5 and 7 (due to their long history, low cost and availability, especially in China and Australia), followed by India Remote Sensing (IRS) Resourcesat and IRS 1C and 1D. The largest user of data in the mid-resolution category among Asian respondents was the Government Sector for all types of mid-resolution data, followed by the Commercial and Academic Sectors, whose highest level of data usage was Landsat 7, which was followed closely by Resourcesat. The Hardware/Software Sector's highest data usage was IKONOS and QuickBird. The use of Asian Satellite data was, not surprisingly, higher in this study than in the Western Study.

*Aerial Data Usage:* An additional distinction was made during the Asian Study between Aerial Digital data and Aerial Digital from Scanned Film data. The data usage differences between the two studies are apparent in the use of Aerial data, where 30 percent of the Western Study respondents selected Aerial Data, compared to only 16 percent of the Asian respondents selecting the same category.

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Given the more stringent flight regulations in Asia versus other parts of the world, this difference is understandable.

In many of the Asian countries, the government manages most of the remote sensing aerial acquisitions and data distribution. When an individual country's government does allow commercial flying, it takes years for a commercial business to obtain the capital to invest in airplanes and cameras and to obtain the local expertise for the flight management side of the business. Sometimes retired military personnel are seen as the only individuals capable of effectively managing aerial companies.

Photogrammetry is also a much more utilized technology with the Western Study respondents due to the fact that it evolved from military scientific usage and has been utilized for over a century. In addition, many of the Western Study respondents have well-developed civilian imagery programs that require the use of Aerial Data (i.e., the U.S. Department of Agriculture's National Agriculture Imagery Program, or NAIP). Over the years, Western Study respondents have also benefited from large public works projects which uphold and encourage the long-term use of aerial imagery, such as the extensive transportation and highway projects in the US and Europe. See Tables 2 and 3 in the Appendix for additional data usage detail and comparison.

#### Remote Sensing Product Type Usage

Although the Western and Asian respondents ranked usage of GIS Data and Processed Imagery consistently, there was a large variance in the use of

Raw Imagery, with the Asian respondent usage far surpassing that of the Western Study. This can be interpreted in two ways: 1) The high level of expertise in the technical level of the respondents for the Asian Study supports their ability to work with raw imagery, and they like to work with raw imagery in order to apply their own algorithms for data processing; 2) As stated by respondents during interviews, "raw imagery is typically a less expensive product and sometimes the only viable option for our limited budgets." Figure 4 in the Appendix highlights the responses for Product Type Usage.

#### Projected Budgets

The projected expenditures for data by the Asian Government Sector equal the projected Government expenditures for data in the Western Study. The Asian Government Sector's projected employee levels for those dedicated to remote sensing activities also depict a slight increase in personnel levels at the medium-sized organization level, with a slight decrease projected in their larger organizations' personnel levels over the next five years. This decrease could be indicative of the release of some government-sponsored satellite programs to quasi-commercial operators. This can be seen in the relationship of the India Department of Space and the India Space Research Organization (ISRO) with their commercial arm, Antrix Corporation Limited, as well as that of the Chinese Ministry of Science and Technology (MoST) and its commercial arm, Landview Mapping Information Technology Co., Ltd., which manages the Beijing-1 microsatellite program.

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Overall, the Asian end user community also shows slight budget increases during the coming decade. These budget increases, coupled with a desire for "Greater Ground Resolution" products, bodes well for the satellite industry with respect to the increased usage of high- and mid-resolution data products. Asia is still constrained by many fragmented economies which makes it difficult for many countries to afford the data products they desire. Based on Asian respondent interviews, the highest increase in usage of remotely sensed data products appears likely to be in the Mid-Resolution category (perhaps with Resourcesat and SPOT, given the age and health status of Landsat 5 and 7). Aerial data usage will continue to grow in the Government Sector, and aerial data usage for the Commercial Sector will be limited by data availability.

#### Remote Sensing Applications

The Asian respondents are highly focused on environmental uses, regardless of whether the source of the remote sensing data is aerial or spaceborne instruments.

For example, in October, 2006, at the Office of the State Council of the People's Republic of China meeting in Beijing, the Chinese Space Agency reported that breakthroughs have been made in a large number of key application technologies; infrastructure facilities have been strengthened; the technological level and operational capabilities of the application system have been notably improved; and a national satellite remote-sensing application system has taken shape. China has built and improved the National Remote-Sensing Center,

National Satellite Meteorology Center, China Resources Satellite Application Center, National Satellite Oceanic Application Center and China Remote-Sensing Satellite Ground Station, as well as satellite remote-sensing application and certification institutes of relevant state departments, provinces and cities. An optical remote-sensing satellite radiation calibration station has also been completed and put into operation. Satellite remote-sensing application systems have been put into regular operation in many important fields, particularly in meteorology, mining, surveying, agriculture, forestry, land mapping, water conservancy, oceanography, environmental protection, disaster mitigation, transportation, and regional and urban planning. They are playing an important role in the nationwide land resources survey, ecological construction and environmental protection, as well as in major state projects, such as the South-North Water Diversion Project, the Three Gorges Project (as seen on the cover of this study), and the Project to Transmit Natural Gas from West to East.

In addition, the Chinese Academy of Science is developing advanced aerial hyperspectral imaging systems focusing on precision agriculture, mineral exploration, water resource management and urban investigation. As recently as April, 2006, China successfully launched a remote sensing satellite known as the Remote Sensing Satellite No. 1 or Yaogan 1. This satellite will be mainly used for scientific experiment, survey of land resources, appraisal of crops and disaster prevention and remediation.

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The continuing development of satellite payloads such as these allows Asia to maintain a strong position in addressing the environmental issues that confront them, from tsunamis to earthquakes. A complete listing and comparison of data uses for the Western and Asian Study is located in Table 4 in the Appendix.

Remote Sensing Software Usage: As with the Western Study, the Asian selections for Software Usage ranked the leaders, ESRI and ERDAS Imagine, as one and two respectively across all the user sectors. The Asian results highlight a much more fragmented usage pattern than the Western respondents. Figures 5 and 6 in the Appendix highlight the comparisons

between the Western and Asian software selections.

Overall, the health and interest of the Asian marketplace in the remote sensing profession is strong. The Asian remote sensing sectors studied are primarily focused on the spaceborne side of the remote sensing industry. The young workforce in all of the remote sensing sectors bodes well for the long-term growth and sustainability of the profession. Asia is well positioned in terms of providing technical and processing support to the rest of the world, as well as growing their own capabilities in the coming decade as more satellites are launched that will provide increased data availability.



## 2 – Asian Remote Sensing Satellite Sector Study Results

Of great importance to the worldwide and Asian remote sensing profession is the need for both high and mid-resolution satellite imagery. Dramatic changes have occurred in the past decade in the Satellite Sector, not only in the number of “quasi-commercial” satellite programs and launches, but also in terms of sensor resolution. The satellite industry has moved from commercially providing mid-resolution, multispectral, 28 meter data to providing high resolution, .41meter panchromatic data. This new data accessibility has also created many opportunities for application and software development.

The number of Asian respondents from the Satellite Sector was double that of the Western Study respondents. The Satellite Sector respondents were primarily from India, China, and Australia and held professional positions as GIS Analysts and Managers with

experience levels spread evenly in five year increments, beginning with six to ten years of experience.

The Asian respondents in the Satellite Sector provide an optimistic view of the Asian satellite industry. Both the Western and Asian studies also indicated strong government support of the commercial satellite industry. The contract awards by the US federal government agency, National Geospatial-Intelligence Agency (NGA) to Digital Globe and OrbImage (now GeoEye) provided financial support to the satellite sector in the US which was vital to maintain industry growth. This is not unlike the support of the European government in the coming launches of Pleiades 1 and 2 and of the Indian government supported launches, most recently, of IRS Resourcesat 2 and CartoSat 2.

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### 2.1 Satellite Sector Projected Revenues and Employees Levels

In terms of revenue projections, just over 40 percent of the Asian Satellite Sectors stated that revenue projections were not applicable to their businesses in either the current or five year projections. This selection demonstrates just how strong the government support of the Asian satellite programs really is. Many of the Asian satellite companies have developed commercial arms of their space programs. such as Antrix Corporation Limited (India) and Korea Aerospace Industries (KAI Image, Inc.), or are in the process of developing

these commercial arms. These new organizations do not yet have a complete commercial profit and loss focus, and they realize (as has the US satellite sector) that the commercial satellite sector cannot stay afloat without the support of government contracts. With this stated, however, none of the US Satellite Sector respondents selected the “not applicable” category for revenue projections. The US satellite companies are developing viable commercial companies, -

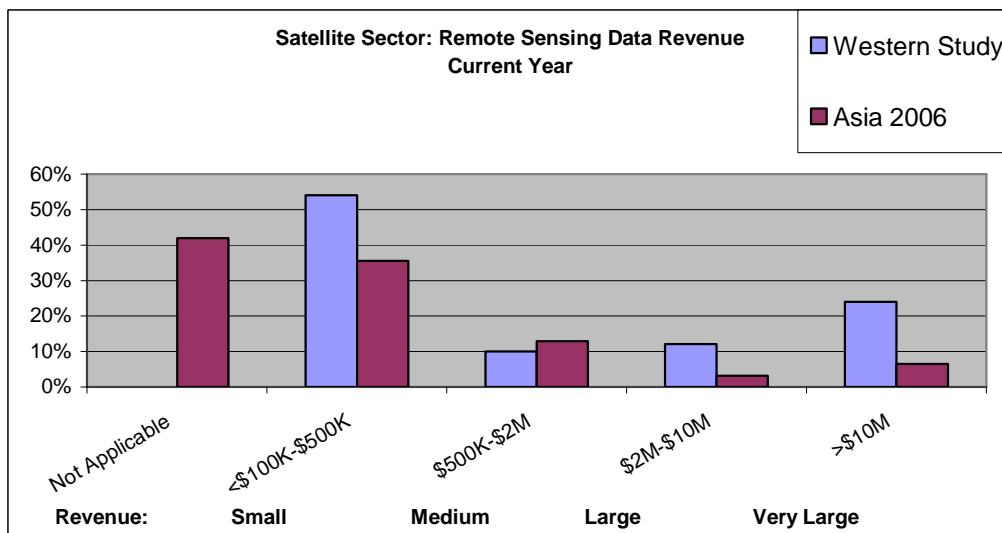
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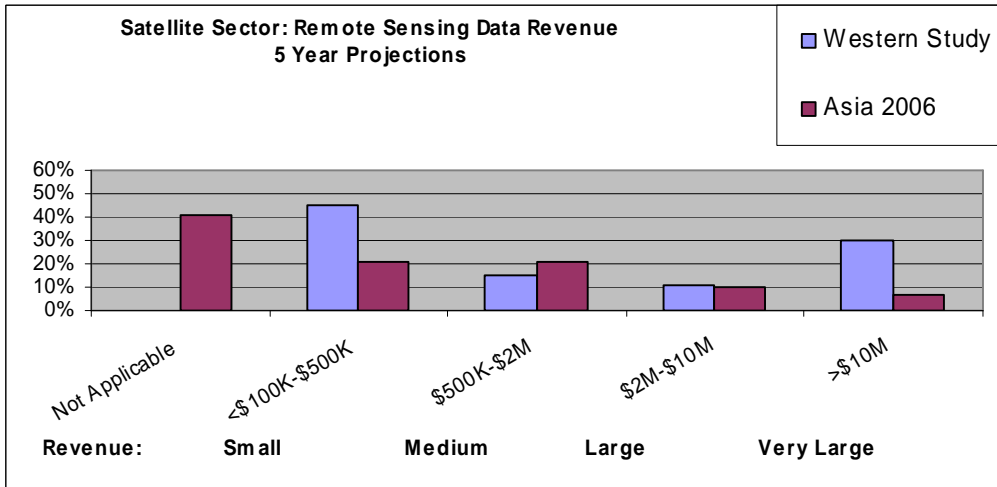
as demonstrated by GeoEye when the NASDAQ Stock Market, LLC approved its application to list its securities under the symbol, "GEOY" on September 14<sup>th</sup>, 2006.

The Asian Satellite Sector data also suggests a continuing focus in Asia to maintain their organizations through government investments in developing and launching new satellite sensors (at least for the coming decade). This investment phase will allow the Asian Satellite Sector to actively compete in the world market without the constant pressure from investors for increased profit margins. Figures 7 & 8 highlight the comparison of the Western and Asian Study responses and show that most of the growth for Asia will continue to be provided through government support and will gain momentum over the next few years in medium and large-sized organizations.

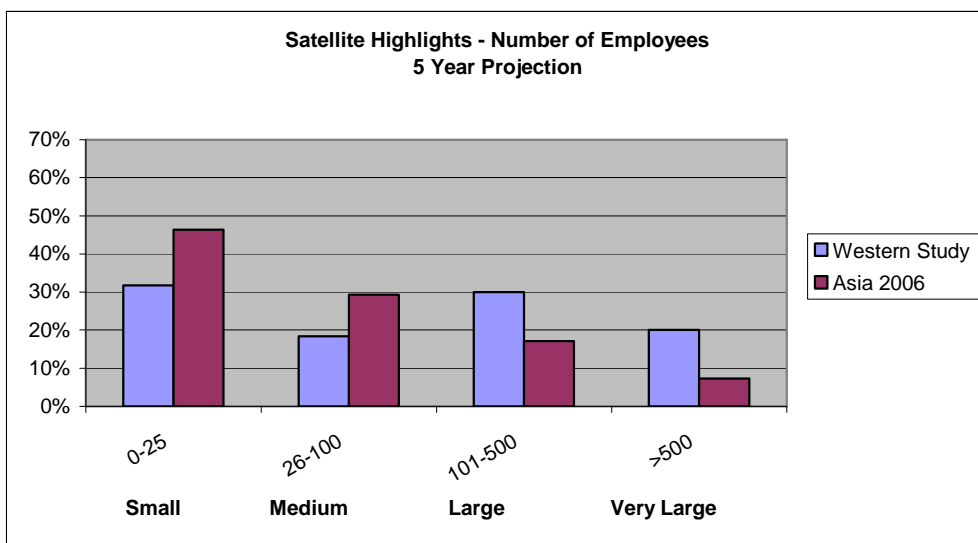
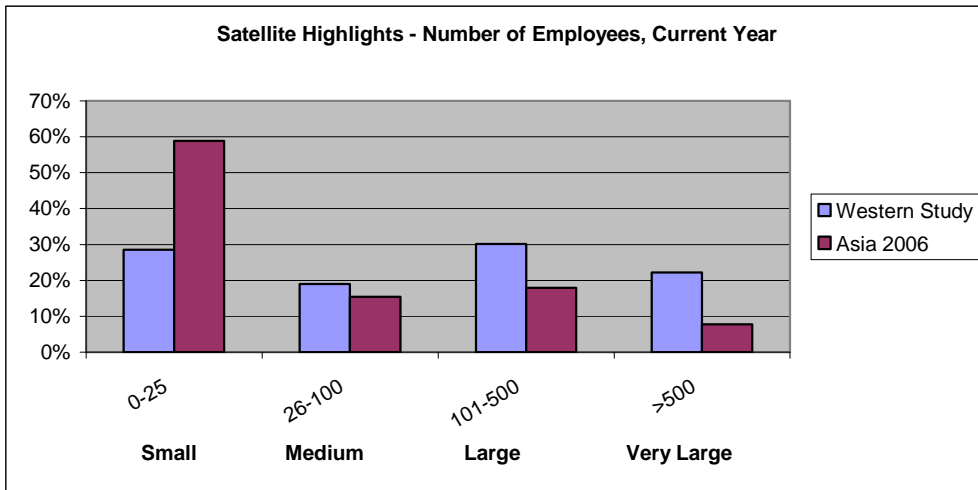
In terms of organization size, the Asian satellite industry will continue to maintain smaller, more nimble organizations, compared to the larger satellite organizations of the Western respondents. Based on their employee level projections and interviews, the Asian Satellite Sector respondents indicated a move from small to medium-sized organizations as their planned satellite programs move from the planning phases into full production. Although the Asian growth projections for revenue and employee levels lags behind that of the Western Study, their satellite planned launch projections exceed those of the West. The employee projection comparison between the US and Asian Satellite Sector supports the revenue pattern discussed previously, with the greatest growth occurring in the medium-sized organizations.

**Figures 7 & 8: Satellite Sector – Revenue from US Company/Affiliation (USD)**





**Figures 9 & 10: Satellite Sector – Number of Employees, Company**



## 2.2 Satellite Sector Remote Sensing Applications

The Asian respondents in the satellite sector are currently focused on environmental applications and are somewhat less focused on security and infrastructure applications.

Satellite Data Application	Western Study 2005	Asian Study 2006
Environmental Monitoring/Management	50%	53%
Natural Resource Management	43%	58%
Land Management/Development	38%	49%
Forestry	36%	38%
Security (National Defense/Homeland Security)	39%	25%
Utilities	27%	24%

**Table 5: Satellite Sector – Satellite Data Applications**

As indicated in the interviews, this is due to the fact that they have much less data available to them that provides the type of data needed for those applications; and in most cases, security and infrastructure applications are managed by their governments, which manage aerial acquisitions. Environmental- and security-focused applications were most frequently selected by the Western Study respondents.

However, it should be noted that there is a great deal of overlap in applications, and it is often difficult to categorize a project as a specific application. For example, Land Management uses some of the same data and analysis methods as Sustainable Development, and Utilities use both Engineering and Land Management techniques.

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## 2.3 Satellite Sector Political, Economic and Environmental Trends

Both the Western and Asian Satellite Sector respondents selected “National Defense/Homeland Security Issues” as their number one response. The Asian respondents more often selected “International Trade” and the “Open Skies Initiative” as having an impact on their businesses than the Western respondents.

The Asian Satellite Sector had a much stronger response from the Western Study participants in their view of the impact that “Global Warming” and “Natural Resource Management” would

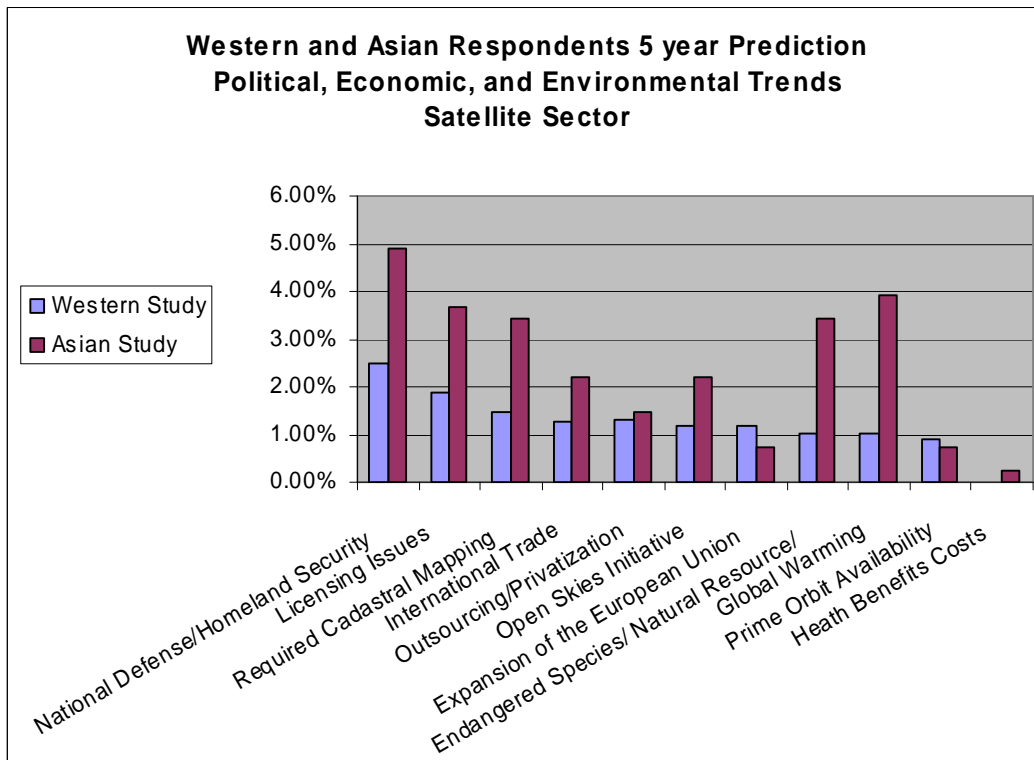
continue to have on their organizations. This difference can be explained because the Asian respondents have planned launches which will provide higher resolution and multispectral instruments as well, thereby allowing them to plan in advance ways in which to address these serious environmental issues. The Western Study respondents were more focused on “Security and Licensing Issues,” which seem more in line with their plans to focus on launching high-resolution instruments.

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“Health Benefits Costs” also appeared in the Asian responses as a future business impact. This response is most likely based on the extremely high cost of health care, especially in China and India. The Chinese Ministry of Health reports that medical care costs are constantly going up far faster than incomes. The Centre of Social Medicine and Community Health in India also reports alarming facts concerning the lack of care facilities for the rural

population and the difficulties caused by rising health care costs and lack of trained personnel for public and private health care facilities. These scenarios have similarities to the health care issues faced by Western Study respondents, but they are much more in the forefront of the thinking by the Asian respondents in the remote sensing profession. Figure 11 further illustrates the comparison of the Western and Asian trend selections.

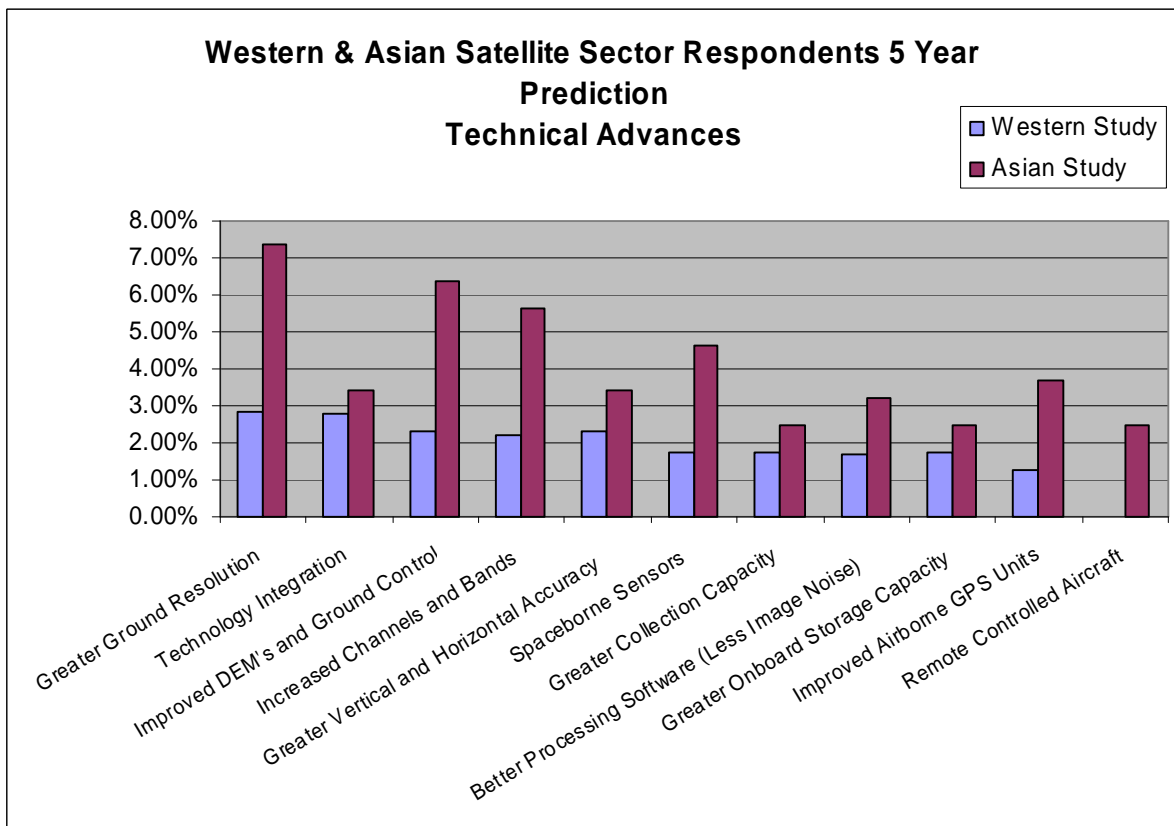
**Figure 11: Satellite Sector-Political, Economic, and Environmental Trends**



## 2.4 Satellite Sector Technical Trends

In comparison to the Western Study respondents, the Asian respondents are extremely focused on basic technologies driving “ground resolution, data storage, and data processing.” These technical trends will continue to be important to their satellite industry as they move rapidly toward becoming a significant force in the global satellite

controls that part of the remote sensing community. Therefore, the advent of an even larger number of “Remote Controlled Aircraft” could decrease the Satellite Sector’s future budgets for high-resolution satellites as governments invest more heavily in aerial-related technologies.



**Figure 12: Satellite Sector-Technical Trends**

data provider community. The Asian Satellite Sector respondents show concern that “Remote Controlled Aircraft” will impact their businesses in the future. The data and interviews suggest the Asian Satellite Sector tends to view itself as competing with the Aerial Sector, which is based on the fact that the government supports and

Keep in mind the Asian survey was completed one year later than the Western Study and during that time, the use of “Remote Controlled Aircraft” (i.e., “Unmanned Aerial Vehicles”) has appeared more in the news media from the Asian Federal/National Civilian government market.

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Both the Chinese and Indian governments are pursuing unmanned tactical aircraft programs and marketing these unmanned systems to friendly nations in Asia and Africa. These aircraft carry payloads such as low-light cameras and airborne video and laser altimeters. These aircraft can provide “continuous surveillance” and be utilized for monitoring areas of environmental concern, such as forest fires and volcanic eruptions. Based particularly

on their response in the on-line surveys and during interviews, the Asian Satellite Sector is paying special attention to the proliferation of “remote controlled aircraft.” Both the Asian Government and the Western Government respondents selected “Remote Controlled Aircraft” as a technical advance that would impact their use of remote sensing in the next decade.

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## 2.5 Satellite Sector Data Usage

When queried about the type of data they utilized, over half of the Asian Satellite Sector selected high and mid-resolution data, such as Quickbird (Digital Globe), followed by Landsat 5 (US), SPOT 5 (France), Landsat 7(US), and MODIS (AVHRR-NASA, US), and SPOT 4 (France). Overall, the response

from the Asian Satellite Sector was more thorough and detailed than the Western Satellite Sector’s response. This level of response indicated a high level of interest in and a promising future for the Asian availability of commercial satellite data.

**Table 6: 2006 Asian Satellite Sector Data Usage**

<b>ASIAN Satellite Data Usage</b>	<b>Sector %</b>
<b>Aerial Products:</b>	
Aerial Dgital from Scan Film Imagery	3%
Aerial Digital from Actual Digital Scanners	-
Aerial Sensor	1%
Aerial Film/Analog	1%
<b>Subtotal:</b>	<b>5%</b>
<b>Satellites:</b>	
<b>High Resolution</b>	
IKONOS (GeoEye – Formerly Space Imaging), US	5%
IRS CartoSat 1 (Antrix Corporation), India	3%
EROS - 1B (ImageSat), Israel	2%
OrbView (GeoEye – Formerly Orblmage), US	3%
QuickBird (Digital Globe), US	8%
SPOT 5 (France)	6%
<b>Subtotal :</b>	<b>27%</b>
<b>Mid-Resolution</b>	
IRS ResourceSat (Antrix Corporation), India	3%
IRS 1C (Antrix Corporation), India	4%
IRS 1D (Antrix Corporation), India	4%
Landsat 5 (US)	7%
Landsat 7 (US)	6%
SPOT 2 (France)	4%
SPOT 4 (France)	5%
<b>Subtotal:</b>	<b>33%</b>
<b>Other</b>	
Disaster Monitoring Constellation (Multi National)	2%
DMC BilSat (SSTL) (Algeria)	-
DMC UK (SSTL) (UK)	-
DMC NigeriaSat 1 (SSTL) (Nigeria)	-
EO-1 (NASA) (US)	2%
MODIS (NASA)	6%
MTI (US)	-
NOAA/AVHRR (US)	5%
NOAA/GOES (US)	5%
PROBA (ESA)	-
RadarSat (MDA) (Canada)	5%
SAC-C (Argentina)	-
TERRA (ASTER) (US)	4%
<b>Subtotal:</b>	<b>29%</b>
<b>ASIAN Satellite Systems:</b>	
ALOS (Japan)	1%
Beijing-1 (China)	1%
CBERS-2 (China and Brazil)	2%
KOMPSAT-1 (Korea)	-
MONITOR-E1 (Russia)	-
RocSat 2 (Taiwan)	1%
Thai Microsatellite (Thailand)	1%
ThaiPhat (SSTL) Thailand	-
TopSat (SSTL) (Thailand)	-
Uribyol (South Korea)	-
Ziyuan (China)	2%
<b>Subtotal:</b>	<b>8%</b>
<b>TOTAL:</b>	<b>100%</b>

### 3 – Asian Remote Sensing Government Sector Study Results

The Asian Government Sector was represented primarily by India, Australia, and Thailand. Their professional positions comprised GIS Analysts, GIS Managers, Technical Analysts, and Technical Managers, with the respondents spread evenly in five year increments up through 20 years of experience. The largest response within the Asian government was the Federal/National Civilian unit; the lowest response was from the Federal/National Defense unit.

About 40 percent of the Asian Government Sector utilizes ESRI software, followed by ERDAS Imagine. The Asian Government respondents indicated relatively low remote sensing software budgets, with over 50 percent of the respondents spending less than \$50,000.00 a year over the next decade.

Based on the Asian Government selections of remote sensing hardware, storage devices, storage space, etc., the respondents appear to operate currently with 50 percent less remote sensing

equipment than the Western Study government respondents.

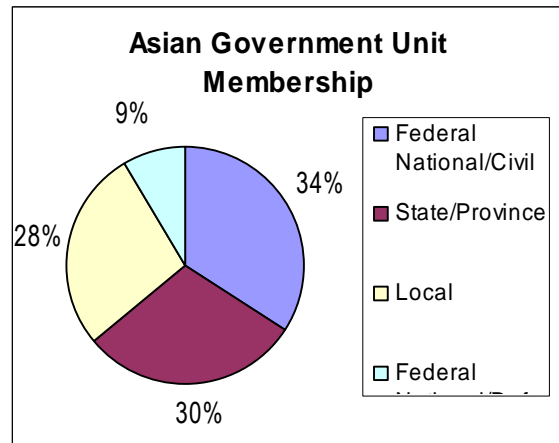


Figure 13: 2006 Asian Government Unit Membership

The type of data purchased most often by the Asian Government respondents was listed as Landsat with 70% of the respondent selection; IKONOS at 37%; and IRS 1C and Aerial Digital data from Scanned Film Imagery both utilized by 29% of the respondents.

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#### 3.1 – Government Projected Remote Sensing Budgets

The Asian governments' support of the Remote Sensing profession is critical to the continuing success of the research and development in their aerial and spaceborne programs. This pattern of government support matches that in the Western Study. Even in the government expenditures for remote sensing data, the Western Study and Asian respondents closely paralleled one another, with the bulk of the

respondents' purchasing data with budgets under \$50,000. Both sets of respondents predict modest increases (approximately 15%) during the next five years. The main difference between the government respondents in both studies is represented by the amount of Asian government investment over the next decade in the development of new -

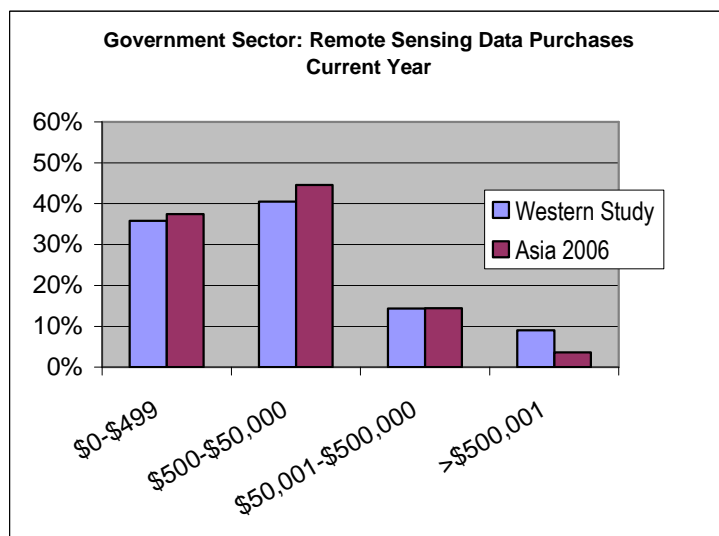
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satellite programs available for civilian and commercial purposes, compared with that projected by the Western Study respondents in the US and Canada.

Other remote sensing budgets (current and five and ten year projections) addressed in the Asian Government Sector included data, hardware, software, and value added services and their overall potential funding for remote sensing funding.

Hardware/Software are projected to remain even, with 65% of the government units purchasing under \$20,000.00/year and 30% spending over \$50,000.00/year.

Asian Government Sector purchases of Remote Sensing Value Added Services also will remain constant over the next decade, with approximately 70% of the government units purchasing under \$20,000.00/year in services and 10% spending over \$90,000.00/year.

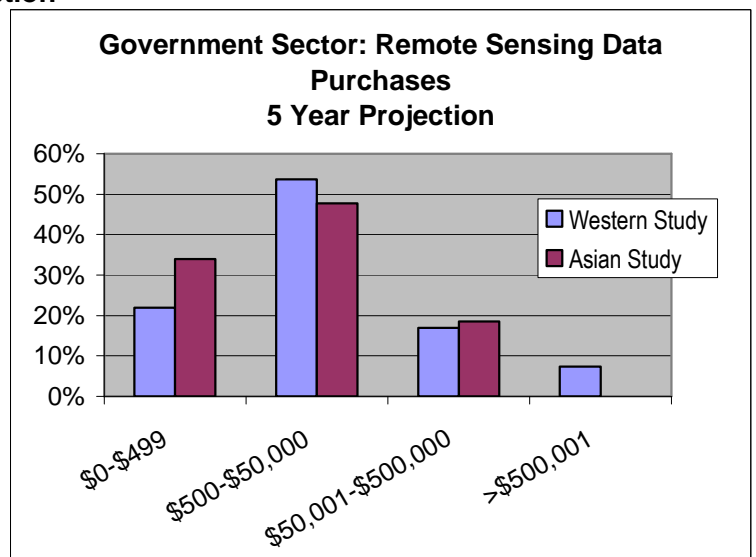


**Figure 14: Government Sector Data Purchases Current Year and 5 Year Projection**

Although the Asian Government respondents do not highlight large commercial budgets, there is a clear indication that their interest and usage of remote sensing technology will continue to grow, along with coming innovations, as long as the Federal/ National Defense and Federal/National Civil Sectors continue to make large investments in remote sensing technology research and development.

The overall remote sensing funding indicates a slight increase (approximately 8 percent) in remote sensing funding over the next decade. Based on the on-line surveys and interviews, this increase in funding will be utilized to purchase additional remote sensing data. The data category was the only budget category which showed an increase over the next decade of approximately 5%.

During the coming decade, the Asian government expenditures for



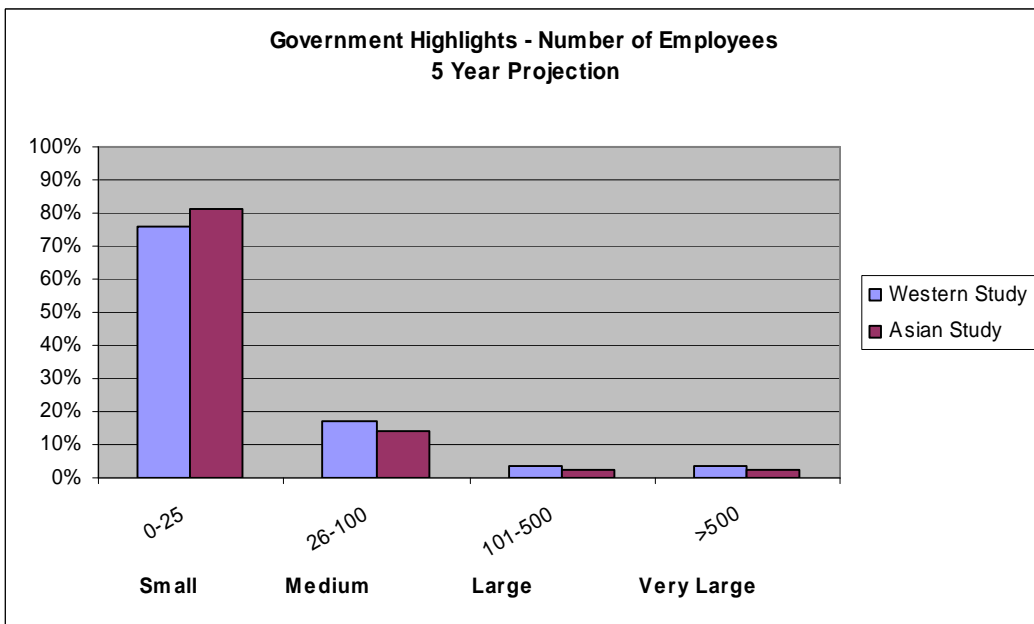
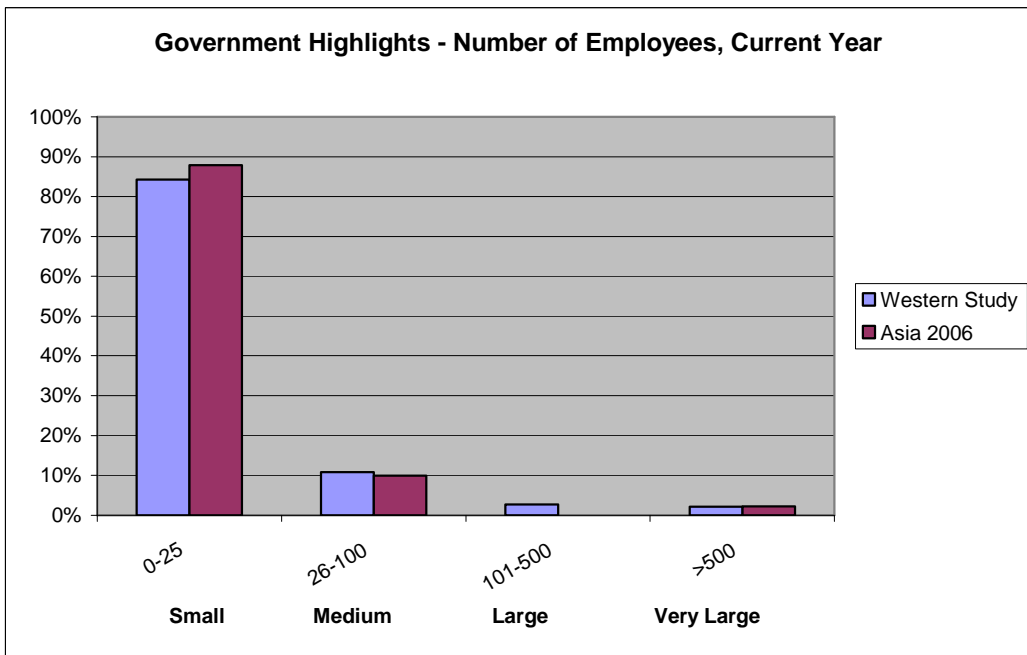
**Figure 15: Government Sector Data Purchases 5 Year Projection**

### 3.2 – Government Employee Projections

The government respondents in both studies also followed similar patterns, with employees dedicated to GIS and remote sensing activities keeping the

majority of the employees involved in smaller, more mobile teams and with little to no growth expected in the larger organizations.

**Figures 16 & 17: Government Sector Employee Levels Current and 5 Year Projections**



### 3.3 – Government Remote Sensing Applications

Given that the Asian Federal/National Civilian government response rate was the largest responding government unit, these selections of most popular remote sensing applications are not unusual.

The Federal National/Civilian government unit carries the responsibility for land management and focuses their remote sensing efforts on supporting their missions.

**Table 7: Western Study & Asian Government Top Remote Sensing Applications**

<b>Applications by Sector</b>	<b>Western Study</b>	<b>Asia 2006</b>
<b>Government Respondents</b>		
Environmental Monitoring/Management	<b>46%</b>	48%
Land Management/Development	39%	39%
Natural Resource Management	31%	<b>49%</b>
Cadastral	27%	31%

### 3.4 – Government Political, Economic and Environmental Trends

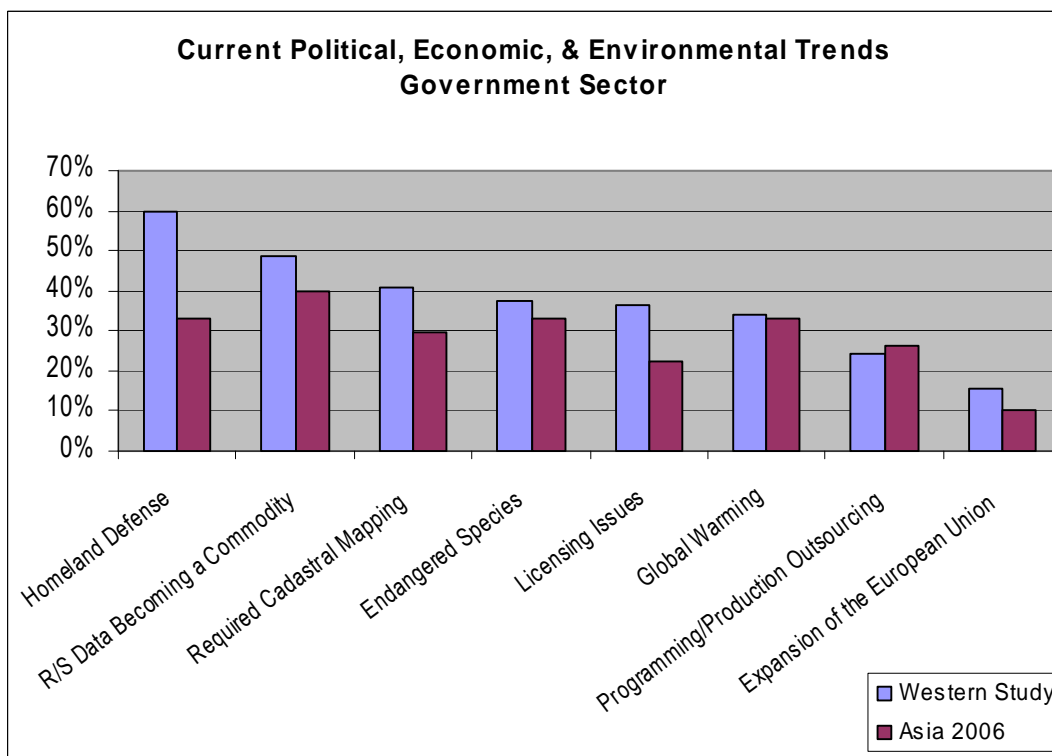
The Western and Asian Government responses were very similar in this trend selection, with the greatest variance appearing in the low selection of Asian respondents of “Required Cadastral Mapping,” “Open Skies Initiative,” and “Licensing Issues.” There is no requirement for an Asian National Digital Cadastre, so every country possesses its own cadastral map standards.

In terms of licensing, most Asian countries have some general space laws. These laws address activities such as launch safety, data usage, and liability responsibilities. Very few of

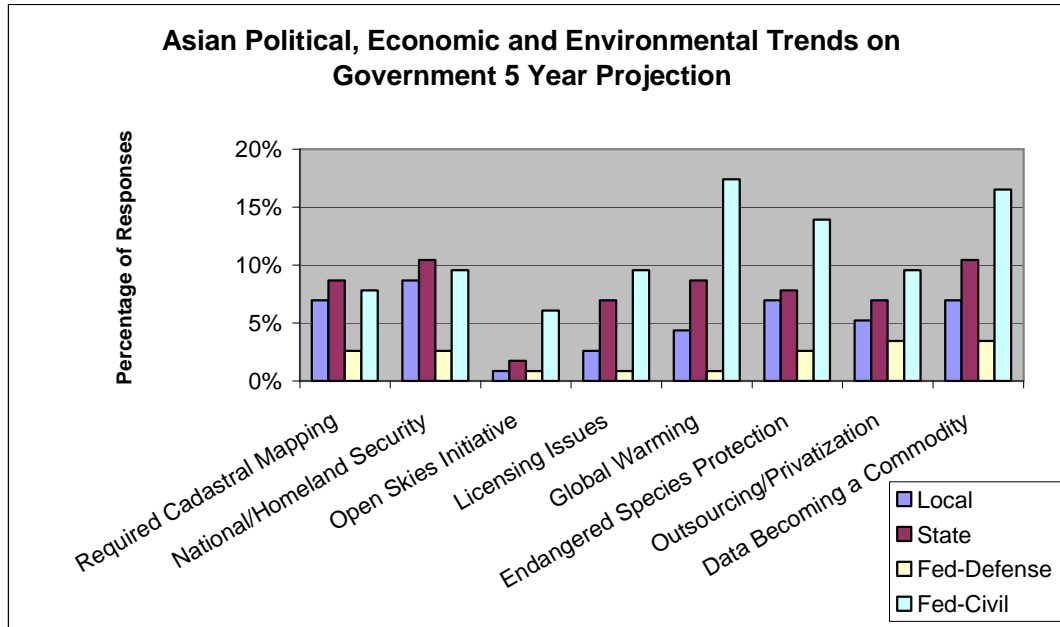
these space laws even relate to remote sensing activities. For example, there is no law relating to remote sensing in India, but a comprehensive data policy and remote sensing data distribution is controlled over the country. In Japan, for instance, there are currently no licenses required. With that said, there are also no commercial companies operating remote sensing instruments in Japan.

Both the Asian and Western Government respondents are focused on “Remote Sensing Data becoming a Commodity.”

**Figure 18: 2005 Western Study & 2006 Asian Respondents Current Political, Economic & Environmental Trends**



**Figure 19: 2010 Western Study & 2016 Asian Respondents 5 Year Political, Economic & Environmental Trends**



### 3.5 – Government Technical Trends

The technical trends that would most impact their use of remote sensing technology selected by the Asian Government respondents closely matched those of the Western Study government respondents. The Asian government respondents' highest areas of interest were in technical trends such as "Greater Ground Resolution, Improved GPS Units, Computer Processing Speeds, and Improved Data Storage Devices."

As discussed in the Satellite Sector, the Federal/National Civilian government unit showed a continued interest in "Remote Controlled Aircraft" and other

technological advances over the next decade, including the continuing and improved use of "Artificial Intelligence." The on-line surveys and interviews indicated the Asian community is making great advances in artificial intelligence for Intelligent Image Processing Algorithms for Remote Sensing Data, Soft Computing for Pattern Recognition and Data Mining and Robotics, which supports their belief that artificial intelligence, will impact their usage of remotely-sensed technologies.

*continued on page 27...*

Government support is imperative to the success and continued technological improvements of both the Western and Asian remote sensing industries. The Asian governments' focus on commercial remote sensing is strong, and government investments will continue over the next decade in the development and launch of aerial and spaceborne instruments. The Asian remote sensing market is focused on developing faster technologies with greater data handling capacity, whereas the Western Study respondents were more focused on the application development arena, and specifically on high resolution data. The Asian market is close behind its Western counterpart in the area of high resolution instruments and advanced aerial sensors, as countries relax their policies on the dissemination of high resolution data. Many Asian countries are developing their own unique version of a quasi-government and commercial remote sensing data management and distribution system. In general, though, the Asian countries want to make data openly available to the world, except for areas of national security. For instance: in India, all data over 5.8 meters is commercially available, but data with higher resolution than 5.8 meters is provided on an individual basis. Based on the Asian interviews, there is much interest from the Commercial,

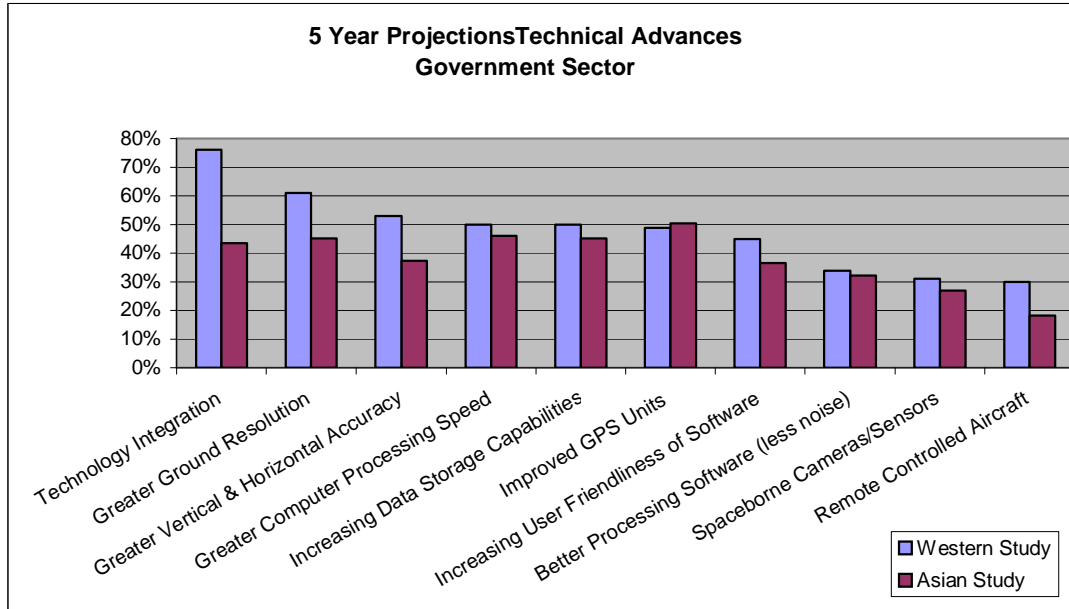
Hardware/Software, and Academic end users in gaining access to the high resolution data.

There are many other ways in which to analyze and compare the research collected from the Western and Asian Studies. Tables 8 and 9 in the Appendix provide an overview of the sectors studied and a listing of responses by country. Table 10 provides the comparison of the Western and Asian responses on some of the key areas researched.

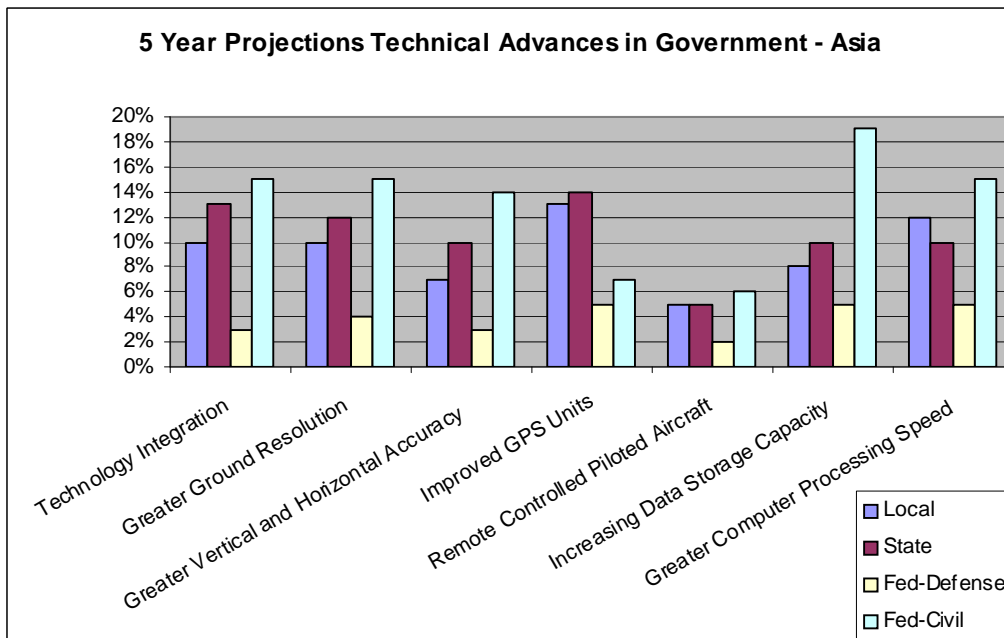
In summary, the Asian remote sensing profession is growing and will continue to do so over the next decade. The recognition of Asian remote sensing professionals as leaders in the development of aerial and spaceborne remote sensing capabilities will continue and grow as additional data sets are offered to the rest of the world. Asian remote sensing data providers are feeling the pressure from their governments to show commercial value for their remote sensing programs and to make the data available globally. During the coming decade, Asian data producers and providers will continue the rapid advancement of their technologies and will further blur the distinction between Western remote sensing programs and their own.

**Figure 20: 2010 Western Study & 2011 Asian Government Sector Respondents**

**Technical Advances**



**Figure 21: 2011 Asian Government Unit Sector Respondents Technical Advances**



## 4 – APPENDIX -TABLES

Table 1: 2006 Asian Study Respondents

Asian Respondents by Country - All Sectors	Total %
Other (Either did not specify or split among 16 countries )	36%
India	17%
Australia	10%
China	7%
Thailand	4%
South Korea	3%
Japan	3%
Malaysia	2%
Taiwan	2%
Singapore	2%
Sri Lanka	2%
Vietnam	2%
Mongolia	2%
Hong Kong	2%
Cambodia	1%
Russia	1%
Philippines	1%
Myanmar	1%
Laos	1%
Indonesia	1%
Bangladesh	1%
Nepal	1%
Bhutan	1%

Table 2: 2005 Western & 2006 Asian Remote Sensing Data Usage

DATA USAGE Comparison	Western Respondents	Asian Respondents
<b>Aerial Products:</b>		
- Aerial Digital/Scanned Film	-	6%
- Aerial Digital	19%	5%
- Aerial Sensors	1%	2%
- Aerial Film/Analog	10%	3%
<b>Satellites:</b>		
- High-Resolution	23%	26%
- Mid-Resolution	22%	35%
<b>Other:</b>		
- Radar	25%	23%
- Optical		
<b>Totals:</b>	<b>100%</b>	<b>100%</b>

**Table 3: 2006 Asian Remote Sensing Data Usage**

ASIAN DATA USAGE	Asian Respondents
<b>Aerial Products:</b>	
- Aerial Digital/Scanned Film	6%
- Aerial Digital	5%
- Aerial Sensors	2%
- Aerial film/Analog	3%
	<b>Subtotal: 16%</b>
<b>Satellites:</b>	
<b><u>High-Resolution</u></b>	
- IKONOS – (GeoEye - formerly Space Imaging)	8%
- IRS CartoSat 1 (Antrix Corporation), (India)	3%
- OrbView (GeoEye – formerly Space Imaging)	1%
- QuickBird (Digital Globe), (US)	8%
- SPOT 5 (France)	6%
	<b>Subtotal: 26%</b>
<b><u>Mid-Resolution</u></b>	
- IRS ResourceSat (Antrix Corporation), India	4%
- IRS 1C (Antrix Corporation), (India)	4%
- IRS 1D (Antrix Corporation), (India)	4%
- Landsat 5 (US)	7%
- Landsat 7 (US)	9%
- SPOT 2 (France)	3%
- SPOT 4 (France)	4%
	<b>Subtotal: 35%</b>
<b>Other:</b>	
- Other	1%
- EO-1 (NASA), (US)	1%
- MODIS (NASA), (US)	4%
- NOAA/AVHRR (US)	3%
- NOAA/GOES (US)	1%
- RadarSat (MDA), (Canada)	3%
- TERRA (ASTER), (US)	3%
	<b>Subtotal: 16%</b>
<b>Asian Satellite Systems:</b>	
- ALOS (Japan)	1%
- Beijing-1 (China)	1%
- KOMPSAT-1 (Korea)	1%
- RocSat 2 (Taiwan)	1%
- Ziyuan (China)	1%
	<b>Subtotal: 5%</b>
<b>Total:</b>	<b>100%</b>

**Table 4: 2005 Western and 2006 Asian Remote Sensing Applications by Sector**

<b>Applications by Sector</b>	<b>Western Study</b>	<b>Asia</b>
<b>Aerial Digital</b>		
Cadastral	47%	38%
National Defense/Homeland Security	50%	-
Natural Resource Management	45%	25%
Engineering	45%	25%
Utilities	-	38%
<b>Aerial Sensor</b>		
Coastal Management	42%	50%
Environmental Monitoring/Management	40%	50%
Utilities	40%	75%
Forestry	36%	-
Flood Plain Mapping	-	75%
Telecommunications, Real Estate, Land Management/Development, Transportation, Engineering, Environmental Monitoring/Management, Forestry, Natural Resource Management	-	25%
<b>Aerial Film</b>		
Engineering	59%	29%
Transportation	57%	36%
Land Management/Development	56%	29%
Utilities	41%	38%
<b>Software/Hardware</b>		
Environmental Monitoring/Management	41%	57%
Land Management/Development	31%	56%
Natural Resource Management	28%	57%
National Defense/Homeland Security	35%	-
Forestry	-	37%
<b>Commercial</b>		
Environmental Monitoring/Management	54%	58%
Land Management/Development	39%	44%
Engineering	30%	27%
Natural Resource Management	27%	53%
<b>Government</b>		
Environmental Monitoring/Management	46%	48%
Land Management/Development	39%	39%
Natural Resource Management	31%	49%
Cadastral	27%	31%
<b>Academic</b>		
Environmental Monitoring/Management	78%	67%
Natural Resource Management	49%	58%
Forestry	45%	37%
Land Management/Development	41%	38%
<b>Satellite</b>		
Environmental Monitoring/Management	50%	53%
Natural Resource Management	43%	58%
Land Management/Development	46%	49%
Forestry	36%	38%

**Table 8: 2005 Western Study & 2006 Asian Respondents Sector Comparison**

Geographic Region	Aerial Film	Aerial Sensor	Aerial Digital	Satellite	Com'l End User	Gov't	Academic	Software/Hardware	Total
Western Study-US, Canada, Europe, etc.	4%	4%	3%	5%	25%	34%	17%	8%	100%
Asia 2006	3%	1%	2%	13%	20%	28%	15%	18%	100%

**Table 9: Remote Sensing Study Country/Sector Comparisons**

Geographic Region	Aerial Film	Aerial Sensor	Aerial Digital	Satellite	Com'l End User	Government	Academic	Software/Hardware
U.S	59%	75%	61%	24%	50%	56%	45%	39%
Canada	3%	3%	4%	4%	11%	9%	5%	9%
Europe	15%	12%	9%	16%	8%	4%	12%	5%
Asia	19%	7%	17%	43%	18%	19%	20%	38%
Central & South America	3%	0%	2%	3%	3%	2%	5%	3%
Australia	0%	2%	2%	2%	1%	1%	1%	0%
Africa	3%	2%	4%	7%	7%	6%	11%	3%
Other	0%	0%	0%	2%	2%	2%	2%	3%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Table 10: NOAA Remote Sensing 2005 Western and 2006 Asian Comparison Results**

<b>TOPIC</b>	<b>WESTERN RESPONSES</b>	<b>ASIAN RESPONSES</b>
<i>Study Length</i>	1-Year	1-Year
<i>Country Focus</i>	U.S., Canada and Europe	India, China, Australia, Thailand, South Korea, Japan
<i>Years of Experience - Respondents</i>	>16+ Years	<10 Years
<i>Professional Position - Respondents</i>	CEO/Presidents/Managers	Technical/GIS Analysts
<i>Largest Response Sector</i>	Government and Commercial	Government and Commercial
<i>Technical Trends (All Sectors)</i>	Technology Integration	Greater Ground Resolution
<i>Technical Trends (Government)</i>	Technology Integration	Greater Ground Resolution
<i>Technical Trends (Satellite)</i>	Technology Integration	Greater Ground Resolution
<i>Technical Trends (Aerial)</i>	Technology Integration	Better Processing Software
<i>Political, Economic and Environmental Trends (All Sectors)</i>	National Defense/Homeland Security	Remote Sensing Data Becoming a Commodity
<i>Political, Economic and Environmental Trends (Government)</i>	National Defense/Homeland Security	Remote Sensing Data Becoming a Commodity
<i>Political, Economic and Environmental Trends (Satellite)</i>	National Defense/Homeland Security	National Defense/Homeland Security
<i>Political, Economic and Environmental Trends (Aerial)</i>	Outsourcing/Privatization	Outsourcing/Privatization
<i>Data Usage</i>	Satellite 68% Aerial 30%	Satellite 84% Aerial 16%
<i>Remote Sensing Data most Utilized</i>	Landsat 7 IKONOS Quickbird	Landsat 7 IKONOS Quickbird
<i>Remote Sensing Product Type Usage</i>	GIS Data	GIS Data Raw Imagery
<i>Projected Budgets</i>	Government – Increase over 10-years	All Asian Sectors – Slight Increase over 10-years
<i>Employee Levels</i>	Highest in Large Organizations with >500 Employees	Highest in Medium Organizations with 26-100 Employees
<i>Remote Sensing Applications</i>	Homeland Defense	Environmental
<i>Software Usage</i>	ESRI	ESRI

**Table 11: 2006 Asia NOAA Alliance Research Partners and  
Target Geographic Areas**

Alliance Partner	Target Geographic Area
1. Global Marketing Insights, Inc.	India, Japan, China and Australia
2. Corbley Communications	All of Asia, Australia and India
3. GSDI Spatial Data Infrastructure – Asia and Pacific (SDI-AP)	All of Asia
4. DigitalGlobe	All of Asia and India
5. Asian Survey and Mapping/Spatial Business News – Position Magazine	All of Asia and Australia
6. KIM Geomatics Corporation	All of Asia
7. Yonesi University, Seoul Korea	Korea
8. eePublishers – PositionIT	All of Asia and Australia
9. Coordinates Magazine	India and Asia
10. GeoSpatial Solutions – Earth Imaging Newsletter	All of Asia
11. National Space Organization of Taiwan (NSPO)	Parts of Asia
12. GISuser.com	All of Asia
13. SuperMap or link at (CGISID - Center of GIS Industry Development of Chinese Academy of Sciences)	Asia (China)
14. KAI Image, Inc.	Korea
15. Manipur University	India
16. ISG - Indian Society of Geomatics	India
17. GIS Development	All of Asia and US Asian Contacts
18. SSI – Spatial Sciences Institute	India
19. GeoWorld	Asia and US Asian Contacts
20. Navayuga	All of Asia
21. SPOT	All of Asia

## 4 – APPENDIX - FIGURES

Figure 1: 2006 Asian Respondents Professional Position

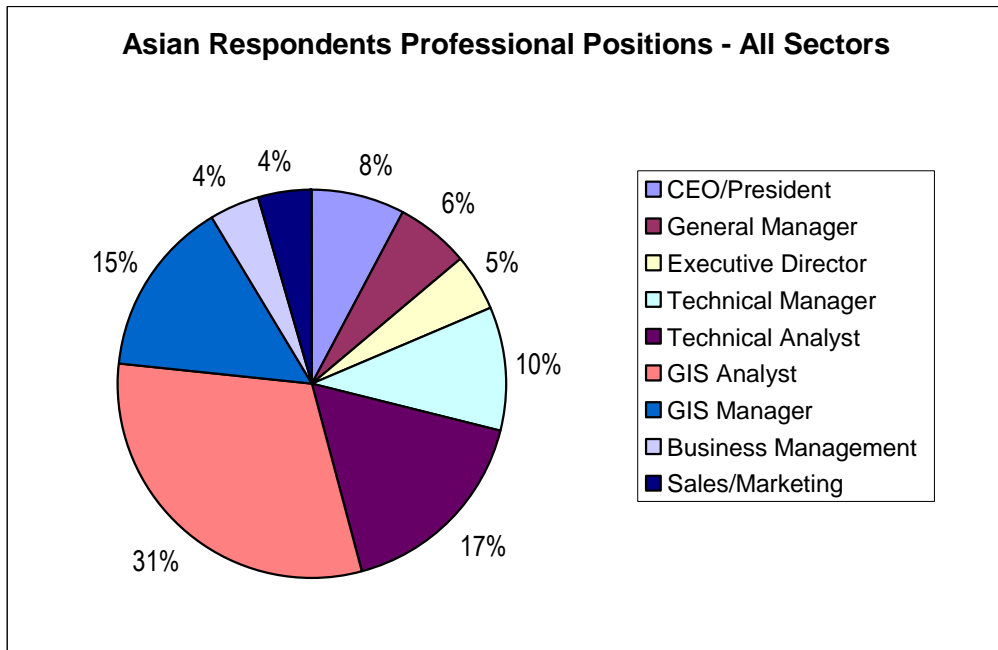
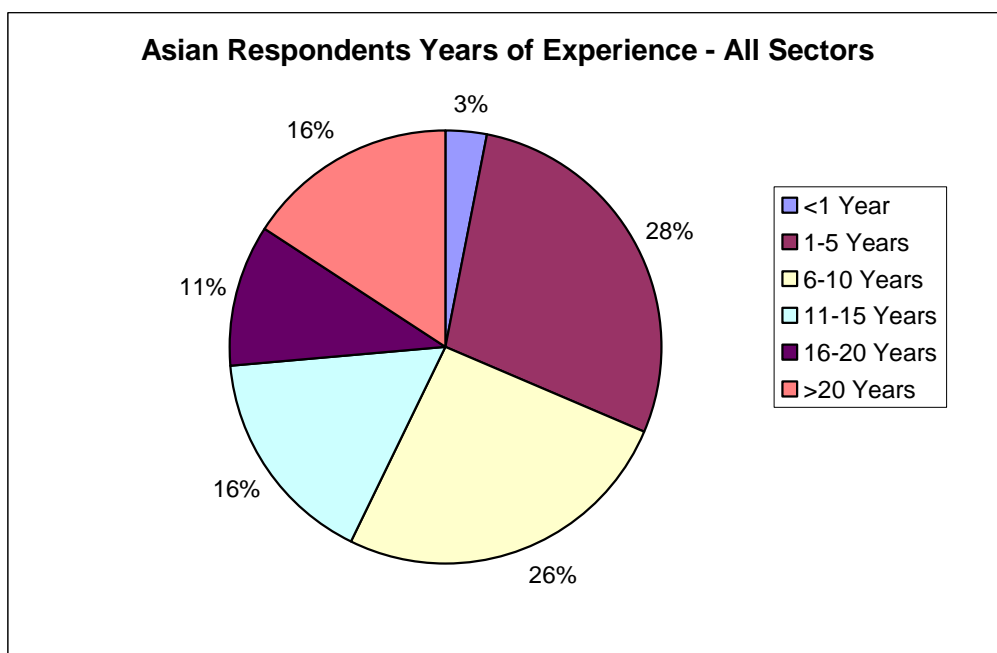
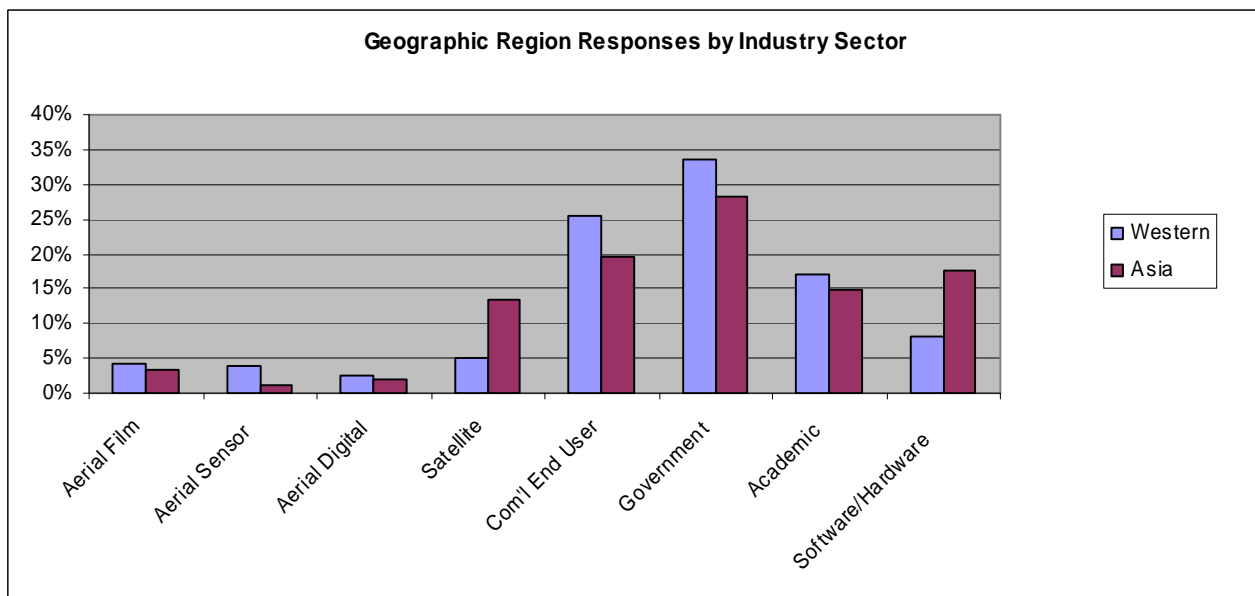


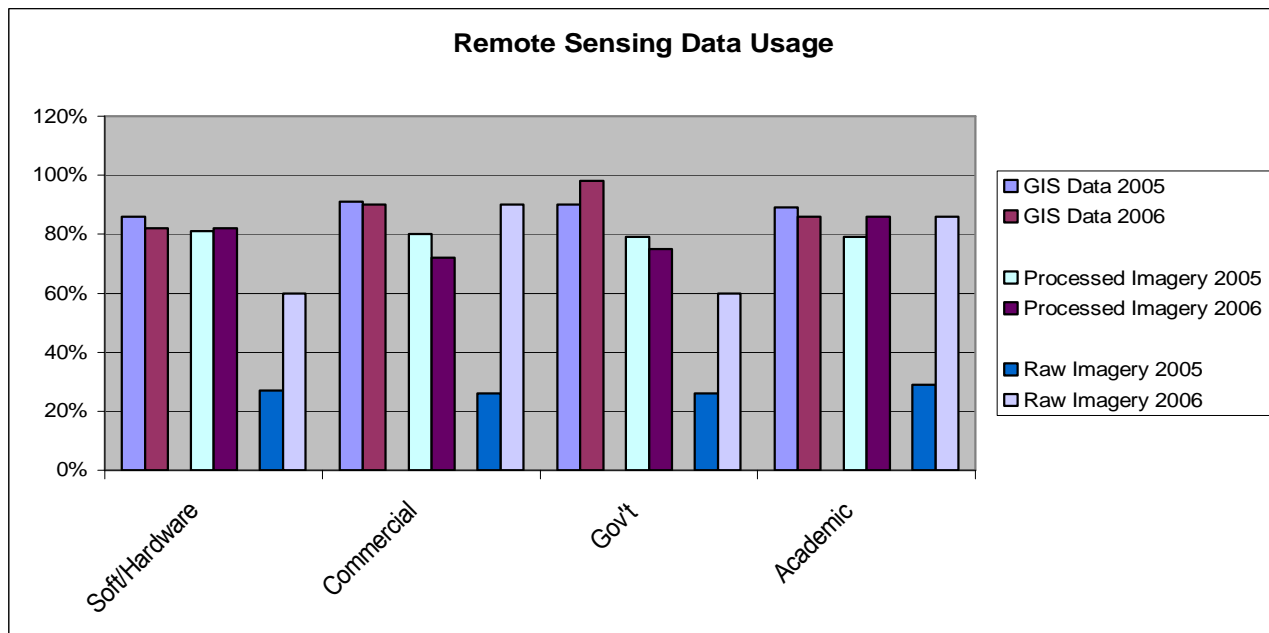
Figure 2: 2006 Asian Respondents Professional Position



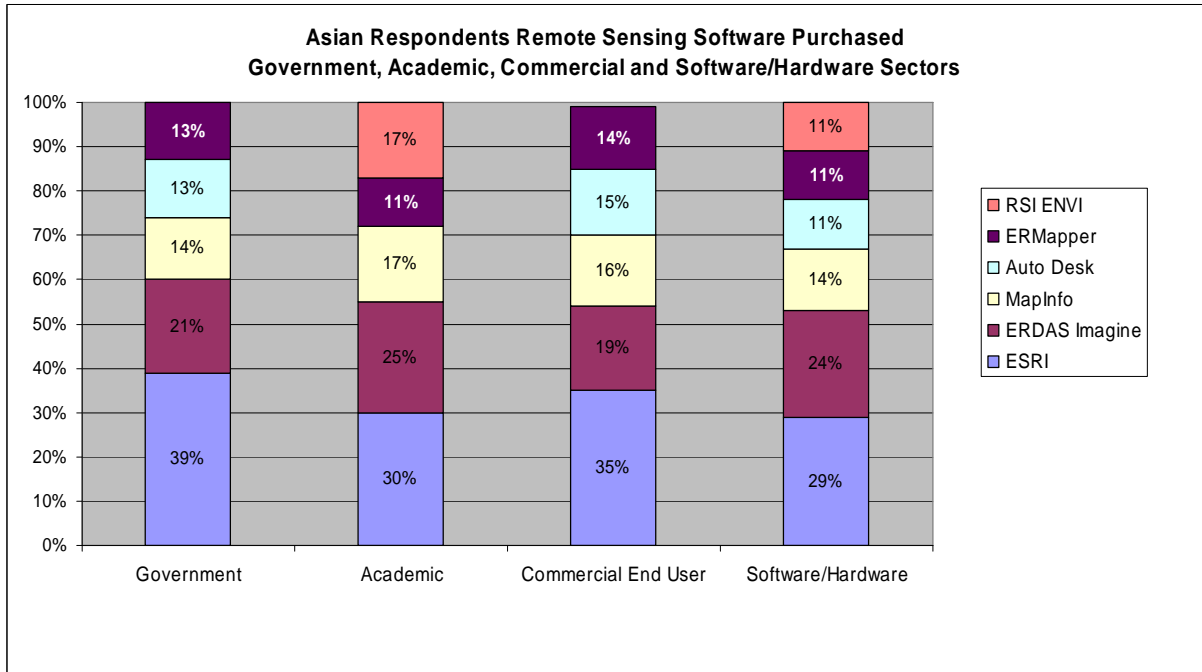
**Figure 3: 2005 Western & 2006 Asian Sector Respondents by Sector**



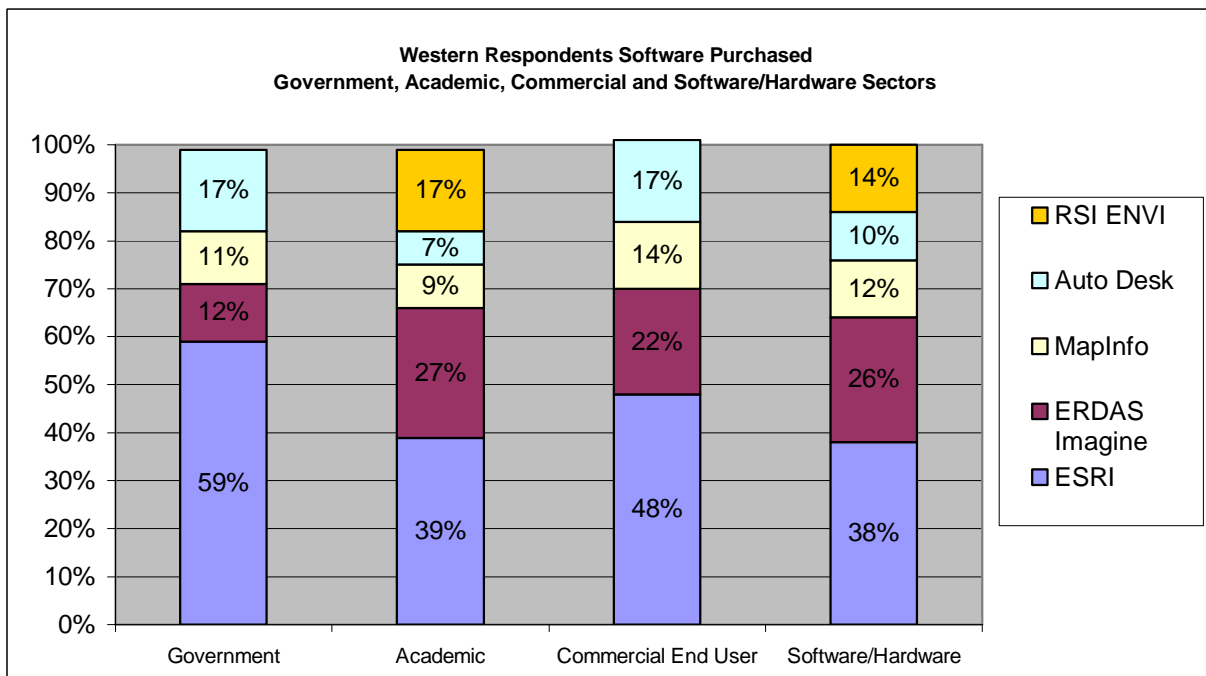
**Figure 4: 2005 Western & 2006 Asian Respondents Product Type Usage**



**Figure 5: 2006 Asian Respondents Remote Sensing Software Purchased**



**Figure 6: 2005 Western Respondents Remote Sensing Software Purchased**



## 4- APPENDIX - ASIAN ALLIANCE RESEARCH PARTNER INFORMATION

### 1. Global Marketing Insights, Inc.



[www.globalinsights.com](http://www.globalinsights.com)

Global Marketing Insights, Inc., is a specialist in GeoSpatial Technology market research and strategic planning. Since 1997 we have provided our international federal government and commercial client base with global market research and assisted them in the development of their strategic business plans. This planning involves geospatial technology such as aerial and spaceborne remote sensing as well as geographic information systems and location based systems solution. Global Marketing Insights, Inc. is the author of the 2005-2015 NOAA International Remote Sensing Market Study and the 2006-2016 NOAA Asian Remote Sensing Market Study For more information contact: [info@globalinsights.com](mailto:info@globalinsights.com) or 216.525.0600.

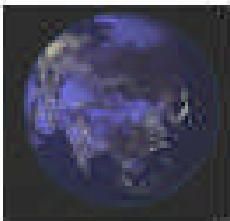
### 2. Corbley Communications



[www.corbleycommunications.com](http://www.corbleycommunications.com)

For more than a decade, geospatial organizations around the world have turned to Corbley Communications Inc. (CCI) to promote their products and services domestically and internationally. With unrivaled experience in the geotechnologies, CCI is the only marketing communications firm that provides Public Relations and Marketing Support exclusively to the international geospatial community. Since 1993, CCI has developed integrated marketing communications campaigns for companies, government agencies, and academic institutions in every segment of the GIS, remote sensing, digital mapping and location-based services industries.

### 3. GSDI Spatial Data Infrastructure – Asia and Pacific (SDI-AP)



[www.gsdi.org](http://www.gsdi.org)

Spatial Data Infrastructure – Asia and Pacific (SDI-AP) is a free electronic newsletter for people interested in GIS, remote sensing, and data management issues in Asia and Pacific. It aims to raise awareness and provide useful information to strengthen national SDI initiatives and support synchronization of regional activities. The Permanent Committee on Geographic Information for Asia and the Pacific (PCGIAP) is a regional forum that is promoting SDI development. The newsletter is sponsored and prepared by the Global Spatial Data infrastructure (GSDI) Secretariat with input from PCGIAP.

#### **4. DigitalGlobe**



[www.digitalglobe.com](http://www.digitalglobe.com)

An Imagery and Information Company, DigitalGlobe was founded in 1992 by GIS and mapping users who wanted commercial access to a consistent and rapidly expanding supply of high-quality earth imagery and geo-spatial information products. That same year, it was the first company ever to receive a high-resolution commercial remote sensing license from the U.S. Government under the Land Remote Sensing Policy Act. With the launch of its QuickBird satellite in October 2001, DigitalGlobe became the world's highest resolution commercial satellite imagery provider. Today, DigitalGlobe employs more than 350 people and is leading the industry into the next generation of commercial satellite imaging with the planned launch of its WorldView system. This partner was instrumental in providing Asian and Australian Ground Station and distributor contacts.

#### **5. Asian Survey and Mapping/Spatial Business News – Position Magazine**



[www.asmmag.com](http://www.asmmag.com)

Asian Surveying and Mapping is published monthly by South Pacific Science Press International Pty Ltd (ACN082312810)

Publisher: Wendy Chapman



Position Magazine is Australasia's magazine for the surveying, mapping and geoinformation industries.



Spatial Business provides you with the most up-to-date news and analysis for the spatial industries. The newsletter is published fortnightly and can be mailed to in print form, sent by email, or accessed online via this website.

## **6. KIM Geomatics Corporation**



[www.kimgeomatics.com](http://www.kimgeomatics.com)

Specialists in natural resources monitoring and management, geomatics, and remote sensing, with special emphasis on international development project and program development, management and evaluation, market studies, and policy assessments.

Our senior level staff have worked in over 70 countries since the 1970s for a variety of international agencies, national governments, aid agencies, and corporations. Our most senior staff member has over 30 years of senior professional experience. We have many clients in North America, Across Asia, Africa, the Pacific Region, Latin America and Europe and our staff and associates speak English, French, Portuguese, German, Spanish, and Mandarin and are based in Latin America, the Asia-Pacific region, and North America.

## **7. Yonsei University, Seoul Korea**



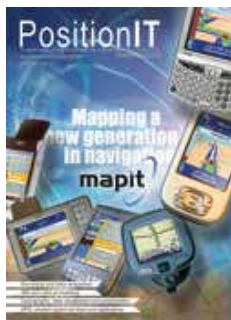
**YONSEI UNIVERSITY**  
DIGITAL SIGNAL PROCESSING LAB.

[www.yonsei.ac.kr](http://www.yonsei.ac.kr)

Yonsei University was established in 1957 when Yonhi University and the Severance Union Medical College and Hospital were formally united, and the new institution was renamed as Yonsei University, derived from the first two syllables of the two institutions. Although the formal integration of the two schools did not materialize until 1957, bilateral cooperation began as early as 1928, and by 1949, the two institutions agreed to a merger.

As of October 2004, Yonsei University currently has enrolled 49,754 students (35,148 undergraduates and 14,606 graduate students) in 18 graduate schools and 19 colleges. As one of Korea's outstanding teaching and research institutions, Yonsei remains firmly committed to retaining its leadership role as the most comprehensive and forward-looking university in Korea.

## **8. EePublishers – PositionIT**



[www.eepublishers.co.za](http://www.eepublishers.co.za)

The primary activity of EE Publishers is publishing in the print and electronic media, with a particular focus on the electrical, electronics, automation, control, computer, information and communications technology sectors of Southern Africa.

**PositionIT** - the geoinformatics, surveying, GIS, location intelligence and related spatial applications journal for Southern Africa - is a technical journal published in English six times a year, serving these sectors and the wider target audience in Southern Africa. PositionIT is a voice for the Geo-Information Society of South Africa (GISSA), the South African Geomatics Institute (SAGI) and Plato.

## **9. Coordinates Magazine**



[www.mycoordinates.org](http://www.mycoordinates.org)

Coordinates is a monthly magazine on positioning, navigation and associated technologies. It aims to broaden the canvas of the technology by taking it from the domain of experts to realm of potential users.

Coordinates is published by Centre of Geo-Information Technologies cGIT), a Non Government Organization (NGO) based in Delhi, India

## **10. GeoSpatial Solutions – Earth Imaging Newsletter**

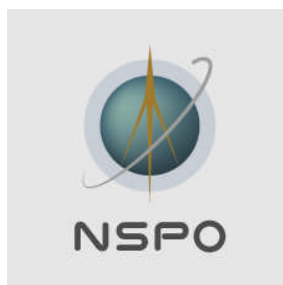


[www.geospatial-online.com](http://www.geospatial-online.com)

For more than 15 years, *Geospatial Solutions* has been the voice of the geospatial community. *Geospatial Solutions* is the objective and authoritative forum for emerging intelligence about GIS and related spatial technologies. In this venue, industry leaders and peers define issues and share solutions critical to forging a community among professionals from diverse application environments.

With an industry-high circulation of nearly 30,000, the magazine serves decision makers in government, the private sector, and academia. Readership and content reflects the diverse range of applications supported by such geospatial tools and techniques as GIS, GPS, remote sensing, surveying, photogrammetry, and more.

## **11. National Space Organization of Taiwan (NSPO)**



[www.nspo.org.tw](http://www.nspo.org.tw)

National Space Organization (NSPO) was originated in October 1991 as National Space Program Office for carrying out the first stage plan of a 15-year "Space Technology Long Term Developmental Program" approved by the Executive Yuen. It acts as an execution organization for Taiwan's space program and integration capability for large high-tech system. The purpose is to develop Taiwan's space technology development infrastructure as well as competitive resources that would benefit Taiwan's space application industries for future international space market.

## 12. GISuser.com



[www.gisuser.com](http://www.gisuser.com)

**Spatial Media LLC**, Frederick, MD, (founded by Allen Cheves & Glenn Letham) owns and operates several leading online [technology resources](#) including GISuser.com (*GIS/Geospatial*), MAPuser.com (*Surveyors*), and LBSzone.com (*mobile & location-based services*). Additionally, the company partners are owners and publisher of SymbianOne.com and The American Surveyor Magazine (print).

GISuser.com was officially launched by Spatial Media LLC in February, 2004. Our goal is to provide the geospatial [technology](#) user & industry professional with the latest developments, analysis, and reports affecting the GIS user and related geospatial technologies.

GISuser.com editorial and management is in the capable hands of veteran geospatial industry analyst and editor, Glenn Letham. Glenn brings to GISuser more than 7 years experience as a respected online editor and writer having founded

## 13. SuperMap



[www.supermap.com](http://www.supermap.com)

SuperMap GIS Technologies, Inc. is a leading GIS company in Asia, specialized in the development of GIS software platform. Through a severe market competition, SuperMap has become one of the rapidly developing high-tech companies and a leading GIS software provider in Asia.

With the support from the Chinese Academy of Sciences, SuperMap is devoted to geospatial technological innovation and has developed a suite of GIS technologies. SuperMap GIS covers a broad range of products which including components-based GIS platform, Web GIS and embedded GIS development toolkits, spatial database engine, as well as desktop GIS.

SuperMap GIS has been widely used in governments, industries, and operated in hundreds of large scale systems now in nationally and internationally. It has entered into the GIS markets of Japan, Korea, Singapore, Italy, as well as Taiwan Province, Hong Kong SAR and Macau SAR of China.

## **14. KAI Image, Inc.**



[www.kaiimage.co.kr](http://www.kaiimage.co.kr)

KAI image, inc. is established to proudly introduce “KOMPSAT” to the world. But, first, we wish to share the exultation and proud with the scientists and researchers at Daeduk Science Park who kept us spirited by making “KOMPSAT” possible.

“KOMPSAT” is for all of us in this world, and every member at KAI image, inc. will do our very best in providing the service that reaches beyond the world’s expectation.

Somewhere on the planet, there are groups of people who bring tiny but very precious dreams to a great reality by launching man-made stars, “satellites.” We are proud to say that Korea, too, is the place where they bring such dreams come true. Starting with the “KITSAT” series as first small stars, “KOMPSAT” was successfully introduced as our first commercial remote sensing satellite to the world back in 1999 and still in strong operation. And, now, we are excited in witnessing the birth of second “KOMPSAT” which is waiting for its launch in this year.

## **15. Manipur University**



[www.manipur.nic.in/maniuniversity.htm](http://www.manipur.nic.in/maniuniversity.htm)

The Manipur University came into existence on June 5, 1980. It is constituted under the Manipur University Act, 1980 (Manipur Act NoVIII of 1980).

The objects of the University shall be to disseminate and advance knowledge, wisdom and understanding by teaching and research and by the example and influence of its corporate life. In the light of the above objectives ,t he approach of the Manipur University is to evolve policies and programmes which will make the University a distinct addition to the national resources in higher education rather than a mere quantitative expansion of facilities which already exist .The university has identified and will concentrate upon some major distinct academic programmes ,which are relevant to the progress and development of the country in general and the north-eastern region in particular.

## 16. Indian Society of Geomatics



[www.isgindia.org](http://www.isgindia.org)

The aims and objectives of the Society shall be:

- Advancement, dissemination and application of the knowledge of Geomatics
- Provide a forum for interaction amongst professionals - as individuals and between organizations, private and government, who are interested in achieving the advancement, dissemination and application of Geomatics and allied technologies as stated above.
- Promote and undertake research and consultancy endeavors in the technology of Geomatics and its allied fields.
- Undertake and execute all acts which shall promote all or any of the aims and objectives of the Society.

## 17. GIS Development



### OUR MISSION

[www.gisdevelopment.net](http://www.gisdevelopment.net)

As a *Geospatial Communication Network*, GIS Development promotes the usage of Geographic Information Science, Technology and Applications in various areas of development, worldwide and Asia in particular. It assists community and government in developing their productivity, policies and management capabilities by facilitating knowledge transfer in the domain of geographic information. It fosters the growing network of those interested in geo-informatics and encourages the exchange of scientific know-how through its key platforms: Magazines, Portal, Conferences and Training.

## 18. SSI – Spatial Science Institute



[www.spatialsciences.org.au](http://www.spatialsciences.org.au)

**Vision of the Spatial Sciences Institute:**

**To provide a globally recognized forum for the spatial sciences community that leads, promotes, advocates and delivers excellence.**

The Spatial Sciences Institute is a national body catering for the professional people who make up the spatial information industry. It gives a voice to the members of the spatial science community in both the national and international arena.

The Spatial Sciences Institute is a national body taking advantage of economies of scale, standardized administrative procedures across the nation, and centralized functions, where that is of advantage to members, but with service delivery maintained at the regional level to ensure the needs of members are understood and met.

## 19. GeoWorld



[www.geoplance.com](http://www.geoplance.com)

**GeoWorld** is the authoritative "must-read" for spatial industry executives looking to keep their competitive edge in the marketplace. Each month the magazine reaches more than 25,000 subscribers – giving them in-depth features, news and commentary.

**GeoWorld** provides timely, relevant, and useful information about Geospatial innovations, trends, and events.

**GeoWorld** is the Business Monthly for the GIS Industry.

## 20. Navayuga



[www.navayugaspatial.com](http://www.navayugaspatial.com)

Navayuga Spatial Technologies Pvt. Ltd. (NST) is a business endeavor of Navayuga Group - aiming at serving the needs of the national and global markets through focused, innovative, efficient & quality products and services in all areas of spatial technology and applications. NST brings horizontal and vertical integration of satellite/aerial Remote Sensing, Photogrammetry, Positioning applications, GIS databases and applications, GIS web-services and networking of GIS databases.

NST has experience in seamless integration of spatial technology and conventional ICT solutions - thus opening up new vistas and niche - areas of applications services.

## 21. SPOT Image



[www.spotimage.com](http://www.spotimage.com)

Spot Image is the worldwide distributor of **geographic information products and services** derived from the Spot Earth observation satellites, including the **Vegetation** instrument flown on SPOT 4 and 5.

Spot Image also distributes complementary optical and radar data acquired by **other satellites** offering low to very high resolution images.

Spot Image was appointed by CNES as **sole commercial operator** of the SPOT satellites, the first of which was placed in orbit in 1986.

Spot Image **acquires the SPOT data** through a receiving station at its premises in Toulouse and via a network of partner stations around the world.

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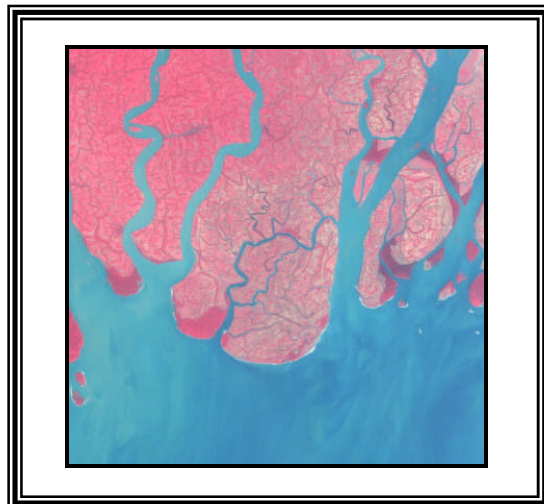
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**2006-2016 Asia Remote Sensing Study**



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Banda Aceh, Sumatra, Indonesia –  
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