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ABSTRACTS

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Contents

Indonesian Space Act (ISA)

by

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Extended Abstract

Space activities in Indonesia has been developed since 1960s, and since 1970s has been major communication satellite operator in the world, but there was a lack of comprehensive national legal basis. Since 1990s Indonesia has also become the party of four international treaties which have been negotiated and drafted in the UNCOPUOS, i.e. "Outer Space Treaty", "Rescue Agreement", "Liability Convention"; and "Registration Convention". Therefore, in the implementation of those treaties needs a robust national legal framework to encompass national and international law governing activities in outer space. The efforts to develop a draft of space act was started in 2000s. The draft Act was discussed with the Parliament since 2012 and was approved by the Parliament on 9th July 2013. Indonesian Space Act (ISA) was signed by the President on August 2013 as the Space Act 2013 of the Republic of Indonesia No. 21. Since then it has fulfilled the gap in national legislations and entered into force.

ISA is a robust national legal framework aiming at protection national interests and concerns in space activities for the benefit of community prosperity; strengthening the institutional capacity; establishing legal basis for the implementation of international treaties and conventions ratified by Indonesia; optimizing the utilization and efforts of national resources for space activities. The objectives of regulations under ISA are: (1) to create self-sufficiency and promote nation competitiveness; (2) to optimize space activities; (3) to ensure the sustainability of space activities; (4) to provide robust legal basis; (5) to achieve safety and security in space activities; (6) to protect nation and civilians from negative impacts of space activities; (7) to optimize the implementation of space international treaties and conventions ratified by Indonesia.

ISA emphasizes on national space law regimes encompassing national and international law governing activities in outer space conducted in and/or by Indonesia. ISA regulates space activities in broad sense including space science, remote sensing, space technology development, launching, and commercial space activities. Other

relevant activities are also regulated by ISA including NPS utilization, astronaut rescue, space debris management, space object registration, institutional arrangement, strategic plan, research and development, commercial, standards, liability, cooperation, as well as funding. A number of implementation regulations mandated by ISA, such as Government Regulation(s), Presidential Decree(s), Ministerial Decree(s), and Agency Decree(s) should be accomplished until 2015.

As it promotes remote sensing satellite development and operation as well as utilization of space-based data application, ISA enables the acquisition of satellite data and its applications to climate change on regular basis more efficiently. By establishing standards of satellite data processing and products, the applications of satellite data could result more accurate information. In the future, it is expected that through the implementation of ISA and other related regulations could minimize the risks, while it could promote enhanced capacity in space science and technology and their applications more systematically through international, regional, and national collaborations.

Remote Sensing Data Processing for Ecology and Climate Monitoring at the Territory of the Republic of Belarus

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The paper describes the developed technologies and systems used in the Republic of Belarus for monitoring ecological situation and climate changing at our territory. The remote sensing data obtained from space satellites as well as digital maps are used for these tasks.

The developed interactive and automatic image processing techniques are described in the paper. We also show the efficient procedures for change detection and updating digital maps by remote sensing images.

We have long-term practical experience in creation of systems for integrated processing of remote sensing and map images. The following applied tasks have been solved with the help of these systems:

1. Discovery of fires on satellite images and the calculation of their coordinates on maps.
2. Evaluation of forest state to produce forest maps from satellite images (forest status monitoring). Classification of forest by wood species and age;
3. Pollution spreading forecasting on digital map taking into account atmospheric conditions (wind propagation and others);
4. Control of territory flooding and modeling of its dynamics;
5. Hazard (extreme) situation modeling;
6. Using remote sensing images for climate changing at our territory.

The practical systems for dealing with these and other tasks have been developed and used in organizations of Belarus. Practical results and systems will be shown at Conference.

The adaptation strategies and application of space based data in mitigation of climate change impact in Bangladesh

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Bangladesh is one of the most climate-vulnerable countries in the world. The country is experiencing changing weather patterns, increasing natural disasters (i.e. flood, cyclone, tornado, thundering, heavy rains, droughts, cold/hot waves, river erosion) due to climate change. Change in water levels and temperatures are affecting both people's lifestyle, social and economical conditions. Many rivers have dried up, parts of northern Bangladesh are becoming desert, and many fish varieties are being lost. Casualties of human lives have increased by natural phenomena and start shortage of resources (properties, cultivable land, fire woods).

Bangladesh becomes innocent victim by climate change effect. Increase in temperature by 2° C and rise of sea level by 45 cm may cause 29% higher chance of flood risk and permanent inundation. According to average scenario of 2050, sea level may rise 70 cm, land subsidence 80 cm, inside shoreline erosion 2.5 km, population displacement and migration 17% (20 million people), and reduction of mangrove forest 45%. Bangladesh will possibly suffer in water salinity (tidal water intrusion- goes up to 250 km inside the country, reduce fresh water), water logging (sea water rise, rain water, flood, while no adequate drainage system), soil salinity (12 % land will be saline-affected), and human diseases. Salinity in water and soil may cause shortage of safe drinking water and food security (hamper crops production).

To face the climate change impact, the government of Bangladesh has prepared the ‘Standing Orders on Disaster Management’ (2008), the ‘National Adaptation Program of Action’ (2005), and the ‘Bangladesh Climate Change Strategy and Action Plan’ (2008 and revised 2009) under the recommendations of Bali Action plan. The government has

established a Climate Change Fund from own resources with a capital of $45 million, and a Multi Donor Trust Fund with a proposed contribution of $188 million. Many development partners are taking part in adaptation programs and already deposited $90 million. According to the strategy and action plan the government has taken various programs for adapting climate change, e.g. better early warning system, river and coastal embankments, cyclone-flood shelter (already built 3200 shelter for vulnerable people), better irrigation schemes for rice crop production in dry season, and developing saline-drought-flood adapted crop varieties.

To adapt the effect of climate change, Bangladesh has given emphasis on geospatial information systems (GIS) using satellite technology, developing an understandable early warning and forecasting systems which successfully reduce mass casualties and properties. Satellite images help for preparing better prediction, accurate cyclone and flood tracks, preparedness for crops production. Recent reduction in disaster casualties shows the successful overcoming the risk situations using space based data (e.g. cyclone-SIDR Nov 15, 2007 (people died 4000), cyclone-AILA May 25, 2009 (people died 100), cyclone Oct 11, 2012 (people died 40); cyclone Mahasen May 16, 2013 (people died 24) compare to previous cyclones (people died 500,000 in 1970 cyclone, 140,000 died in 1991 cyclone). The space based technology is used in flood flow, flood zoning, river erosion, accretion, and changes of river direction. Satellite images are used as first responses to disasters. Satellite phones are useful for emergency workers. The technology is also used for post-disaster damage detection, based on comparative analysis of before and post disaster images. The space based data is most useful and applicable for Bangladesh climate, recommended for space based technology transfer to sustainable disaster reduction. Further applications of satellite technology will certainly benefit by Bangladesh in adapting climate change effects.

Space- based information applications related to climate change monitoring in Morocco

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As a vulnerable country facing climate change, Morocco is currently experiencing climate change impacts in various socio-economic. Part of the non-Annex 1 Parties, it signed and ratified the UN Framework Convention on Climate Change (UNFCCC). To honor its commitments to the Conference of the Parties, it is kept for the purpose of submitting regular national communications describing the collective efforts being made to follow and evaluate the impacts of climate change and the national programs including measures to mitigate GHG emissions. Two first national communications were transmitted and a third is being prepared focusing on four main components:

- Elaboration of the national inventory of GHG emissions;
- Vulnerability assessment and adaptation to climate change impacts in three key fields: water resources, agriculture and forestry, marine and coastal areas;
- Analysis of potential mitigation potential of GHG emissions;
- Assessment of needs for capacity building, financing and technology transfer, systematic research and observation, education and training, awareness, information and up networks

In this context, the space technologies contribute significantly to the mitigation of national efforts and to the developing appropriate adaptation solutions to climate change, by providing accurate information mainly in the field of the diagnostic of the impacts of climate changes identifying, quantifying and characterization the vulnerability in various sectors. In this respects, the Royal Centre of Remote Sensing undertakes researches and analysis and develops space applications in different topics related directly or indirectly to climate change in Morocco, in particular to characterize the vulnerability of the country facing impacts in several fields. So, monitoring documents of drought, vegetation conditions, and desertification and land degradation are regularly provided while identifying the most sensitive areas. Otherwise, inventories of land cover and land use changes are produced systematically at national level and various scales, focusing on the agricultural and forest evolution influenced by climate change. This information is used to quantify the GHG and mitigation efforts. In addition, applications on monitoring of water resources are carried out covering particular sites impacted by dryness. Finally, researches are conducted in the field of

marine and costal zones suffering also the impacts of climate change including level sea monitoring and their effect on coastline modifications, and upwelling fluctuations with consequences on resource marine stocks.

However, further efforts are required to make operationally and systematic the use of space-based information in all areas related to climate change both in the GHG inventory field, the mapping and the monitoring of vulnerability, but also in the production of climate scenarios and implementing adaptation measures.

Remote sensing role in climate change research in Lebanon

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Climate is usually defined as the “average weather” in a place. It includes patterns of temperature, precipitation (rain or snow), humidity, wind and seasons. Climate patterns play a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. Temperatures, rainfall, droughts, high-intensity hurricanes and severe flooding events all are increasing and projected to continue as the world's climate warms, according to the National Climate Assessment for 2012.

The overwhelming consensus in the scientific community is that human activity has accelerated the rate of climate change. Climate change causes and effects are difficult to monitor because it takes place over a long time and on global scales. Some measurements can be taken on site, but by far the climate change monitoring is done remotely. It is largely because of information gathered through remote sensing networks and satellite sensors that human-induced effects on the global climate have been confirmed. A brief overview of the Lebanese Remote Sensing Center activities such as the monitoring of the natural resources (forests and water) will help in evaluating and predicting the current and future effect of the climate change on the these resources. In addition, it is important to emphasize the role of the remote sensing in estimating carbon budget. This role is based on improving land cover classification through the use of advanced algorithms and methods and hyperspectral images**.**

Keywords: Snow cover, Forests, Remote Sensing, Hyperspectral image, Multispectral image, Land cover, Water.

The Asia Knowledge and Innovation Lab

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AKIL is part of a larger effort to build applications that can be used across development programs and agencies. Incubated from the PSF PNPM Support Facility, AusAid and WB, is the Asia Knowledge and Innovation Lab (AKIL). The objective is to strengthen Government of Indonesia efforts to reduce poverty and vulnerability by promoting and supporting existing ICT initiatives and accelerate new innovations for development and poverty reduction.

The intermediate outcomes expected of the program include:
1. Improved accessibility of development data owned by government and donors, and enhanced publishing in 'open data' formats for broad use and accountability.
2. Mobile and other rapid forms of government data collection to allow for real-time monitoring and information sharing are developed or strengthened;
3. A developer community working with the public and private sectors to apply technical skills to develop ICT applications for social development purposes in Indonesia is created.

AKIL is was developed to allow the Development Community to respond to this request and directly support the strengthening of ICT knowledge and innovation in poverty reduction programs, which was outside the purview of other existing programs. The PSF PNPM Support Facility will incubate some innovations under AKIL with the goal of moving this work into a larger body. AKIL will act as a convening space and a testing ground, to trial and support ICT innovations to promote open and accountable government, collect and share data, and deliver services in new ways. To do this, it will engage with our traditional development partners, including government, civil society, research institutions and other donors, as well as establish new relationships with technical communities and the private sector; and link in with regional communities of practice, and expand to become a regional initiative over time.

The use of space-based applications to identify how best to adapt to the challenges of climate change in Jamaica

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Jamaica is an archipelagic state with an exclusive economic zone that is approximately 25 times the size of its landmass. It is the third largest island in the Caribbean Sea with a total landmass of 10,991 km^2. The island is centered on latitude 18°15' N and longitude 77°20' W.

The devastation caused by hurricanes in Jamaica and the Wider Caribbean has demonstrated the country's vulnerability to the forces of nature and the importance of building capacities to adapt to their effects. There is consensus amongst the research community that there will be increases in rainfall intensity as well as in associated peak wind intensities associated with tropical storms under climate change. The CARIBSAVE Climate Change Risk Atlas for Jamaica notes that changes to the frequency or magnitude of storm surge experienced at coastal locations in Jamaica are likely to occur as a result of the combined effects of increased mean sea level in the region; changes in storm surge height, etc., which determine the sensitivity of the island to storm surges by influencing the height of the storm surge generated by a given storm.

Continual coastal development in Jamaica, for commercial and residential purposes, increase local vulnerabilities to sea level rise and storm surges. The fact that 25% of Jamaica's population lives within coastal areas and 90% of our GDP is produced within these areas, makes this island nation extremely vulnerable.

In Jamaica there has been wide spread application of space based technologies, in particular satellite imagery, in the areas of environmental monitoring, land use management and disaster management, and the country's response to adaptation measures to the impacts of climate change. In 2001, the Land Information Council of Jamaica led by the National Spatial Data Management Division spearheaded the collaborative acquisition of large scale satellite IKONOS imagery. Satellite imagery, along with, web mapping, remote sensing and information systems technologies, have proven to be

powerful tools that combine vector data and map information for improved and efficient analysis and decision-making as it relates to, analysis of settlements, quantification of urban sprawl, disaster and risk assessments and climate change adaptation strategies.

This paper will describe the advantages of utilizing available space technology applications to include: Increased Efficiency/Productivity, Cost Avoidance and how access to current and accurate space based data is required by the country to better inform climate adaptation strategies and responses.

Use of space-based technologies to climate change adaptation and mitigation: Prospects for Ethiopia

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Ethiopia is a vast country with an area of 1.13 million km^2 and endowed with diverse agro-ecologies that are mainly modified by altitude, ranging from about 116m below sea level to 4550 above sea level. Consequently, the climate is temperate type on the highlands and hot in the lowlands.These agro-ecological diversities, together with socio-cultural diversities, have endowed the country with plant and animal diversity. However, this diversity is largely endangered by exasperating climate change. Weather extremes are becoming frequent with high degree of variability in both time and space; whether the rainfall is too much or too little, it influences most agricultural activities. Despite using traditional farming systems, the agriculture sector is significantly contributing to the GDP, foreign currency earrings and employment opportunities. Ethiopia's geographical location and topography in combination with low adaptive capacity entail a high vulnerability to the impacts of climate change. Climate change is not a future possibility for Ethiopia; it is a present reality (http://www.epa.gov.et/). As Ethiopia's economy is dependent on rain-fed agriculture, which is predominantly sensitive to climate change, it is extremely vulnerable. As climate change is affecting poor communities toughest, adaptation can greatly reduce vulnerability to climate change by assisting them to adjust to climate change and variability, and helping them cope with adverse consequences. The National Adaptation Programme of Action (NAPA) report of Ethiopia (NMA 2007) identified the arid, semi-arid and dry sub-humid parts of the country as the most vulnerable areas to climate change-induced drought. According the same source, the agriculture sector is identified as the most vulnerable to climate variability and change. Climate models suggest that Ethiopia will see further warming in all seasons between 0.7°C and 2.3°C by the 2020's and between 1.4°C and 2.9°C by the 2050s (http://www.epa.gov.et/. The Environmental Protection Authority (EPA) has been mandated to co-ordinate the national response to climate change. Several organizations operating in the country (GOs, NGOs, UN agencies, universities and research institutions and professional associations) also have projects that address climate change related issues. Being the focal unit for climate related research, the Biometrics, GIS and Agro-meteorology Directorate of EIAR is undertaking climate change related research activities with government and external funding such

as the Rockefeller foundation, CIMMYT and ASARECA. Space science is relatively young in Ethiopia. Recently, a postgraduate study on Space Science is opened and a Space Science Society of Ethiopia (ESSS) is established to promote the Science in the country. Moreover, space science facility is inaugurated to work more and benefit from Space technology. With regard to the awareness and the use of Geo-Information Technologies (GITs) that include GIS, Remote sensing and GPS) in various sectors, Ethiopia is showing progress. The information from remote sensing, GPS, and Meteorological satellites is critically important to address climate change issues in the country. Integrated use of GITs, together with information from other space technologies, will help us to efficiently and effectively address the complex climate change challenges. Integrated space technology information (ISTI) is vital to have a good understanding of the extent and severity of climate change potential impacts and predict climate change trends for sustained agricultural production and productivity. Hence, data from earth observation satellites, with their wide coverage, multi-temporal, and multispectral capability, have huge potential contribution to Ethiopia in providing climate change related data/information for extensive areas. Climate change is a complex issue which needs integrated efforts of using integrated and comprehensive data/information. So, it is recommended that efforts in data, technical support/sharing and tailor-made training and coordinated climate change assessment be strengthened to help developing countries like Ethiopia, which cannot afford in getting such huge data on regular bass and lack advanced technical facilities.

Adaptation to Climate Change in Guatemala, efforts by MARN

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Guatemala is the northernmost country of Central America. It is located between three tectonic plates: Cocos, Caribbean and North America, with 34 volcanoes (four of them active) and in the hurricane belt of the Atlantic Ocean and Tropical Storms of the Pacific Ocean. The country has 38 basins distributed in three areas (Pacific, Gulf of Mexico and Caribbean Sea) and two mountain ranges.

With an area of 108,800 square km, Guatemala's population rises to nearly 15 million people where more than half lives in rural areas, and of that, 70 percent live in poverty with major economic and social disparities which eventually result in deforestation and land degradation, slash-and-burn subsistence agriculture and overexploitation of water resources.

These characteristics present a country with high exposure to the impacts and effects of geological, tectonic, volcanic and hydrometeorological phenomena that increase the social, economic, environmental and territorial conflicts. Deteriorating socio-economic conditions of the population due to food security, loss of livelihoods, and the reduction in productivity and resilience of ecosystems are most likely to generate economic, social progress and environmental degradation.

Under these conditions, the country has prioritized implementing adaptation measures oriented to the management of water resources as well as to the adequacy of production practices to promote food security. Conservation of natural ecosystems for the maintenance of ecosystem services for climate change adaptation is also considered important. Some advances have been made with initiatives to promote low carbon economy and reduction from deforestation and degradation as mitigation measures (REDD+).

Regarding the use of remote sensing in the country for mitigation efforts and adaptation to climate change, a national effort has been made mainly, to generate maps that describe forest cover and it's dynamics (1991-1996-2001, 2001 - 2006 and 2006-2010), the state of mangrove coverage (2012), forest fires (Geospatial Information System for fire Management in the Republic of Guatemala, 2009) and the

situation of water bodies (Atitlan, with CATHALAC support, 2009, 2010). Most of these are one-time efforts although should be revised and updated on a regular basis, although some of the support information, qualified personnel and funding for fieldwork, equipment and software, is usually not available.

However, knowing the potential that the use of space-based information provides, Guatemala is working in several initiatives that are oriented towards having a better description of the natural resources. Currently and under the Forest Mapping Group (composed by the National Forest Agencies (INAB and CONAP), the Ministry of Agriculture(MAGA) and the Ministry of Environment and Natural Resources (MARN) with Universidad del Valle de Guatemala and Universidad Rafael Landívar), there is an on-going work on the forest land uses map using RapidEye images donated by the GIZ (German Society for International Cooperation) as a part of the Regional Programme for Reducing Emissions from Deforestation and Forest Degradation in Central America and Dominican Republic. This map will help generate an analysis in Land Use, Land-Use Change and Forestry as part of the country's report to the UNFCCC.

Land Reforms and Usable Floor Space its Results

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State Committee Land and Cartography of Azerbaijan Republic

Total area of Republic of Azerbaijan	86,42 square kilometers
Population of country	9,4 million people

Among the countries of the former Soviet Union for the first time in Azerbaijan in 1996 carried out radical land reforms.

All the land of collective farms and state formers and other state agricultural farms free property transferred to some 3,5 million rural population.

As a results of land reform about 875 thousand families were on the property of 1,7 million hectares of the fertile land in the country.

Before the land reform in the country it was on state property. Three forms were formed the reform of property: 1. State property, 2. Municipal property and 3. Private property.

As a result of the total area country remained at 56,9 % state property, 23,5 % of the property transferred to the Municipalities and 19,6 % divided by its own population by drawing of lots.

At the state property of land remained Forestry and Water fund, winter and summer pictures, land for industry and other unsuitable land.

When carrying out land reforms take info account all the elements of soil fertility and evaluated bonitos score. The basic criteria for soils that are dependent fertility. Among them the reserves of humus, nitrogen, phosphorus, texture, amount of absorbed bases, soil acidity. Pay special attention to water and physical properties of soils that are connected to the bioclimatic potential of soil.

All families are issued state acts (legal documents) on the ownership of land. On the official acts all parcels of land given coordinates, which are derived from satellites.

At the present time all results of land reform are shuffled on the Internet. You can easily find any land in the website of the State Committee Land and Cartography and specify its location and coordinates. In addition you can find out who owns the land, the quality, fertility and regulatory cost.

Rapid Eye Applications in REDD

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RapidEye is a leading provider of quality high-resolution satellite imagery. With a constellation of five Earth Observation satellites, RapidEye images up to five million square kilometers of earth every day, and adds over one billion square kilometers of imagery to its archive every year. Every square kilometer imaged by RapidEye can be browsed with its online discovery tool, EyeFind (eyefind.rapideye.com). With an unprecedented combination of wide area repetitive coverage and five meter pixel size multi-spectral imagery, RapidEye is a natural choice for many industries and governments. RapidEye is headquartered in Berlin, Germany.

This presentation will provide the audience with an overview of applications of RapidEye data to Climate Change through the REDD programs; specifically forest cover loss and degradation and it's effects on the global carbon budget.

Assessment of some Vulnerability Parameters to the Urban Heat Island in Tanta City, Egypt using Remote Sensing and GIS

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Most local governance systems are also facing new and increasingly significant problems associated with global climate change such as rise in atmospheric temperature, droughts and storms, desertification, rising sea level and flood impacts, and their impacts on urbanized areas. Egypt is one of the African countries facing the highest rates of urban growth. Other problems such as poverty, degraded public health systems, shortfalls of adequate housing, and increasing demands on public infrastructure are increasing is emerging. The rise in urban area temperature is degrading the urban micro climate in cites, thus affecting health, activity and expenditures. This paper is concerned to address what factors affect vulnerability to these impacts in Tanta city, Nile Delta, Egypt as a pilot study area.

Remote sensing and geographic information systems can help detecting and studying of the Urban Heat Island on different cities. The vulnerability of the Egyptian cities to the heat island effects can be expressed by some parameters such as buildings heights, building use, buildings densities , percentage of green areas, percentage of open bare areas, sewage service, waste management and transportation system. Remote sensing, geographic information system and field surveys reveal that numerous contributing factors exist : urban pattern and high densities, crowded traffic roads, randomly distributed small industries exist in Tanta city, was used to study the Urban Heat Island using multi-temporal Landsat images thermal bands. A land cover change detection and city growth was also mapped and measured. For assessment of some vulnerability parameters of the city to UHI, a database was established based on a high resolution image and field surveys.

Identifying UHI hotspots in the city was followed by some field investigations. Results revealed a high building density, crowded traffic in roads, a poor management system for the city solid wastes, low percentage of green areas are effective and unfortunately common in most residential districts. Vulnerability of the city can be

reduced by improving the environment by adopting more policies for efficient transportation systems, moving the randomly distributed workshops , increasing the percentage of open spaces and green areas and improving the solid waste management system. More studies are needed for reducing the emissivity of the building materials.

Efforts to address climate change in Colombia

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Colombia since the creation of the National Environmental System in 1999 has progressed in a path of development together with its rich biodiversity. The commitments made at international level are developed with responsibility within the country in initiatives such as the Millennium Development Goals, the Kyoto Protocol and the United Nations Framework Convention on Climate Change. The country has submitted two National Communications to collect climate change evidences, the national inventory of greenhouse gases, potential impacts and adaptation and mitigation actions, taking into account the high vulnerability of the territory to climate change.

The tools provided by the earth observation have allowed an integral understanding of shift patterns and trends in the use and exploitation of natural resources, as well as supporting decision making and planning in areas impacted by extreme hydro-meteorological events such as La Niña 2010-2011. The path followed has brought valuable learned lessons and also has opened the spectrum of opportunities for the implementation of new processes, the use of new technologies, and challenges of coordination and institutional strengthening at national, regional and local level.

The Interface between International and National Mission Products for Climate Change Applications

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Applications for climate change monitoring rely on a diverse range of data sources. Of the Space Based data sources, broadly two types are available, satellites from the longest established space agencies such as NASA and ESA and those from smaller space agencies and commercial operators. The longest established space agencies generally provide large area, low resolution systematic products while those from smaller agencies and commercial operators normally provide higher resolution products.

The purpose of the presentation is to demonstrate the applicability of both regional and international efforts in space-based climate change monitoring. It will compare the products available from a selection of missions in the context of climate change applications and evaluate the various benefits of each data source by evaluating metrics such as data continuity, accessibility, data quality, ease of use and usefulness for various applications.

Remote Sensing Application Technique to Detect and Identify Climate Change over Indonesia

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This presentation is mainly concerned the possibility an application of remote sensing technique to detect an identification of climate change over Indonesia. According to the IPCC AR4 Report (2007), the climate in IPCC usage refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. For the study case, we applied the monthly of surface rainfall data observation over Cilacap, middle of Java Island for period of 1901 to 2012 (about 112 years observation).

By applying the statistical analysis referred from the IPCC AR4 Report above, we made 11 rainfall clusters for each 10 year observation that started from 1901 to 1910, following by 1911 to 1920, and etc. The first cluster taken from 1901 to 1910 for example, we found the peak of dry and wet season is occurred in July, and October, respectively. While, for the second cluster taken from 1911 to 1920, the peak of dry and wet season is occurred in August and October, respectively. By investigating these study cases carefully, we found that since the third cluster, taken from 1921 to 1930, the peak of dry season is variated. Sometimes is occurred in July, but sometimes is August or September. While, the peak wet season is still same that is in November. On the other hand, we can see that since 1921 to 2010, the large variability of rainfall intensity is occurred in dry season. While, the small variability of rainfall intensity is occurred in wet season, that is in November.

We investigated also for other citites, they are Surabaya, Yogyakarta, Jakarta, and others, incuding the surface temperature observation. Please note here, all data that we have already analized is taken from the *in-situ* observation. Since, the rainfall and temperature can be derived from satellite, we are interest to apply that remote sensing technique to detect an indetification of climate change over Indonesia, especially over Java Island using the rainfall and temperature taken from the satellite observation. For this case, we show the comparison of satellite and *in-situ* observation over Malang, East Java using the

statistical analysis. Furthermore this study results will be discussed in this paper.

Keywords: Climate Change, Trend of Rainfall, and Remote Sensing Technique

Utilizing information from space-borne sensors for climate risk management

Gabrielle Iglesias

Climate change adaptation and disaster risk management intersect where future climate change produce impacts in terms of changes on hydro-meteorological hazards, on the environment, and on the vulnerability of elements-at-risk to disasters. The Asian Disaster Preparedness Center (ADPC) has been working within this intersection known as climate risk management.

For nearly 30 years, ADPC has been making Asia-Pacific safer by strengthening disaster resilience at all levels. Established in 1986, ADPC is an independent non-governmental organization. Our portfolio focuses on DRM capacity building, improving DRM for cities and climate change, mainstreaming DRM into national and local development, improving DRM systems and undertaking disaster risk assessments.

Current initiatives in climate risk management are on downscaling future climate projections, and utilizing these for early warning and climate change adaptation.

Space Application in Climate Change in SUPARCO, Pakistan

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SUPARCO, Pakistan

Space Technology Applications to Monitor Effects of Climate Change in Pakistan

According to Intergovernmental Panel on Climate Change (IPCC), the global averaged surface temperature on Earth will increase by 1 to 3.5°C by the year 2100. The harmful impacts of climate change and global warming include frequent and intense occurrence of extreme weather events like cyclones, floods and droughts, etc. There is also evidence of accelerating recession of most glaciers on Earth, rainfall variability and changes in marine ecosystems. Pakistan is severely impacted by the negative effects of climate change. SUPARCO, the Pakistan's national space agency has been utilizing space technology to mitigate the effects of various disasters through provision of timely satellite data and situation update reports to the stake holders. The space based information were useful for rescue/relief activities, early recovery and rehabilitation efforts. To cope with effects of climate change, early warning systems and allied information systems are required to be made more effective to enhance disaster preparedness. Measures for improving forest management and biodiversity conservation should be taken. It is emphasized to adopt appropriate climate change policy into development planning at all scales, levels and sectors.

Climate Change Impacts on Pollination and Insect Pest Management in the East African Mountain Ecosystems

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The four-year (2011–2015) research and development project Climate Change Impacts on Ecosystem Services and Food Security in Eastern Africa (CHIESA) creates new knowledge on the impacts of climate change on mountain ecosystems and their regulating ecosystem services in the East African mountains in the Taita Hills in Kenya, Mount Kilimanjaro in Tanzania and Jimma Highlands in Ethiopia. The on-going monitoring and research activities address the climate change impacts on pollination, insect pest and disease control in the forest-agriculture mosaics of the scattered mountain ranges.

Satellite and aerial imagery are acquired and processed to obtain very high resolution geospatial data sets on land cover and land use change, with a focus on forests and crop surroundings, which play an important role as habitats for pollinators, parasitoids and natural enemies of harmful insect pest species. Data on past and current hydro-meteorological conditions are integrated with life table parameters of target arthropods for maize, crucifers, avocado and coffee from simulated and natural warming conditions to analyze eco-physiological and reproductive responses of these species at varying temperatures and relative humidity ranges along the altitudinal gradients and agro-ecological zones. Climate-driven changes in the pollinator and major crop pest diversity, abundance and geographical distribution may lead to impaired pollination and reduced fruit sets as well as more serious pest outbreaks in the mountain farms affecting their food security. The project will create predictive models and vulnerability risk maps to support the development and implementation of adaptation strategies, such as Integrated Pest Management, in the sensitive and unique mountain agro-ecosystems.

The CHIESA project is funded by the Ministry for Foreign Affairs of Finland and coordinated by the International Center of Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya.

Applications of Space-based Information in the Philippines

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Applications of space-based information – focusing on satellites – are already an essential part of our daily lives and crucial to the functioning of global society. Recent climate-related disasters in the world, particularly throughout Asia and the Pacific have heightened expectations regarding space application and their ability to address new requirements, thereby helping to build a safer, more resilience communities.

The Philippines is strategically located in the tropics and is considered archipelagic in nature with many low-lying areas which are highly vulnerable to the impacts of climate change. The country's climate is predominantly controlled by topography, with several islands, mountain ranges, and coastal plains; and wind systems as a result of the seasonal differential heating of neighboring continents and oceans. The rainfall activity is highly variable and is mainly due to the complex interaction of various weather-causing phenomena such as the inter tropical convergence zone (ITCZ), monsoons and tropical cyclones.

In the Philippines, environmental problems associated with climate change impacts have been identified as among the most serious and pressing issues that need to be addressed. By analyzing satellite observation data and making this information available to researchers, efforts relating to the realization of a safe, secure and resilient society can be enhanced. Further development and adoption of existing satellite applications, while simultaneously making use of new satellite products will be needed to further support the country's requirements and to better monitor, characterize, and predict changes in the Earth system.

Space Technologies in Sudan

By

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The Space Technology Centre in Sudan was established in computer Man College in year 2000. The governmental space program is mainly represented by the Remote Sensing Authority and the Sudan Institute for Natural Resources. The Satellite Receiving Station receives images from satellites which can be used for studying the atmosphere The government has begun to study the establishment of the Sudan Space Agency .Sudan can benefit from several new tools and technologies, the Latest methods, approaches, models used for identifying, assessing and reducing climate change risk, also benefit of using maps to show areas subjected to climate change and those projected to be impacted most in the future to climate variability to identify vulnerable areas and what sectors are going to be impacted most (water, agriculture and livestock, health.). For Sudan to be able to incorporate the routine use of space technology-based solutions there is a need to increase awareness, build national capacity and also develop solutions that are appropriate *to the needs of the country.*

Space-Based Application for Coastal Vulnerability Assessment in Indonesia

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Some of the climate change impacts are the loss of small islands, loss of shoreline, increasing the number of disaster, whether flood or drought and changes in agricultural cropping patterns. It promises bring influence to Indonesia what is the world's largest archipelago, longest coastline, a supermarket disaster and an agricultural country. In the facts, most of big cities which is contained poor people located in the coastal areas. Therefore, Indonesia is vulnerable to climate change. Conducting research on the vulnerability assessment to climate change, especially on the coastal area is important for this country. This paper presents the state of the art of research on using space-based information for coastal vulnerability assessment in Indonesia. It contains the general description of coastal vulnerability assessment, current status of space-based application for coastal vulnerability assessment in Indonesia, example of case study, and the future research of using space-based information for coastal vulnerability assessment in Indonesia. This paper concludes that the researches on using space-based information for coastal vulnerability assessment have been undertaken by researcher and the academia in Indonesia, but still on the limitation numbers. The improvement should be done on the relation of space-based information and the social economic factors. It is a challenge research on the remote sensing community.

Keywords: Coastal vulnerability, space-based information, state of the art, social economy

An Overview of Southern Philippine Climate Change-Related Meteorological Events

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At 7.0 degrees north of the equator, the tropical zone takes the lion's share of solar infrared radiation. Southern Philippines has lately been the recipient of severe climate change-related meteorological events. An overview of these events and the adaptation activities to them will be presented. Ideas for further research will be explored, given the Manila Observatory's southern Philippine station has also been collecting magnetic field data, as part of a MAGDAS project, at the zero dip magnetic equator.

The Impact, Mitigation and Adaptation of Climate Change in Sri Lanka

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Sri Lanka is a negligible contributor to global warming. However, as a nation, we are highly vulnerable to the impacts of climate change, which include:

1. Increases in the frequency and intensity of disasters such as droughts, floods and landslides;
2. Variability and unpredictability of rainfall patterns;
3. Increase in temperature; and
4. Sea level rise, among others.

Sri Lanka has to address these challenges considering the need for increasing investment for environment friendly infrastructure development, increased volatility to energy markets, problems related to food security, trade, commerce and industrial development together with the climate change challenges.

Sri Lanka is actively involve in the global efforts to minimize the greenhouse gas emissions within the framework of sustainable development and principles enshrined in the United Nations Framework Convention on Climate Change (UNFCCC) and it's Kyoto Protocol (KP).

Annual mean temperatures in Sri Lanka shows a significant warming trend while mean annual precipitation decreased by 144mm (7%) during 1961-1990, compared to 1931-1960. Although past trends are fairly clear, Sri Lanka's future climate appears more uncertain. Studies which look at future climate scenarios are rare but there is general consensus among these projections that Sri Lanka will become increasingly warm during the 21st century, although the projected magnitude of temperature increase by 2100 ranges from 0.9-4°C. Rainfall projections, however, are confusing and contradictory, with some studies projecting increased mean annual precipitation and others projecting a decrease.

Understanding of possible climate change scenarios that may affect on Sri Lanka, the new project was started by Department of Meteorology

to construct high-resolution climate change scenarios for region of interest. It is used HadCM3 (Hadley Centre Couple Model, version 3) data with PRECIS (Providing REgional Climates for Impacts Studies) regional climate model. These scenarios can be used in impact, vulnerability and adaptation studies in Sri Lanka. The Department of Meteorology also has FY (Chinese) and COMS (Korea) geostationary weather satellite data receiving stations. These data are mainly practice on weather forecasting purpose in Sri Lanka. In addition to that the Department also received METEOSAT, MODIS, ASCAT and OCEANSAT satellite imagery/data through internet, to analyze the various weather and climate impacts on Sri Lanka.

With a rise in sea level, Sri Lanka is impacted in many ways such as coastal erosion; natural habitat destruction; intrusion of salinity and of course the most dire consequence, shoreline retreat. Sri Lanka has been experiencing a staggering coastal erosion rate of 0.30-0.35 meter/year. This has been said to adversely impact almost 55 percent of the shoreline. The coastal belt is one of the major lifelines in Sri Lanka's economy. Geographically, it covers 24 percent of the total land area and 32 percent of the total population. The coastal belt also houses 65 percent of the urban land area including the capital Colombo.

Temperature increases, rising seas and change in rainfall pattern and distribution due to global climate change will lead to substantial modification in land and water resources in Sri Lanka. Therefore as a small Island, Sri Lanka can be obtain unique benefit of the used of space base information for mitigation efforts and adaptation to climate change.

Ghana Technology Needs Assessment Project for Climate Change Adaptation and Mitigation

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The development goals of Ghana are intractably linked to its ecosystems and environmental conditions. In this regard, Ghana is committed to addressing the challenge of climate change from the local perspective even as it joins the international community to carry out the vital actions to meet the global challenge.

Ghana ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and since then a number of programmes and projects that address the climate change challenge have been conducted and includes the National Climate Change Adaptation Strategy (NCCAS) in 2011 and key policy documents including the Climate Change Policy. These documents served as blueprint to guide the adjustment of Ghana's economy to expected climatic stimuli and their affects, and the strengthening of its adaptive capacity with regard to climate change impacts by building the resilience of the society and ecosystems.

There is environmental degradation with a gradual loss of forest cover and the impact of climate change is already being felt in variability of climactic conditions with uncertain rainfall, drought, increasing temperatures and sea erosion. The overall challenge for Ghana is to enhance the national climate innovation system to facilitate the generation and adoption of technology that response to climate change impacts.

Technology Needs Assessments (TNAs) are a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of countries to climate change. It is central to the work of Parties to the United Nations Framework Convention on Climate Change (Art. 4.5 of the convention). TNAs present a unique opportunity for countries like Ghana to track evolving needs for new equipment, techniques, services, capacities and skills necessary to mitigate Green House Gases (GHGs) emissions, enhance adaptation and reduce the vulnerability of sectors and livelihoods to climate change. TNA development is a key component of the Poznan Strategic

Programme on Technology Transfer supported by the Global Environment Facility (GEF).

This presentation will focus on the project implemented by the Environmental Protection Agency under the auspices of the Ministry of Environment Science, Technology and Innovation (MESTI) with financial support from the GEF and collaborative technical support from UNEP-DTIE (Division of Technology Industry Economic of UNEP), UNEP Risoe Centre (URC) and ENDA. The project aimed at identifying and prioritizing through country-driven participatory processes, technologies that can contribute to adaptation goals of Ghana while meeting national sustainable development goals and priorities. It sought to identify barriers that could hinder the acquisition, deployment, and diffusion of the prioritised technologies, develop Technology Action Plans (TAP) by specifying activities and enabling frameworks to overcome the barriers in order to facilitate the transfer, adopt and diffuse selected technologies in Ghana and identify projects to be implemented as pilot.

Challenges in climate assessments for climate change impacts, vulnerability and adaptation: the potential use of gridded datasets

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Climate change has been considered a serious environmental issue that poses a challenge to human livelihoods. Numerous studies have been undertaken in recent decade to understand the potential impacts of climate change on a wide range of economic sectors. Climate assessments are also often conducted to evaluate vulnerability of a region or location to climate change and to identify potential adaptation options. Unfortunately, climate assessments are complex and pose many challenges. This presentation discusses challenges in climate assessments that should be considered when interpreting the assessment findings. A specific discussion is devoted to address challenges in climate data that are required for climate assessments. Availability of daily solar radiation is used as an example considering this variable is infrequently measured compared to other climate variables such as temperature and precipitation**.** Several daily solar radiation sources estimated from point based models (stochastic, empirical, and mechanistic models) and gridded datasets (satellite estimation, reanalysis datasets, and regional climate model simulations) were compared with observations. An impact model (i.e., crop model) frequently used for climate change impact assessments was also employed to evaluate sensitivity of the model to different daily solar radiation sources. Such assessment was purposed specifically to explore the potential application of gridded datasets particularly satellite estimation for climate assessments. In addition, a proposed assessment strategy that integrates the application of modeling approach and stakeholder inputs for climate change adaptation assessment at the local/regional scale is presented to discuss other aspects beyond the modeling approach that should be considered when conducting an adaptation assessment.

The use of space based information in helping Mauritius to mitigate and address its needs related to adaptation to climate change

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Climate change and its subsequent repercussions are beyond doubt, a common knowledge to all of us. Climate, in fact, has now become the most pressing development concerns of this modern world, and it is well known that weather changes, such as more erratic rainfalls and glazier melts leading to severe droughts, sea level rise, increase in global temperatures, increase in frequency and intensity of natural disasters like cyclones and flooding, and many other more implications.

This presentation will therefore attempt to give a brief overview of climatic change, not from a global point of view, but from the point of view of the SIDS, including Mauritius. It also emphasises two very important facts about climate change in Mauritius. The first are some of the observed impacts of climate change in Mauritius and the second deals with some of the projected impacts of climate change on our island. The importance of space based information to help Mauritius to mitigate and address its needs related to adaptation to climate change is also being addressed, while stressing the fact that all this space technology applications should be adapted to our own specific needs, that is to our local context so that climate change will not threaten the remarkable and significant achievements that our island has accomplished up so far.

Use of Space-based Technology Information in the regional Niger Basin in the West and Central Africa on the Mutual Use of the Shared Water Resources for Sustainable Development and Mitigation of Climate Change Challenges

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River Niger, in the West and Central Africa, is 4,200km long. It is the third longest river in Africa. The river drains an active basin area of 1.5 million sq km that is occupied by over 110 million people (2011 population) in nine countries in the region. The countries are Benin, Burkina Faso, Cameroon, Cote d' Ivoire, Guinea, Mali, Niger, Nigeria and Tchad. There is a framework of cooperation by the nine countries under an institution called Niger Basin Authority (NBA) based in Niamey, Niger Republic. The framework is to ensure joint management and peaceful use of the common resources for integrated development in the shared basin.

This collaborative mechanism for integrated development and disaster management in the region is achieved primarily by the use of space-based information technology for improved hydro-environmental monitoring and data collection for services and planning in the basin and complementing it with a clear aspiration for regional development of driving action called the Shared Vision process.

The World Meteorological Organization (WMO), a technical body of the United Nations, has initiated in 1993, an assisted project called World Hydrological Cycle Observation System tagged WHYCOS. The project aims at assisting, mostly especially the developing countries in the world, with improved space-based technology of hydro-meteorological data collection system in the trans-boundary water resources basins for improved hydrological services and regional development. The West and Central Africa component of WHYCOS, for the Niger Basin region, is called Niger-Hycos.

The Niger-Hycos project has a set of telemetric network of hydro-meteorological observatories on the main Niger and its tributaries, in the nine countries. The monitoring equipment that is used in the basin is the US-made Sutron type of Data Collection Platform (DCP). Each equipment has its own satellite dome for transmission through satellite and a pair of solar panels for energy. The assisted project is providing consistent, quality and real time data at the national and regional level for mutual and integrated use of the common resources for development, flood-forecasting and risk disaster management at

national and regional levels.

It is pertinent to note that the position of Nigeria in the regional basin is critical as the country is located at the downstream end of the basin and so making it vulnerable to all activities of the upstream counties. Consequently, the country has strengthened its National Geo-Spatial Data Infrastructure system, to augment the information from the other space-based information facilities in the region, for an enhanced information gathering against hazards.

The paper is basically to highlight the benefits of space based information system as a veritable tool for development and disaster management, and for risk preparedness and response recovery and mitigation to climate challenges at national and region levels.

From vulnerability to adaptation: the contribution of space technologies

Coupling spatial data and high-resolution climate modeling in support for a strategy to climate change adaptation in Algeria

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According to the IPCC, the Mediterranean should be during this century, a "hot spot of climate change." Since 1970, the South-western Europe experienced a warming of about 2° C, can also be seen in North Africa even though it is more difficult to be quantified because of a less dense observation network.

Urban areas, where a largest part of population is concentrated, are increasingly faced with threats climate (higher temperatures, rising sea levels, heavy rainfall or decline, droughts and storms). These extreme events, which frequency has increased in recent decades take sometimes the magnitude of disasters. Face to this vulnerability, cities face the challenge of preventing risks and improve their resilience to climate change and disasters through mitigation and adaptation strategy planning.

Based on the results of the CIRCE project (FP6) of high-resolution climate modelling that has produced an integrated assessment of climate change impacts in the Mediterranean area, a research project is being developed to combine these results with space data for exert a constant watch of changes in environmental parameters and climatic at an excellent resolution, providing a continuum of observation scales in space and time of oceanic and terrestrial environmental structures. This project, supported by Planet Action initiative (Algeria 7666), aims to the production of useful knowledge to scientific community and plays a role in supporting public policies on the management, development and city planning in a context of climate change.

It allows understanding the impacts of climate change on manmade systems, to develop and validate tools for systems vulnerability assessment as well as dynamic indicators to be used by the scientific

community and policy makers to support the development of local, regional or national adaptation strategies.

Climate Change and disaster-risk management in Bhutan

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Though Bhutan is a small country, it is susceptible to various natural hazards such as Earthquake, Glacial Lake Outburst Floods, Flash Floods, Natural Dam Formation and Dam Burst, Landslides, fires on human settlement and forests, and extreme events such as Windstorms, Thunderstorms, Hailstorms, droughts, epidemics, pests and diseases. Natural Hazards are often caused and its impact exacerbated by environment degradation. Both of which contributes to the impediment of sustainable development efforts. Climate change and global warming have also contributed as catalyst in increasing the frequency and intensity of hazards.

Bhutan has history of earthquakes exceeding 8 on Richter scale dating back to 17th century to most recent of 6.9 on Richter scale in 2011. One of the most threatening hazard due to climate change is the Glacial Lake outburst Floods (GLoF). A study conducted in 2001 by the Department of Geology and Mines (DGM) in collaboration with International Centre for Integrated Mountain Development(ICIMOD) has identified 2,674 glacial lakes in Bhutan, of which 562 are associated with glaciers and 25 of them as 'potentially dangerous lakes'. Other hazards equally attributable to climate change are floods, natural dam formation, landslides and forest fires.

In order to combat disasters and reduce risks, Bhutan has embarked on various initiatives with help of various international organizations such as:

1. GLoF Zonation mapping
2. Undertaken a Project to artificially lower the water volume manually in one of the 25 potentially dangerous Glacial Lakes with financial support from GEF through UNDP.
3. To preserve the forest cover at all times to come, Department of Forest and Park Services is now practicing Community based forest management and
4. Forest Fire Management

Possible areas of collaboration using satellite and technical resource are:

1. Glacial Lake monitoring
2. Multi – hazard zonation
3. Monitor changing Landscape
4. Image for the pre/post disaster
5. Strengthen Forest Fire Management
6. Implementation of pilot and research projects
7. Telemedicine
8. Capacity building

Don’t Waste Space

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In this talk I would like to outline in broad terms some of the plans for setting up and conducting research at UNSW Canberra in support of finding new and useful ways of using space technologies to understand and deal with the challenges of climate change. This is a new area for us, but one which I feel is of critical global importance and, therefore, the use of space-technology is an opportunity not to be wasted. The talk will discuss some of the issues I see as being relevant, ranging from questions of data – what type, how much, “big data” issues etc – to space-borne assets and the issues of data users, data providers and empowerment. Of interest also is whether space technology can only provide a means of monitoring and understanding the problem, versus whether and how far it might be used pre-emptively. In other words, I would like to investigate passive versus active roles for space technology in climate change applications.