

Report on the Second Meeting of the Research Coordination Committee (RCC) of the Asia-Pacific Environmental Innovation Strategy (APEIS) Project

*Bangkok, Thailand
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Background

The Asia-Pacific Environmental Innovation Strategy (APEIS) Project (see <http://www.ecoasia.org/APEIS/>) aims to promote informed decision-making for sustainable development and promote regional cooperation to see the tools it develops used. It has three Sub-Projects. These are:

1. Integrated Environmental Monitoring (IEM),
2. Integrated Environmental Assessment (IEA), and
3. Research on Innovative and Strategic Policy Options (RISPO).

The work being undertaken by the IEM was what brought David Jupp to the meeting. The Research Coordination Committee (RCC) provides the framework for reporting and project evaluation across all of the Sub-Projects and also aims to enhance interchange and synergies between them. The meeting was attended by the primary funding agency (Ministry of Environment, Japan, MOEJ) and also by other stakeholders such as the Asia-Pacific Network for Global Change Research (APN, <http://www.apn.gr.jp/>) and interested parties such as UNESCAP and UNEP.

The IEM has four primary areas of activity. These are:

1. Development of Satellite Network System
2. Monitoring Environmental Disaster
3. Environmental Degradation & Environmental Indices
4. Land-Atmosphere Process & Ecological Functions

The IEM's current program has a strong focus on the use of MODIS data for regional remote sensing and its use in estimating regional fluxes of carbon, water and energy. It is a base activity in all the four areas above. The IEM organised a Capacity Building Workshop, supported by APEIS and APN, in Beijing September 20-21, 2002. At this meeting there were discussions about the value of regional data consistency and standards along lines currently being pursued in Australia. David Jupp attended the meeting in Bangkok to report on activity in the MODIS DB network in Australia since the Beijing meeting, to continue to develop this opportunity and to discuss the possibility of the next IEM Capacity Building Workshop being held in Australia later in 2003.

The main IEM project areas are in Japan and China but there has been a growth in activity in the region with Singapore and Korea involved with MODIS acquisition and processing. There is a set of flux stations in Japan, China and Korea that cover diverse environments and are active to develop high quality data bases as well as utilise satellite remote sensing for regional estimates.

The linkages between the IEM, the IAM, RISPO and policy makers are not as extensive at this time as the project managers would prefer and the Bangkok meeting sought to change this situation. They promoted increased policy relevance of the activities as well as greater linkages being forged between the Sub-Projects and between every Sub-Project and the people concerned with policy. MOEJ was especially keen to establish synergies between the groups and their project objectives and to see policy agencies supported and engaged by the Sub-Projects.

The different Sub-Projects have a very interesting range of objectives and activities. More about the Sub-Projects can be found at the APEIS web site (see <http://www.ecoasia.org/APEIS/>) but the work being done will not be discussed any further here. But briefly, the way the Sub-Projects can fit together is in the sense of:

- Where are/will things happen? (IEM);
- What is happening/causing it? (IEA);
- What can be done about it? (RISPO).

The RISPO Sub-Project has a site in Thailand and the meeting was well attended by people from the Thai Ministry of Natural Resources and Environment. Considerable commentary by the Thai policy makers encouraged greater interaction with policy in general and Thai policy makers in particular. Of special interest was to provide support to develop effective means to carry out the Clean Development Mechanism (CDM) of the Kyoto Protocol from its economic and ecological sides. There is likely to be more emphasis on CDM in a range of the APEIS Sub-Projects in the future.

In the rest of this report the specific items relating to the IEM and its future work will be described.

Reports of the IEM Sub-Project

The IEM activities and progress were reported by:

Prof Masataka Watanabe, National Institute for Environmental Studies (NIES) (the Sub-Project leader and the main talk);

Prof Liu Jiyuan, Chinese Academy of Sciences (CAS);

Dr Soo Chin Liew, National University of Singapore (NUS);

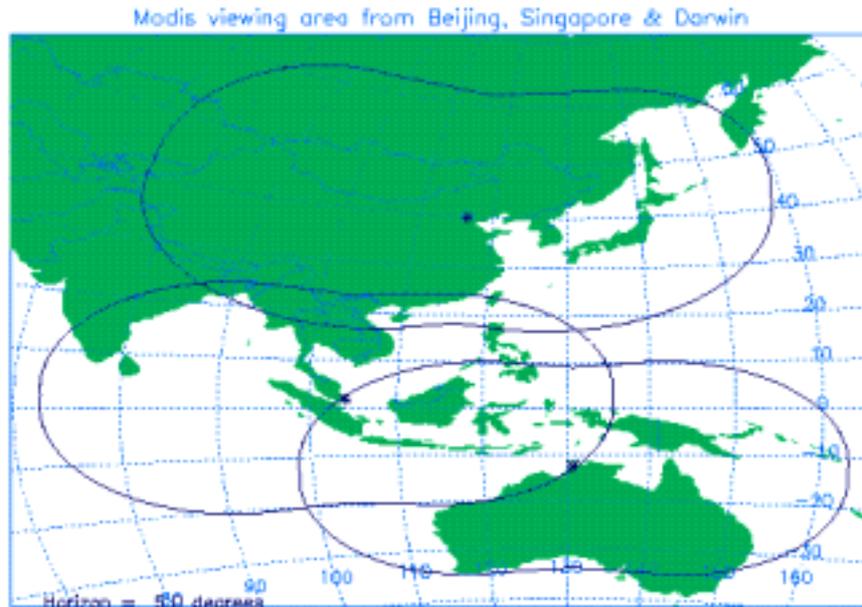
Dr David L B Jupp, CSIRO.

APEIS Integrated Monitoring Sub-Project

Prof Watanabe of NIES (<http://www.nies.go.jp/>) described the IEM Sub-Project briefly and then outlined the developing idea of a regional network of MODIS DB stations that would cover the whole of the South and East Asian region. Already, the network of stations based at:

- Urumqi (Xinjiang, China)
- Beijing (China)
- Tsukuba (Japan)
- Singapore
- Alice Springs (ACRES, Australia)

Can cover the region but some important redundancy and ocean extent is hoped to be added by the involvement of Perth (WASTAC) in Perth and two future stations being proposed by the Australian Bureau of Meteorology (ABoM) at Darwin its equivalent in China at Guangzhou in southern China. There was some discussion of the potential for India to join the network but it is not known which group (if any) is acquiring MODIS DB data. It was also mentioned that a Japanese group acquires MODIS DB data at the Asian Institute of Technology (AIT) in Bangkok but it is not known if that is done regularly or just on occasions. Some idea of the scope of the activity can be gained from the following set of acquisition areas provided for David Jupp's presentation by Paul Tildesley at CSIRO Marine, Hobart:



There is some interest in making the activity truly “Asia-Pacific” rather than just “Asia” but it is unknown what activity (if any) is planned in New Zealand or the western Pacific Islands.

Activity has mainly been a cooperative activity involving NIES and CAS. NIES has acquired the complete MODIS processing system at some considerable expense while China has developed a Chinese MODIS processing system that seems to have some

very good features and high geometric accuracy. Comparisons between the MODIS MOD11A2 surface temperature product and information collected in China showed both a need for local calibration of the standard product and possible improvements in the Chinese product.

There was already a clear message that the global MODIS products need local (re-)calibration and regional settings. A possible outcome of the project is to establish what these are for this region.

The activities at five flux sites in China were outlined. These are at Taoyuan (paddy field), Yucheng (irrigated dry field), Haibei (grassland), Fukang (desertified land) and Qianyanzhou (forest land). These are also being used in MODIS validation. Examples of application of combined information and models to watershed modelling (including biomass production) were presented for China and Japan.

Future activities will include developing the information system, environmental indices, integrated catchment-based flux models, a second Capacity Building Workshop in Australia, applications projects including one with the China Council of International Cooperation (CICED), SEPA, the Changjiang Water Resources Commission and the Millennium Ecosystem Assessment (MA, <http://www.millenniumassessment.org/en/>) project in the Changjiang catchment of China.

Progress on the processing and application of MODIS data received in Beijing and Xinjiang, China

Prof Liu Jiyuan of the Institute of Geographic Sciences and Natural Resources Research (IGSNRR, <http://english.igsnr.ac.cn>) of the Chinese Academy of Sciences (CAS) reported on the progress in the China side of the project. He described activities in both the MODIS processing and at development of the flux station network.

China has established a system to provide both Level 1B and higher-level products. There was always an incentive to have a local system since a Chinese language interface is necessary. In particular, they are confident that they have a better gridding method than the current NASA standard and have demonstrated that ENVI provided the worst result of all the choices.

The Chinese system has been calibrated for local conditions and is being used to provide geo-referenced products of NDVI, land surface temperature (LST) and instantaneous and daily FPAR. Composites of atmospherically corrected data are also being operationally provided from the DB sites. The actual operational data coverage of Beijing and Urumqi in China was shown and was very close to the union of the coverages shown in Paul Tildesley's Figure included above.

Applications currently being undertaken include fire monitoring, urban expansion and land cover mapping as part of the extensive work being undertaken in the Huanghe (Yellow River) and Changjiang (Yangse River) catchments. The data are especially

focussed on the six major ecosystem assessment and flux network sites in China. These cover issues of:

- Desertification
- Wind erosion
- Soil erosion
- Water shortage and pollution
- Deforestation

Despite the system development, the CAS is very keen to ensure that the APEIS project promotes regional consistency and standardisation of the products and also to engage in active validation in order to establish regional settings for the MODIS advanced products.

Research on MODIS data processing and applications at CRISP, National University of Singapore

Dr. Soo Chin Liew of the Centre for Image Processing, Sensing and Processing (CRISP) at NUS (<http://www.crisp.nus.edu.sg/>) provided an update on the activities in Singapore.

Dr Liew pointed out that CRISP has been receiving DB data since March 2001 and operationally provides data from its web site to Level 1B using the International MODIS/AIRS Processing Package (IMAPP, <http://cimss.ssec.wisc.edu/~gumley/IMAPP/IMAPP.html>) software.

The current research and development is aimed at implementing NASA's Level 2 processing algorithms and generating higher-level products. The emphasis will be on adapting the algorithms to local and regional environmental conditions and developing regional applications. Dr Liew mentioned (for example) the poor performance of the standard (global) Fire Algorithms in locations such as Sarawak. CRISP provides locally calibrated hotspot detection maps for the area of coverage that can be accessed from their web site.

The great expense of the complete NASA software system is prohibitive to Singapore and they are relying on IMAPP and released Level 2 products to establish their baseline before moving to develop algorithms independently. Currently they have implemented:

- Cloud mask, atmospheric profiles;
- Aerosol, precipitable water;
- Cloud products;
- Ocean Color;
- Sea Surface Temperature;
- Thermal anomaly, fire detection.

Non-standard higher-level products either operational or close to operational were listed as:

- Geo-rectification;
- Land Products (reflectance, LST, vegetation indices, Land Cover);
- Fire Products (hotspots, sub-pixel fire temperature & area, burn scars);
- Composites.

Dr Liew showed an impressive range of applications being undertaken at CRISP. These include regional fire monitoring, floods, regional land cover and coastal seawater quality and algal blooms.

Regional hotspot alerts and statistics are being provided but are not publicly available through the web while complete validation is being completed. Finally, the data sets are being collected into a web and email based system called the Regional Information System for the Environment (RISE).

As with China, there has been considerable progress beyond Level 1B and considerable development of local calibrations and local versions of software and also new products not part of the NASA suite. Nevertheless, CRISP is also concerned to see an effective level of consistency and standardisation between the stations of the regional network and the people there are keen to participate in data exchange and discussions that will help bring this about.

An update on MODIS DB acquisition, processing and applications in Australia

David Jupp presented an update on activity in Australia. The presentation as a PDF file is available through the EOC web site at <http://www.eoc.csiro.au> under the “MODIS” button on the left hand frame. This area contains a lot of information about Australian activity as well as reports of previous meetings and useful links.

David Jupp prefaced the talk by pointing out that policy relevance in the IEM must include data consistency and standardisation. A lack of standards will make the products difficult for policy makers to use with any confidence. Policy makers are happy to work on the basis of “legal opinion” rather than wait until everything has been tried in court but would be at a loss in the face of shifting and inconsistent legal frameworks. In order, therefore, for the products of our work to be policy relevant it has to have an agreed base of quality and consistency that will instil confidence into the users. Basically, the “best algorithm” is no better than any other if the users do not trust the products.

The talk outlined how this issue is being tackled in Australia under the guidance of the major X-Band data providers and groups such as CSIRO. In the face of such excellent progress in Japan, China and Singapore it was very comforting (albeit not from comfort of the experience) to present the overwhelming response of Australians to the on-line provision of hotspot information via the Sentinel web site constructed by CSIRO, DIGO and ACRES (<http://www.sentinel.csiro.au>) in time for the devastating fires of January 2003. This was a major demonstration of the value of DB information and near-real-time processing.

The talk also provided updates on activities at the ACRES-managed stations at Alice Springs (<http://www.auslig.gov.au/acres/>) and the TERSS site in Hobart (<http://www.terss.org.au/>) plus the rapid developments occurring in Perth with the new WASTAC X-Band system (<http://www.wastac.wa.gov.au/>). In particular, WASTAC, together with the other groups involved in MODIS DB, are proposing that Australia ensure consistency at both the Level 1B stage and also at the Level 2 stage. As part of this there has been strong support for the wide use of the IMAPP package (<http://cimss.ssec.wisc.edu/~gumley/IMAPP/IMAPP.html>) to process the base data.

The Level 2 stage can be thought of as “geophysical” products such as surface temperature or aerosol amounts. Beyond Level 2 are value added products and user oriented products. At that level there may be many approaches and many different user needs. However, if these are based on a consistent Level 2 data framework there will be considerable advantages in market acceptance and trust. Discussions on how to achieve this, how to maximise collaboration with US PIs and how to validate the products is on-going and the next meeting of the groups currently involved is on May 1 2003 in Melbourne.

In addition to developments in the X-Band network and DB products, David Jupp briefly described the OzFlux network of flux stations (<http://www.clw.csiro.au/research/waterway/interactions/ozflux/>) and the move by its developers to use MODIS data to provide a tool to support the regional extension of the data they acquire. There are nine sites in operation covering a variety of land covers and land uses. In particular, the Tumberumba site near Canberra is providing detailed information over alpine forests. This site has had extensive study with many forms of remote sensing data.

The talk concluded by listing the regional opportunities for both the MODIS and OzFlux networks that can be encouraged and developed through the APEIS framework. At the meeting it was decided that the next Capacity Building Workshop should be held in Australia in September or October in SE Australia. The objective is to tackle some of the technical issues of data exchange and standards and discuss collaboration on the development of regionally calibrated and focused products. As previously, the relevance of the products to both the (scientific) objectives of the Flux networks and the policy objectives of regional decision makers will be the background to the discussions.

Discussion & Outcomes

The meeting provided a very good overview of the APEIS and the potential for its three Sub-Projects to cover the range from information provision to decision making on the basis of information and analysis. There was a special emphasis and guidance for the annual report and its technical and management summaries that will need to be completed by the end of May for presentation to the ECO ASIA Environment Congress for Asia and the Pacific (Asia-Pacific Environmental Ministers Forum, <http://www.ecoasia.org/>) to be held on June 6-7, 2003 in Japan.

For the IEM, the plans in the coming year include the development of linkages and data consistency between stations in Japan, China, Singapore and Australia and a

move towards the provision of such data to data analysing centres in IGSNRR and NIES as a base for the regional flux modelling and policy-relevant modelling being undertaken by the various groups. The plans include developing a similarly consistent base of data from APEIS-Flux using the five sites in China and also the development of regionally relevant environmental indices for the region using MODIS DB data.

The Capacity Building Workshop in Australia will continue to build the capacity of the region through its intention to maximise regional participation and also to develop linkages between Australian scientists involved in MODIS processing and also those involved in Flux data collection and modelling and its integration with environmental satellite data.

The level and scope of Australian interaction with the APEIS Sub-Projects can develop in the future as its benefits become apparent to the researchers from the various agencies and groups. The interactions planned for later in the year fit in well with the moves in Australia to standardise MODIS processing as well as moves to increase the utilisation of MODIS data by Flux data collectors and modellers. It has developed at the right time to support this activity and provide a wider framework for the Australian efforts.

Acknowledgements

The APEIS project is thanked for providing the support for David Jupp to attend the meeting. In particular, Prof. Masataka Watanabe has shown particular enthusiasm to include interactions with the Australian DB network in his project plans and objectives. People contributing to the Australian update are gratefully acknowledged and included Alex Held (CSIRO), Richard Smith (DOLA), Stefan Maier (DOLA), Ian Shepherd (ACRES), Mike Pasfield (ACRES), Mike Raupach (CSIRO), Helen Cluse (CSIRO) and Paul Tildelsley (CSIRO).

Acronym Translations

| Acronym/Abbreviation | Expansion |
|----------------------|---|
| APEIS | Asia-Pacific Environmental Innovation Strategy [Project area] |
| RCC | Research Coordination Committee [of APEIS] |
| IEM | Integrated Environmental Monitoring [APEIS Sub-Project] |
| IEA | Integrated Environmental Assessment [APEIS Sub-Project] |
| RISPO | Research on Innovative and Strategic Policy Options [APEIS Sub-Project] |
| MOEJ | Ministry of Environment, Japan |
| APN | Asia-Pacific Network |
| UNESCAP | United Nations Economic and Social Commission for Asia and the Pacific |
| UNEP | United Nations Environment Programme |
| CDM | Clean Development Mechanism [Kyoto Protocol methodology to transfer carbon credits] |
| MODIS | MODerate resolution Imaging Sensor |
| DB | Direct Broadcast [of MODIS data] |
| NIES | National Institute for Environmental Studies [Tsukuba, Japan] |
| CAS | Chinese Academy of Sciences [Beijing, China] |
| NUS | National University of Singapore [Singapore] |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation [Australia] |
| ACRES | Australian Centre for Remote Sensing [Unit in Geoscience Australia concerned with remote sensing data acquisition and provision to Australia] |
| WASTAC | Western Australian Satellite Technology and Applications Consortium [satellite data acquisition site in Perth, Western Australia] |
| ABoM | Australian Bureau of Meteorology [Melbourne, Australia] |
| AIT | Asian Institute of Technology [Bangkok, Thailand] |
| IGSNRR | Institute of Geographic Sciences and Natural Resources Research [CAS, China] |

| Acronym/Abbreviation | Expansion |
|-----------------------------|---|
| CICED | China Council of International Cooperation [China] |
| SEPA | State Environment Planning Authority [China] |
| MA | Millennium Ecosystem Assessment |
| CRISP | Centre for Image Processing, Sensing and Processing [NUS, Singapore] |
| IMAPP | International MODIS/AIRS Processing Package [University of Wisconsin Level 1B processing for DB] |
| RISE | Regional Information System for the Environment [Web- based information system under development at NUS, Singapore] |
| LST | Land Surface Temperature [MODIS Level 2 product] |
| NDVI | Normalized Difference Vegetation Index [Level 2 MODIS product] |
| DIGO | Defence Imagery and Geospatial Organisation [Australian Government group supporting Defence mapping] |
| TERSS | Tasmanian Earth Resources Satellite System [X-Band acquisition site in Hobart, Australia] |
| ECO ASIA | Economic Congress for Asia and the Pacific [Forum sponsored by Ministry of the Environment, Japan for regional environmental discussions] |