

LAPORAN TAHUNAN

MACRES

ANNUAL REPORT

1997



PROFIL MACRES MACRES PROFILE

Pengenalan / INTRODUCTION

Pusat Remote Sensing Negara (MACRES) telah ditubuhkan pada tahun 1988 dan mula berfungsi pada tahun 1990. Ia bermula dengan seramai 17 profesional dan kakitangan sokongan, bertambah kepada 90 dalam tahun 1995 dan dijangka akan meningkat kepada 150 orang apabila kesemua jawatan kosongnya diisi. Objektif MACRES ialah untuk membangunkan teknologi remote sensing angkasa dan teknologi yang berkaitan, dan mengoperasikan aplikasinya dalam pengurusan sumber dan alam sekitar serta perancangan strategik negara.

MACRES ini dilengkapi dengan kemudahan sistem pemprosesan imej untuk memproses data satelit dan sistem maklumat geografi (GIS) untuk menganalisa data ruang. Program pembangunan tenaga manusianya sentiasa berusaha untuk menghasilkan saintis dan jurutera yang berkeupayaan dan terlatih dalam pelbagai bidang khusus demi mencapai tahap berdikari negara dalam teknologi tersebut.

The Malaysian Centre for Remote Sensing (MACRES) was established in August 1988 and became fully operational in 1990. It started with a team of 17 professionals and supporting staff, grew to 90 in 1995 and is expected to reach to 150 staff when all posts are filled. MACRES objective is to develop space remote sensing and related technologies and operationalise their applications for resources and environmental management, and strategic planning of the country.

MACRES is currently equipped with image processing systems for satellite data processing and geographic information system (GIS) for spatial data analyses. Its manpower development programme continues to strive towards having full complement of qualified and trained scientists and engineers in selected areas of specification in efforts to attain the objectives of its establishment.



Visi / VISION

Visi MACRES ialah untuk menjadi peneraju dalam bidang remote sensing dan teknologi-teknologi yang berkaitan serta membimbing negara ke arah kecemerlangan diperingkat antarabangsa dalam bidang-bidang yang berkaitan.

MACRES's vision is to be a leader in the field of remote sensing and related technologies and to lead the nation to international excellence in these areas.

Misi / MISSION

Misi MACRES ialah untuk negara mencapai keupayaan berdikari dan kecemerlangan diperingkat antarabangsa dalam bidang remote sensing angkasa dan teknologi yang berkaitan serta mengoperasikan penggunaan remote sensing angkasa dan teknologi-teknologi yang berkaitan untuk pengurusan sumber semulajadi, alam sekitar serta perancangan strategik negara dengan berkesan, dan menyokong industri tempatan untuk bersaing dalam pasaran terbuka.

MACRES missions are to attain national self-reliance and international excellence in the field of space remote sensing and related technologies to operationalise the use of space remote sensing and related technologies for effective natural resources and environmental management, strategic planning of the nation, and to support the local industry to compete in the open market place.

OBJEKTIF

Membangun remote sensing angkasa dan teknologi-teknologi lain yang berkaitan serta mengoperasikan aplikasinya bagi tujuan pengurusan sumber dan alam sekitar, serta perancangan strategik negara.

OBJECTIVE

To develop space remote sensing and related technologies and to operationalise their applications for resource and environmental management, and strategic planning of the country.

Dua program utama MACRES adalah / Two major programmes of MACRES are :

- Program Penyelidikan dan Pembangunan
Research and Development Programme
- Program Operasi
Operations Programme

PROGRAM PENYELIDIKAN DAN PEMBANGUNAN

- Menjalankan penyelidikan dalam bidang remote sensing angkasa dan teknologi yang berkaitan dalam semua sektor pengurusan sumber dan alam sekitar, serta perancangan strategik
- Menjalankan penyelidikan analisa ruang dan permodelan dalam prasarana sistem maklumat geografik (GIS)
- Menjalankan penyelidikan untuk pembangunan perkakasan dan perisian bagi segmen-segmen Pengguna, Bumi dan Angkasa dan teknologi remote sensing yang berkaitan.
- Menyediakan perkhidmatan perundingan dalam aplikasi dan pembangunan remote sensing angkasa dan teknologi yang berkaitan

RESEARCH AND DEVELOPMENT PROGRAMME

- Conduct research on application of space remote sensing and related technologies in all sectors of resources and environmental management, and strategic planning
- Conduct research in spatial analysis and modelling in geographic information system (GIS) environment
- Conduct research for the development of hardware and software in User, Ground and Space segments of remote sensing and related technologies
- Provide consulting and advisory services on applications and development of space remote sensing and related technologies

PROGRAM OPERASI

- Mengurus dan mengoperasikan pusat perkhidmatan data remote sensing dan perkhidmatan-perkhidmatan lain yang disediakan oleh MACRES untuk pengguna
- Mengurus dan menyelenggara sistem perkakasan dan perisian dalaman
- Merancang dan mengurus program pembangunan tenaga manusia dalaman
- Merancang dan melaksanakan program pengkorpratan MACRES
- Mengoperasi dan menguruskan stesen bumi satelit remote sensing
- Mengoperasi dan menguruskan pusat maklumat remote sensing nasional

OPERATIONS PROGRAMME

- Operate and manage user service centre for remotely sensed data and other services offered by MACRES to clients
- Manage and maintain in-house hardware and software systems
- Plan and implement in-house human resources development programme.
- Plan and implement MACRES corporatisation programme
- Operate and manage satellite remote sensing ground receiving station
- Operate and manage a national remote sensing information centre



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PERUTUSAN PENGARAH DIRECTOR'S STATEMENT

Pengarah MACRES
Director MACRES

Tahun 1997 telah menonjolkan beberapa pencapaian MACRES dalam bidang remote sensing dan teknologi-teknologi lain yang berkaitan. Di bawah Program Remote Sensing Nasional (PRSN), MACRES terus memainkan peranannya dalam menerajui pembangunan dan pengoperasian teknologi-teknologi berkenaan di negara ini. Program ini digerakkan melalui satu jawatankuasa induk dengan disokong oleh tiga kumpulan kerja dalam bidang-bidang pendidikan dan penyelidikan, keperluan data, dan penyebaran maklumat.

Sebagai tambahan kepada projek-projek penyelidikan di bawah mekanisma IRPA dan kerjasama dua-hala dengan rakan kongsi luar negara, program penyelidikan MACRES dalam 1997 memberi tumpuan kepada mewujudkan sistem pengoperasian bagi pengurusan sumber asli dan alam sekitar (NAREM) yang lebih berkesan menggunakan teknologi remote sensing dan sistem maklumat geografi (GIS). Sebagai langkah permulaan, negeri Selangor telah dipilih sebagai kawasan projek perintis NAREM. Pengalaman daripada projek perintis ini akan digunakan untuk pelaksanaan program NAREM peringkat seterusnya.

1997 had been another fruitful year for MACRES. Under the National Remote Sensing Programme (NRSP), MACRES continued to play a leading role in coordinating the development and operationalisation of remote sensing and its related technologies in the country. This was being implemented under the supervision by a national level main committee and supported by three working groups that oversees matters pertaining to training and research, data requirement, and information dissemination.

In addition to research projects implemented under the mechanisms of IRPA and bilateral cooperation with foreign partners, MACRES research programme in 1997 focussed on developing a more efficient operational system for natural resources and environmental management (NAREM) based on integration of remote sensing and geographic information system (GIS) technologies. Selangor has been chosen as the pilot study area for NAREM programme. Experiences gained from the pilot project would be used to assist the implementation of subsequent phases of the NAREM programme.

MACRES meneruskan inisiatif pemindahan teknologi dalam bidang-bidang teknologi terpilih yang memberi manfaat kepada negara melalui projek-projek kerjasama dua-hala dengan rakan-rakan kongsi luar negara. Satu daripada langkah terkini dalam inisiatif ini ialah bidang penggunaan data *polarimetric airborne Synthetic Aperture Radar (SAR)* di mana MACRES telah memulakan projek AIRSAR PACRIM dengan kerjasama *National Aeronautic Space Administration (NASA)*, U.S.A. dan *University of New South Wales*, Australia. Program yang dirancang dilaksanakan sehingga tahun 1999 ini disertai oleh 20 agensi pengguna di negara ini. Objektif utama program tersebut ialah untuk menggunakan data polarimetrik AIRSAR dan interferometrik TOPSAR bagi beberapa kawasan di Malaysia bagi penyelidikan dalam bidang analisa teren, perubahan gunatanah, kawalselia kepadatan hutan, maklumat zon pantai dan memahami pembentukan geologi tempatan.

Malaysia, melalui MACRES, telah terlibat dengan aktif dalam aktiviti-aktiviti serantau ASEAN, ESCAP dan Asia. Di atas reputasi ini, negara kita telah diberi penghormatan sekali lagi oleh Persatuan Remote Sensing Asia (AARS) untuk menganjurkan *The 18th Asian Conference on Remote Sensing* pada 20-24 Oktober, 1997 di Kuala Lumpur. Forum tahunan utama *Asian Association on Remote Sensing (AARS)* ini bertujuan untuk membincangkan aplikasi terkini remote sensing dan GIS dalam pembangunan negara-negara Asia. Ia juga bertujuan untuk meningkatkan penyebaran maklumat teknikal serta meningkatkan kerjasama di antara negara-negara di Asia dalam bidang-bidang penggunaan teknologi berkenaan.

MACRES continued its initiatives to effect transfer of technology in selected fields that could benefit the country through cooperative bilateral research projects with international partners. The latest in these efforts was in the processing and analysis of high resolution, interferometric and polarimetric airborne Synthetic Aperture Radar (SAR) data initiated under the AIRSAR PACRIM programme, and implemented with the cooperation of National Aeronautic Space Administration (NASA), USA and the University of New South Wales (UNSW), Australia. The programme, scheduled for completion in 1999, was currently being participated by 20 relevant agencies in Malaysia. The main objective of the project was to acquire polarimetric AIRSAR and interferometric TOPSAR data over Malaysia for research works in terrain analysis, landuse, landcover change detection, forest density monitoring, coastal zone information extraction and enhancing understanding of local geological formations.

Malaysia, through MACRES, was actively participating in regional activities of ASEAN, UN-ESCAP and Asia. The country was again given the honour by the Asian Remote Sensing Society (AARS) to host *The 18th Asian Conference on Remote Sensing* on 20-24 October, 1997 in Kuala Lumpur. This main annual forum of the Asian Association on Remote Sensing (AARS) was aimed to discuss current development in remote sensing and GIS applications in Asian and non-Asian countries. It also provided a forum to promote dissemination of technical information as well as improved cooperations amongst Asian countries.

Sebagai sebuah agensi P&P baru yang sedang berkembang maju, MACRES memberi penekanan kepada aktiviti-aktiviti pembangunan kapasiti infrastruktur khususnya pembinaan bangunan pejabat baru MACRES dan stesen penerima bumi. Kedua-dua infrastruktur ini akan disiapkan dalam tahun 1998. Pembangunan kapasiti tenaga manusia bagi memastikan peningkatan dalam kemahiran dan kepakaran kakitangannya dalam pelbagai disiplin teknologi yang berkaitan merupakan satu lagi aktiviti pembangunan kapasiti MACRES dalam tahun 1997. Ini termasuklah latihan peringkat lepasan ijazah di mana seramai 10 pegawai penyelidik telah dihantar untuk mengikuti kursus MSc.

As a new and dynamic R&D agency, MACRES was fully committed in its capacity building activities, especially in infrastructural and human resources development. A new office building and a ground receiving station for satellite data are two infrastructural development activities that were given high priority in 1997. Both were scheduled for completion in 1998. Human resources development to increase trained and skilled manpower was another major capacity building activity for MACRES in 1997. This include post-graduate training of 10 and one research officers who were sent for their MSc. and Ph.D programmes, respectively.



NIK NASRUDDIN MAHMOOD, FRSS
Pengarah MACRES

URUTAN PERISTIWA / HIGHLIGHTS of EVENTS



1/3/97 : Jamuan Hari Raya Aidilfitri dan Tahun Baru China di MACRES.
Hari Raya Aidilfitri and Chinese New Year Celebration at MACRES



22/3/97 : Mesyuarat Agong Pertama Kelab MACRES.
Kelab MACRES First Annual General Meeting

URUTAN PERISTIWA / HIGHLIGHTS of EVENTS



22/6/97 : Perlawanan Badminton Tertutup Wanita MACRES
MACRES Woman Close Badminton Tournament



4/10/97 : Majlis perpisahan untuk kakitangan MACRES yang akan berpencen
Farewell for MACRES retiring staff

URUTAN PERISTIWA / HIGHLIGHTS of EVENTS

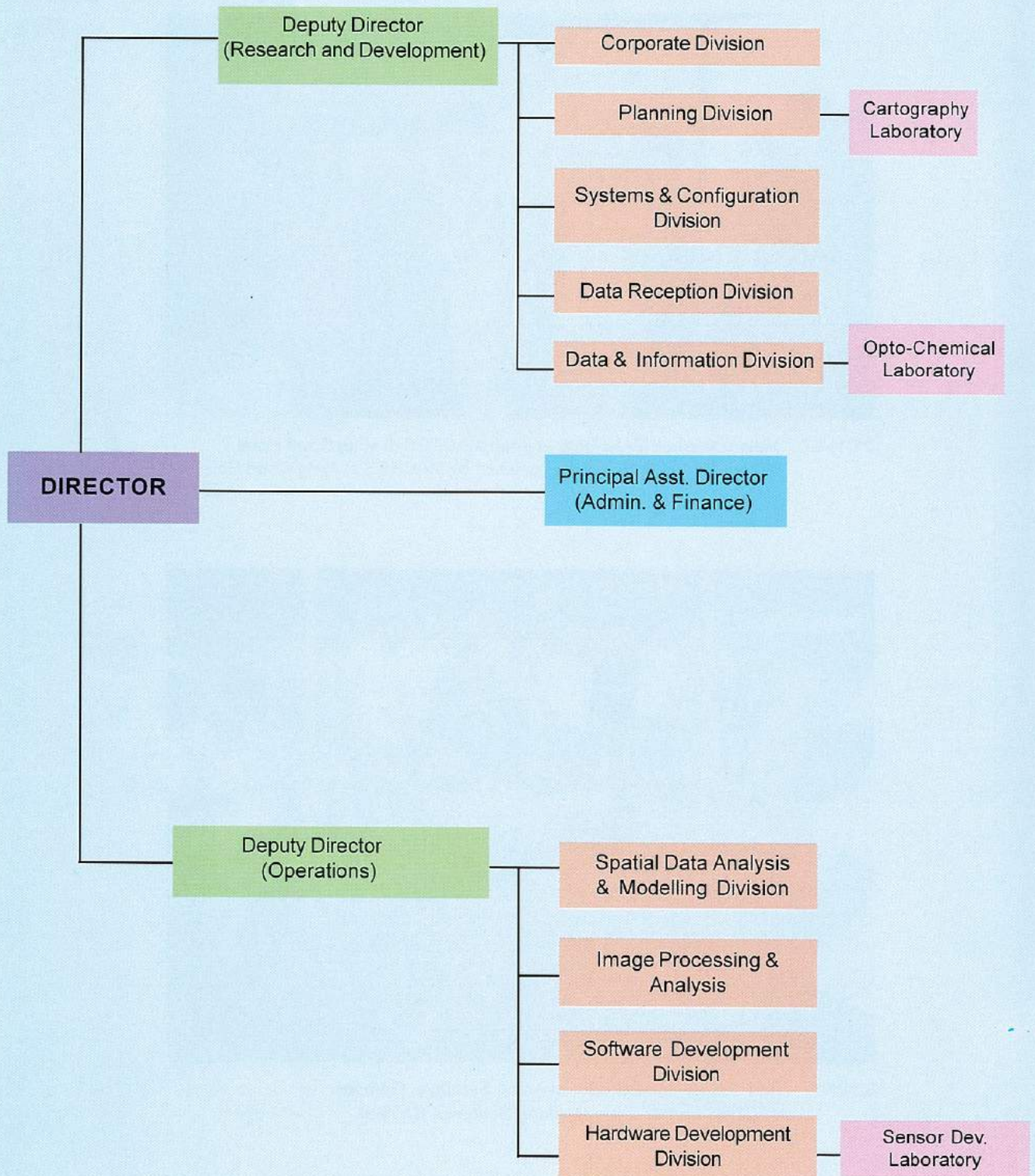


21/11/97 : Malam Mesra KEMSAINS anjuran MACRES di Ming Court Hotel
Malam Mesra KEMSAINS organised by MACRES at Ming Court Hotel



9/12/97 : Hari Keluarga MACRES di Alang Sendayu, Gombak
MACRES Family Day at Alang Sendayu, Gombak

CARTA ORGANISASI MACRES / MACRES ORGANISATION CHART



PROGRAM PENYELIDIKAN DAN PEMBANGUNAN RESEARCH AND DEVELOPMENT PROGRAMME

Pada tahun 1997, MACRES telah melaksanakan tiga inisiatif utama di bawah program penyelidikan dan pembangunan (P&P) yang diluluskan di bawah Rancangan Malaysia Ketujuh (RM7) iaitu inisiatif-inisiatif P&P MACRES, IRPA, dan penyelidikan kerjasama serantau/dua-hala.

In 1997, MACRES implemented three major types of initiative under its research and development (R&D) programme approved for implementation in the Seventh Malaysian Plan (RM7). These were MACRES Research and Development initiative, IRPA Research initiative and Bilateral/Regional Initiative.

Projek Penyelidikan MACRES

Dua projek penyelidikan dan pembangunan yang dilaksanakan ialah:-

- Pengurusan Sumber dan Alam Sekitar Nasional (NAREM)
- Pengeluaran Peta Imej Satelit (SIM)

MACRES Research Projects

Two research and development projects being implemented are:-

- National Resource and Environmental Management (NAREM)
- Satellite Image Map (SIM) Production

*Natural Resource and
Environmental Management
(NAREM)*

Objektif utama NAREM ialah untuk membangun dan mengoperasikan satu sistem bersepadu pengurusan sumber dan alam sekitar nasional bagi menyokong perancangan pembangunan negara dan juga untuk mengukuhkan pembangunan kapasiti tenaga manusia dalam bidang teknologi-teknologi yang berkaitan.

Negeri Selangor telah dipilih sebagai kawasan perintis bagi tujuan pelaksanaan program ini dalam RM7. Tumpuan telah diberikan kepada pembangunan teknologi dalam sektor-sektor pertanian, perhutanan, geologi, alam sekitar, zon pantai, sosial ekonomi, marin dan topografi.

Empat pakar perunding luar dari Kanada (1), China (1) dan Vietnam (2) telah membantu MACRES melaksanakan projek ini khusus bagi tujuan pemindahan teknologi yang berkaitan kepada MACRES. Di antara pencapaian-pencapaian penting dalam tahun 1997 termasuklah :-

- Pembangunan teknologi remote sensing dan sistem maklumat geografi (GIS) dalam bidang pengezonan mineral dan air bawah tanah (Rajah 1 & 2), pengezonan agro-ekologi dan penilaian risiko hakisan tanah.

Pembangunan modul perisian untuk paparan, *enhancement* dan klasifikasi imej satelit.

Natural Resource and
Environmental Management
(NAREM)

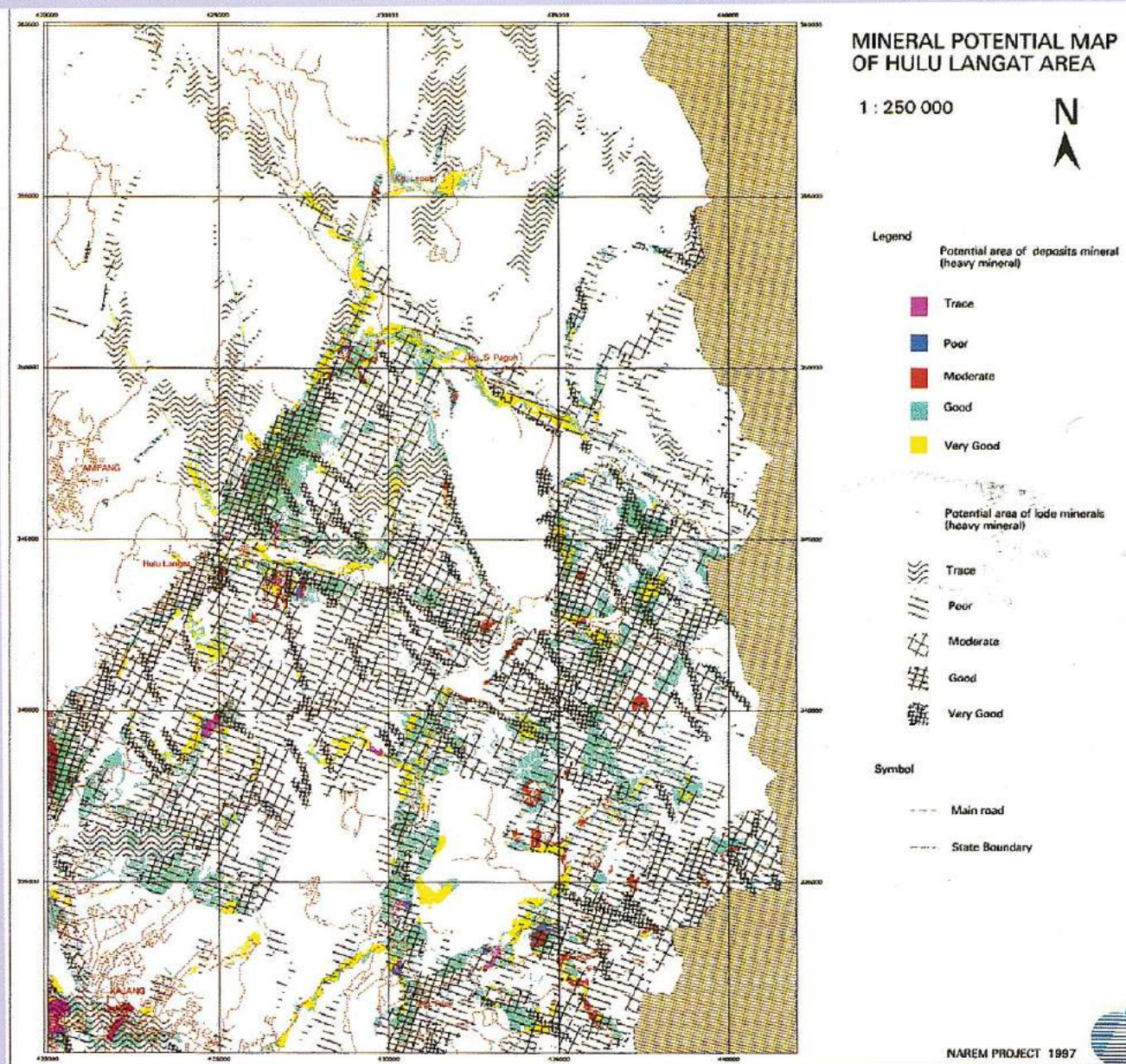
The overall objective of NAREM is to establish and operationalise a system of integrated spatial database on national resources and the environment to support national development planning and also to strengthen capacity building and human resources development.

In RM7, the programme focuses on technology development over the state of Selangor as the pilot area, covering eight sectors : agriculture, forestry, geology, environment, coastal zone, socio-economic, marine and topography.

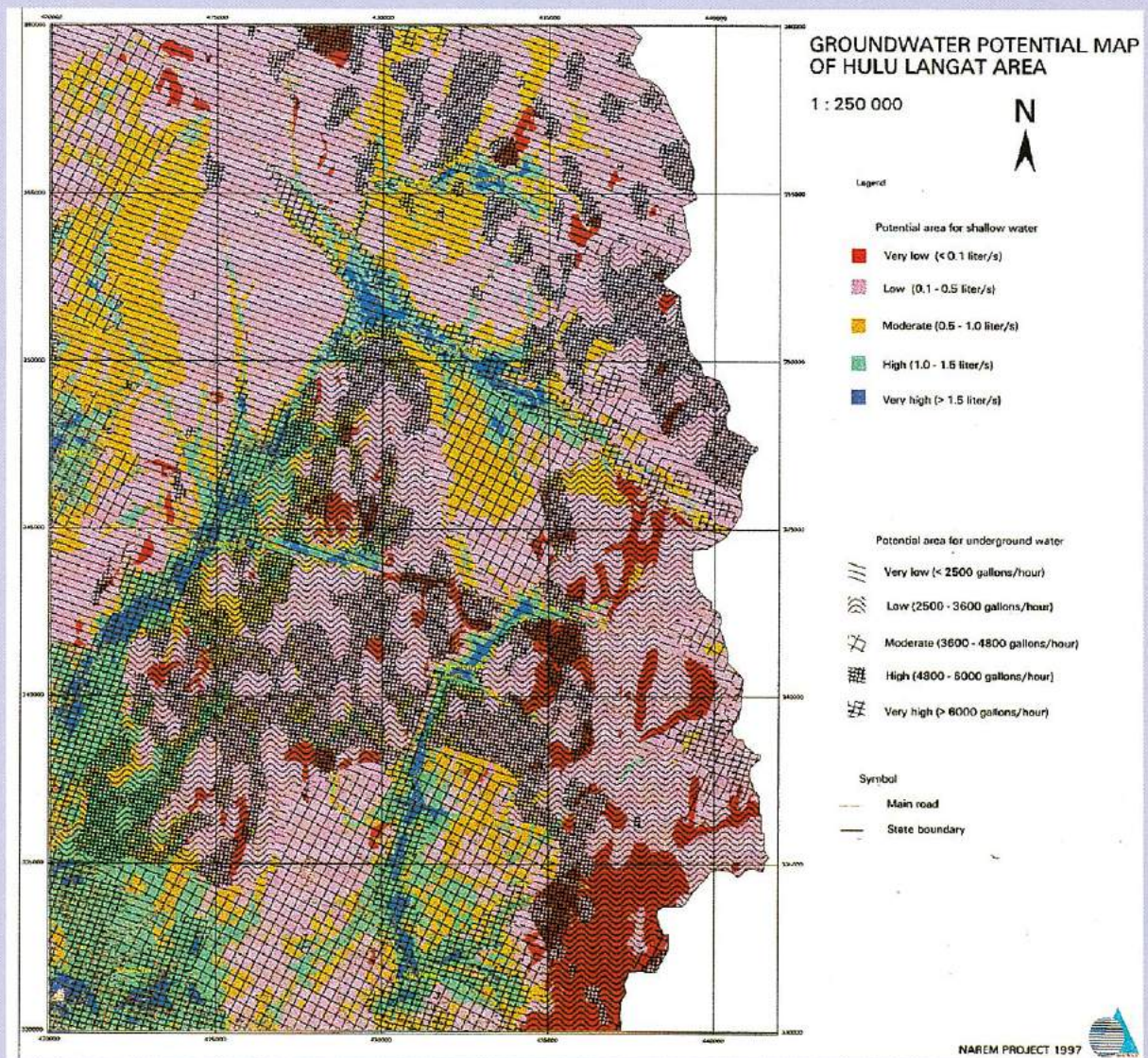
Four consultants from Canada (1), China (1) and Vietnam (2) were engaged by MACRES on a short-term basis to effect relevant technology transfer to MACRES researchers involved in NAREM. Among others, the achievements attained in 1997 include the following :-

- Development of remote sensing and geographic information system (GIS) technologies for mineral and ground water resources zoning, coastal sensitivity zoning (Figure 1 & 2), agro-ecological zoning and soil erosion risk assessment.

Development of software modules for satellite image display, enhancement and classification.



RAJAH 1 : Peta Potensi Galian Di kawasan Hulu Langat, Selangor
FIGURE 1 : Mineral Potential Map of Hulu Langat Area, Selangor



RAJAH 2 : Peta Potensi Air Bawah Tanah Bagi Kawasan Hulu Langat, Selangor
FIGURE 2 : Ground Water Potential Map of Hulu Langat Area, Selangor

Satellite Image Map (SIM)

SIM menyediakan peta asas topografi yang digunakan sebagai input kepada kajian-kajian tematik di bawah projek NAREM. SIM adalah peta topografi yang berlatarbelakangkan imej satelit. Pelaksanaan projek ini bermula dalam tahun 1997 dan sehingga kini telah menghasilkan 19 imej satelit yang telah di *geocode*, meliputi seluruh negeri Selangor. *Geocoding* adalah berdasarkan 23 *ground control points* yang telah disediakan oleh pasukan projek SIM dengan menggunakan *Satellite-based Positioning System*.

Satellite Image Map (SIM)

SIM provides the topographical base data as inputs for thematic studies under NAREM such as agriculture and forestry. Essentially, SIM is an image-based topographical map. The project implementation commenced in 1997 and to-date, 19 geo-coded satellite images were generated, covering the state of Selangor. The geocoding was based on a network of 23 ground control points, already established by the SIM project team using Satellite-based Positioning System.

Initiatif Penyelidikan IRPA

MACRES telah melaksanakan dan mengkordinasikan satu program penyelidikan yang melibatkan pelbagai agensi bertajuk *AIRSAR PACRIM* dan mengambil bahagian sebagai *co-investigator* dalam projek bertajuk *Land Use/Cover Mapping Using Radar* yang dikoordinasikan oleh Institut Penyelidikan dan Pembangunan Pertanian Malaysia (MARDI) bersama-sama dengan Jabatan Pertanian dan Universiti Putra Malaysia (UPM).

IRPA Research Initiative

Under the IRPA mechanism, MACRES implemented and co-ordinated a multi-agency research programme entitled "AIRSAR PACRIM" and participated in another as co-investigator. The latter project entitled "Land Use/Cover Mapping Using Radar" was coordinated by the Malaysian Agricultural Research and Development Institute (MARDI) together with Department of Agriculture (DOA) and Universiti Putra Malaysia (UPM).

AIRSAR PACRIM

MACRES bersama 11 agensi kerajaan telah mengambil bahagian dalam projek serantau ini yang meliputi kawasan pesisiran Pasifik. Program ini dianjurkan oleh *National Aeronautic Space Administration (NASA)*, Amerika Syarikat dan *University of New South Wales*, Australia. Program ini telah dijadual untuk pelaksanaan dari bulan November 1997 hingga November 1999. Objektif utama program ini ialah untuk tujuan pemindahan teknologi pemrosesan dan analisa data resolusi tinggi iaitu *interferometric and polarimetric airborne Synthetic Aperture Radar (SAR)* kepada negara-negara yang mengambil bahagian. Data bagi tujuh lokasi di Malaysia telah diperolehi dalam misi khas NASA pada bulan Disember 1996.

Pada tahun 1997, program ini telah memberi fokus kepada pemindahan teknologi dan perolehan peralatan. Dua bengkel latihan telah dianjurkan pada 4 - 6 Jun 1997 dan 6-20 Disember 1997 untuk pemindahan teknologi daripada kumpulan pakar luar negeri AIRSAR kepada para profesional Malaysia. Satu lagi bengkel AIRSAR serantau telah diadakan di Kuala Lumpur pada 11-13 Ogos 1997 bertujuan memberi peluang kepada peserta dari negara-negara yang mengambil bahagian untuk berinteraksi dan bertukar pengetahuan dengan kumpulan pakar AIRSAR.

AIRSAR PACRIM

MACRES together with 11 other Malaysian government agencies participated in this regional programme for the Pacific Rim area, which was organised by the National Aeronautic Space Administration (NASA) of USA and the University of New South Wales, Australia. The programme was scheduled for the period November 1997 - November 1999. The main objective of the programme was to effect technology transfer concerning the processing and analysis of high resolution, interferometric and polarimetric airborne Synthetic Aperture Radar (SAR) data to all participating PACRIM countries. The data over seven sites in Malaysia were acquired during a special NASA mission conducted in December 1996.

In 1997, the programme focussed on technology transfer and equipment procurement. Two training workshops were organised on 4-6 June, 1997 and 6 - 20 December 1997 to effect relevant technology transfer from the AIRSAR group of foreign experts to Malaysian professionals participating in the programme. In addition, a regional AIRSAR workshop was also organised in Kuala Lumpur on 11-13 August 1997 to facilitate interactive discussion and exchange of knowledge between participants of PACRIM countries and the AIRSAR expert team.

Dua stesen kerja dan 11 komputer mikro yang telah dilengkapi dengan perisian ENVI/IDL telah diperolehi dalam bulan Disember 1997 untuk pelaksanaan projek ini. Satu latihan khas telah juga dianjurkan pada 6 – 20 Disember bagi membiasakan para penyelidik dalam penggunaan perisian ENVI/IDL yang telah direka khusus untuk memproses data SAR. Penyelidikan penggunaan data ini akan bermula pada tahun 1998.

Two workstations and 11 PCs installed with ENVI-IDL softwares were procured in December 1997. A special training session was also organised on 6 - 20 December 1997 to acclimatise the researchers in the use of the ENVI-IDL softwares designed specifically, among others, to process SAR data. Research works on the data will commence in 1998.



Mesyuarat *Second Regional AIRSAR PACRIM* pada 11-13 Ogos, 1997, di Kuala Lumpur

The *Second Regional AIRSAR PACRIM Meeting* on 11-13 August, 1997, in Kuala Lumpur

Inisiatif Kerjasama/Serantau

INDFORSUS

INDFORSUS ialah inisiatif kerjasama European Union(EU)–ASEAN yang dijadualkan untuk tempoh 1997–1999. MACRES mengambil bahagian dalam projek ini bersama-sama dengan INNOPRISE Corporation Sabah Berhad. Peranan utama MACRES ialah untuk membangunkan petunjuk remote sensing bagi perhutanan mapan (INDFORSUS) yang berkaitan dengan komponen hidrologi dan hakisan tanah bagi projek tersebut. Peruntukan bernilai RM 132,000 telah disediakan oleh EU kepada MACRES untuk menjalankan projek ini di Lembah Danum, Sabah. Pada 22 Jun 1997 hingga 19 Julai 1997, kumpulan penyelidik INDFORSUS MACRES telah menghadiri bengkel latihan mengesan gangguan (*disturbance*) hutan menggunakan remote sensing di University of Manchester, United Kingdom. Sehingga kini, projek ini telah mencapai :-

- Mewujudkan sebuah stesen kekal untuk *Global Positioning System* di Lembah Danum.

- Menjalankan pembetulan geometrik data satelit bagi kawasan kajian mengikuti unjuran *Universal Traverse Mercator (UTM)*.

- Analisa data satelit peringkat pertama untuk membangunkan teknik-teknik mengesan gangguan (*disturbance*) hutan.

Bilateral/Regional Initiative

INDFORSUS

This project was a joint European Union -ASEAN initiation scheduled for 1997 - 1999. MACRES, together with INNOPRISE Corporation Sabah Berhad, participated in the project. The main role of MACRES was to develop remotely sensed indicators of forest sustainability (INDFORSUS) of relevance to hydrological and erosion components of the project. A sum of RM 132,000 was allocated by EU for MACRES to undertake the task to be carried out at Danum Valley, Sabah, the study area. During the period 22/06/97-19/07/97, the MACRES INDFORSUS team comprising four researchers attended a training workshop on forest disturbance detection using remote sensing at University of Manchester, United Kingdom. The project has thus far achieved the following milestones :

- Established a permanent Global Positioning System (GPS) base station at Danum Valley

- Conducted geometric correction of the satellite data over the study area to conform to the Universal Traverse Mercator (UTM) projection

- Preliminary Analysis of the satellite data for developing techniques to detect forest disturbance

MALAYSIA-KANADA

MACRES bersama Universiti Malaya (UM) telah memulakan satu projek dengan *Canadian Centre for Remote Sensing (CCRS)* dalam penggunaan data *Radarsat* untuk mengesan hasil padi pada tahun 1997. Tujuan kajian ini ialah untuk membina model pemalangan SAR untuk anggaran hasil pengeluaran padi secara meluas di Malaysia.

Lima siasatan di lapangan telah dijalankan di kawasan kajian Muda-Merbok, Kedah pada tarikh-tarikh perolehan data *Radarsat*. Hasil kajian awal projek telah dibentangkan dalam laporan bertajuk *SAR Backscatter Response of Various Growth Stages of Wetland Rice in Malaysia* di Persidangan Remote Sensing Asia pada 20-24 Oktober 1997 di Kuala Lumpur. Projek ini dijangka siap pada tahun 1999.

MALAYSIA-CANADA

MACRES together with the University of Malaya (UM) commenced a project with the Canadian Centre for Remote Sensing (CCRS) in the use of RADARSAT data for monitoring rice yield in 1997. The aim was to develop a SAR backscatter model to predict rice yield and monitor rice production on a large scale in Malaysia.

Five fieldtrips were carried out in the study area - Muda-Merbok, Kedah in 1997, coincided with acquisition dates of *Radarsat* data. Preliminary results of the project were presented in a paper entitled "SAR Backscatter Response of Various Growth Stages of Wetland Rice in Malaysia" at the 18th Asian Conference on Remote Sensing held on 20-24 October, 1997 in Kuala Lumpur. The project is expected to complete by 1999.

MALAYSIA-JEPUN

Projek bertajuk *Characterisation of Land Cover JERS-SAR Signatures* telah dijalankan secara bersama antara MACRES dengan *National Space Development Agency (NASDA)*, Jepun untuk jangka masa 1993 - 1997. Projek ini telah siap dalam tahun 1997 untuk dua kawasan di Malaysia iaitu Kedah dan Johor. Rajah 3 mempamerkan *backscatter signatures of wetland rice derived from 12 JERS acquisitions*, kawasan Muda, Kedah. Pantulan signal meningkat hingga 9 decibels, iaitu semasa tanaman padi berumur 90 hari selepas kerja mengubah dan menurun secara berperingkat selepas dituai

MALAYSIA-JAPAN

The project entitled "Characterisation of Land Cover JERS-SAR Signatures", carried out jointly by MACRES and the National Space Development Agency (NASDA) of Japan for the period 1993-1997, was completed in 1997 over two areas in Malaysia - Kedah and Johore. Figure 4 gives the average backscatter signatures of wetland rice derived from 12 JERS acquisitions over Muda, Kedah. The return signals increased until a maximum of 9 decibels, 90 days after transplanting (ripening stage) and then decreased gradually during the last month of harvest.



Kakitangan MACRES semasa membina *base station* GPS di Lembah Danum .

MACRES staff establishing a GPS base station at Danum Valley

Di Johor, 21 data ERS -1 dan 14 JERS-1 digunakan untuk kajian *backscatter characterisation* bagi kelapa sawit dan getah. Perbandingan antara ketinggian pokok kelapa sawit dan pantulan dari data JERS -1 dan ERS -1 ditunjuk dalam Rajah 4. Korelasi ketinggian pokok dan pantulan bagi data JERS-1 adalah baik, tetapi tidak dengan data ERS-1. Rajah 5 menunjukkan korelasi di antara ketinggian pokok getah dan pantulan untuk kedua-dua data JERS-1 dan ERS-1.

MALAYSIA-THAILAND

Dua projek aplikasi remote sensing dijalankan sejak tahun 1996 di bawah projek kerjasama dengan Thailand. Projek-projek tersebut ialah (i) *Complementary Nature of Landsat TM and JERS-1 data for Land Cover/Use Mapping* dijalankan di Johor, dan (ii) *Coastal Zone Studies Using the Integration of Remote Sensing and Geographic Information System (GIS)* yang dijalankan di Selangor. Kedua-dua projek dirancang siap dalam tahun 1998.

In Johore, 21 ERS-1 and 14 JERS-1 acquisitions were studied to analyse for rubber and oil palm backscatter characterisation. A comparison between the heights of oil palm trees and backscatter returns of JERS -1 and ERS -1 data is shown in Figure 4. Tree height correlated well with backscatter of JERS -1 but no correlation existed with ERS -1 data. Figure 5 shows clear correlation between the heights of rubber trees and backscatter returns both from JERS -1 and ERS -1.

MALAYSIA-THAILAND

Under the Memorandum of Understanding (MOU) signed between Malaysia and Thailand in 1995, two remote sensing application projects have been on-going since 1996. They are (i) *Complimentary Nature of Landsat TM and JERS-1 Data for Land Cover/Use Mapping* and (ii) *Coastal Zone Studies Using The Integration of Remote Sensing and Geographic Information System*. The former is being implemented in Johore, Malaysia while the latter in the coastal zone of Selangor, Malaysia. Both projects are due for completion in 1998.

Projek-Projek Lain

Projek-projek ini dilaksanakan secara *ad-hoc* bergantung kepada permintaan dan keperluan dari masa kesemasa. Projek-projek tersebut termasuklah:-

i) Pembangunan Sistem Amaran Awal Kebakaran Hutan

Pembangunan sistem amaran awal kebakaran hutan dengan menggunakan data satelit remote sensing SPOT beberapa tarikh telah di gunakan untuk menilai kebakaran hutan di Indonesia. Beberapa parameter telah diperolehi dan akan digunakan dalam pembangunan sistem amaran awal kebakaran hutan.

ii) Cantuman Imej Malaysia

Sejumlah 27 imej Landsat TM meliputi seluruh negara telah dibuat pembetulan geometri, radiometri dan dicantum serta dicetak pada skala 1:100,000. Imej cantuman ini telah diedarkan kepada beberapa Kementerian yang berkaitan

iii) Buku *ASEAN FROM SPACE*

Dalam projek ini, setiap negara ASEAN akan mendapatkan maklumat yang menarik daripada data satelit untuk dimuatkan dalam sebuah buku yang akan dijual untuk tujuan promosi pelancungan negara-negara anggota ASEAN. Projek ini bermula pada tahun 1997 dan dijangka siap pada tahun 1998.

Other Projects

These projects were carried out based on ad-hoc request s from relevant authorities. These projects include:-

i) Development of Early Warning System for Forest Fire

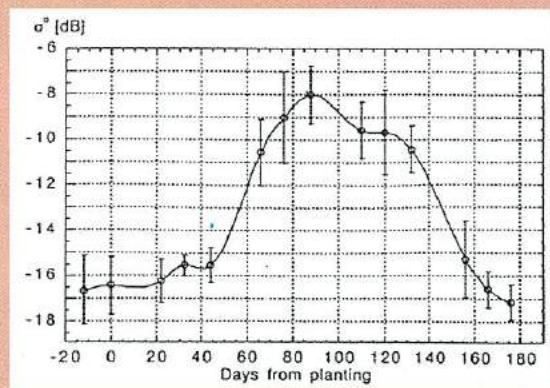
Early warning System Using Temporal SPOT data were used in the assessment of forest fire damages over Indonesia. Some parameters were established and these will form the basis for development of an early forest fire warning system.

ii) Mosaic Image of Malaysia

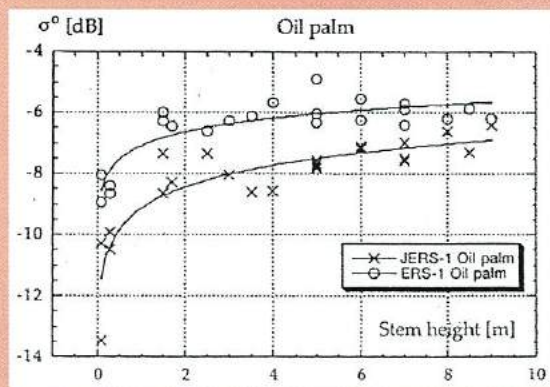
Twenty Seven Landsat TM scenes, covering the whole country were geocoded, radiometrically corrected and mosaicked at a scale of 1:1,000,000. The mosaic was distributed to relevant Ministries in Malaysia.

iii) ASEAN FROM SPACE Book

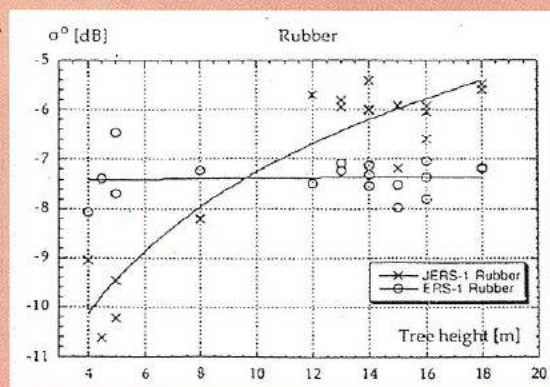
Under this project, each ASEAN country will extract fascinating scenes from remote sensing satellite data. A book will be compiled comprising the respective scenes from the ASEAN countries. The book will be put on sale for the promotion of tourism in ASEAN. The project started in 1997 and is expected to be completed in 1998.



Rajah 3 : Pembalikan JERS-1 berbagai tarikh bagi kawasan padi
 Figure 3 : Temporal JERS-1 backscatter of wetland rice



Rajah 4 : L(JERS-1) dan C(ERS-1) - Pembalikan mengikut ketinggian pokok kelapa sawit
 Figure 4 : L(JERS-1) and C(ERS-1) - Backscatter vs stem height of the oil palms



Rajah 5 : L(JERS-1) dan C(ERS-1) - Pembalikan mengikut ketinggian pokok getah
 Figure 5 : L(JERS-1) and C(ERS-1) - Backscatter vs rubber tree height

**Penerbitan Artikel Penyelidikan
dan Pembangunan**

**Publication of Research and
Development Articles**

Berikut adalah senarai artikel-artikel yang telah diterbitkan dan telah dibentangkan oleh MACRES dalam forum-forum remote sensing kebangsaan dan antarabangsa.

The following are articles published and presented by MACRES in national and international remote sensing fora.

N.N. Mahmood, K.F. Loh and S. Yapo

"Space Technology Applications - Infrastructural and Development Challenges," : Asia Pacific Regional Space Applications Forum-4, Tokyo, 17-19 March, 1997

N.N. Mahmood, A. Salleh, K.F. Loh and K.M.K. Ku Ramli

"SAR Remote Sensing Advances in Malaysia" : AIRSAR PACRIM Meeting, California, 24-28 March, 1997

N.N. Mahmood, K.F. Loh and S. Ahmad

"SAR Applications in Malaysia " : Proc. Geomatics in the Era of Radarsat 1997 (GER) Workshop, Ottawa, 25-30 May, 1997

N.N. Mahmood, K.F. Loh

"Airborne Remote Sensing Applications in Malaysia " : Proc. 3rd International Airborne Remote Sensing Conference and Exhibition, Copenhagen, 7-10 July, 1997

N.N. Mahmood, K.F. Loh and S. Ahmad

"Remote Sensing Research in Malaysia " : Proc. IGGARSS Conference, Singapore, 3-7 August, 1997

K.F. Loh, M. Halid and S.A. Hashim

"Agro-Economical Zoning for S.West Selangor Using Remote Sensing and Geographic Information System " : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20-24 October, 1997

R. Samad and N. Abdul Patah

"Soil Erosion and Hydrological Study of the Bakun Dam Catchment Area, Sarawak Using Remote Sensing and GIS" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20-24 October, 1997

Z.A. Hassan, K.M.N. Ku Ramli, I. Selamat and K.F. Loh

"Complementary Nature of SAR and Optical Data for Landcover/use Mapping in the State of Johore, Malaysia" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20 -24 October, 1997

S.B. Abu Bakar and A.T. Shaari

"A Preliminary Study of Phenological Growth Stages of Wetland Rice Using ERS and Radarsat SAR Data" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20 -24 October, 1997

J. Talib

"Slope Instability and Hazard Zonation Mapping Using Remote Sensing and GIS Techniques in The Area of Cameron Highlands, Malaysia" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20 -24 October, 1997

N.N. Mahmood, R. Simard and L.C. Har

"Human Resource Development Strategy for Remote Sensing in Malaysia" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20 -24 October, 1997

M. Halid

"Landuse Change Detection Using Knowledge Based Approaches : Integrating Remote Sensing and GIS" : The 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20-24 October, 1997

A. Napiah, N.N. Thach, A. Ismail, N.N. Mahmood

"Geological & Mineral Prospecting in the Kuala Kelawang Area Using Remote Sensing & GIS Technique" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20-24 October, 1997

M. Muhammad

"A Study of Landuse / Landcover Changes From 1988 to 1994 in Nilai and Surrounding Areas" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20 -24 October, 1997

M.S. Manaf

"Software Customisation : Customisation of The Graphical User Interface In Image Processing System" : Proc. 18th Asian Conference on Remote Sensing, Kuala Lumpur, Malaysia, 20 -24 October, 1997

PROGRAM OPERASI **OPERATIONS PROGRAMME**

Pembangunan Tenaga Manusia

MACRES telah menyediakan strategi dua peringkat Pelan Pembangunan Tenaga Manusia (PTM) yang memberi tumpuan kepada keperluan latihan dalaman MACRES dan latihan agensi pengguna.

Pelan PTM di MACRES memberi keutamaan kepada usaha bagi peningkatan kemahiran dalaman dalam bidang pengurusan, membangunkan keupayaan P&P remote sensing dan juga memberi tumpuan kepada pembangunan kemahiran baru untuk pengoperasian teknologi dengan lebih efektif.

Aktiviti-aktiviti PTM yang dilaksanakan adalah program ijazah lanjutan, kursus jangka pendek dan aktiviti-aktiviti latihan lain seperti bengkel, konferen dan latihan sangkut, serta pemindahan teknologi. Pada prinsipnya, garis panduan PTM adalah berlandaskan di mana semua pegawai diperlukan melibatkan diri sekurang-kurangnya dalam satu aktiviti pembangunan profesional setiap tahun. Walau bagaimanapun, penglibatan tersebut diselaraskan supaya tidak lebih daripada 40% pegawai berada di luar MACRES pada satu masa.

Human Resource Development

MACRES formulated a two-level strategy in its Human Resource Development (HRD) Plan focussing on both MACRES internal and user agencies' training requirements.

The HRD plan for MACRES gave priority on strengthening internal management skills, building remote sensing R&D capabilities and developing new skills needed for effective operationalisation of the technologies.

Types of human resource development activities include post-graduate studies, short courses, short training activities such as workshops, conferences and attachment trainings, and other initiatives for technology transfer. As a general guideline, all staff are required to participate in at least one professional development activity per year. However, the number of staff allowed to be away at any particular time should not exceed 40% of the total number of staff in MACRES.

Fokus Pelan PTM diperingkat nasional adalah untuk memperkukuhkan keupayaan tenaga manusia agensi pengguna untuk pengoperasian aplikasi remote sensing di Malaysia. Aktiviti-aktiviti latihan agensi pengguna dikategorikan kepada tiga bahagian utama iaitu program ijazah lanjutan, kursus asas remote sensing (2-3 bulan), dan bengkel/seminar berkaitan aplikasi remote sensing (1-2 minggu).

Dengan perancangan tersebut, MACRES telah dapat mengelolakan sumbernya (tenaga manusia dan kewangan) dengan lebih sistematik untuk memastikan manfaat maksimum daripada pelaburan dalam program latihannya.

Dalam tahun 1997, sejumlah 87 aktiviti latihan telah dianjurkan dan jumlah ini adalah peningkatan sebanyak 158% dalam aktiviti PTM MACRES. Daripada jumlah ini, sejumlah 29 latihan adalah di peringkat antarabangsa. 90% daripada topik latihan yang dilaksanakan adalah merangkumi bidang remote sensing/GIS/GPS; 5% mengenai kemahiran pembangunan organisasi, komunikasi dan pengurusan; dan selebihnya adalah topik berkaitan dengan teknologi informasi.

Pada masa yang sama, MACRES telah menghantar 11 pegawainya untuk mengikuti kursus ijazah lanjutan di peringkat M.Sc dan Ph.D di institusi dalam dan luar negeri. Dalam membantu pelaksanaan Program NAREM, pegawai-pegawai berkenaan dikehendaki menyediakan projek/tesis berkaitan topik NAREM sebagai sebahagian daripada keperluan program M.Sc/Ph.D mereka.

Focus of the HRD Plan at the national level was towards strengthening human resources capabilities of user agencies in operationalising remote sensing technology in Malaysia. User agencies training activities were categorized into three major groups; the post-graduate programme, basic remote sensing course (2-3 months), and remote sensing applications related workshops/seminars (1-2 weeks).

With the plan in place, MACRES was able to systematically organise its human and financial resources to ensure a maximum return of its investment on training programmes.

A total of 87 training activities were organized and these represent 158% increased in MACRES human resource activities in 1997. Of these, 29 were the training activities at international level. 90% of the training topics covered remote sensing/GIS/GPS area; 5% on development of organizational, communicational and management skills; and the balanced 5% were topics related to information technologies

At the same time, MACRES sent 11 officers to both local and overseas institutions of higher learning for M.Sc and Ph.D programmes. In line with the implementation of the approved NAREM Programme, the officers were required to undertake project on NAREM related topics as part of the requirement for their M.Sc/Ph.D programmes.

Kesemua staf MACRES dikehendaki melibatkan diri dalam kolokium dalaman MACRES. Kolokium yang dijadualkan pada setiap Sabtu antara 9.00 sehingga 10.30 pagi adalah bagi menyediakan forum untuk staf membincang isu-isu teknikal, berkongsi pengalaman dan menimba ilmu, dan memberi pendedahan dalam pengucapan awam bahasa Inggeris. MACRES juga menjemput pakar-pakar teknikal yang melawat MACRES untuk menyampaikan ceramah. Sejumlah 40 kolokium dan 4 ceramah ad-hoc telah dikelolakan dalam tahun 1997.

MACRES berjaya mendapatkan peruntukan daripada Tabung S&T KEMSAINS untuk menganjurkan 2 bengkel dan 1 kursus asas remote sensing untuk agensi-agensi pengguna. Bengkel dan kursus jangka pendek ini telah dianjurkan pada bulan Julai, Ogos dan September-November. Permintaan agensi-agensi pengguna untuk mengikuti kursus-kursus ini adalah sangat menggalakkan. Walaubagaimanapun, MACRES telah menghadkan jumlah penyertaan kepada 26 peserta untuk memastikan keberkesanan kursus.

Sekali lagi, MACRES telah merekodkan peningkatan permohonan daripada universiti-universiti tempatan bagi latihan industri pelajar-pelajar mereka, dan juga permintaan perkhidmatan kemudahan dan nasihat teknikal. Memandangkan pertambahan ini, MACRES telah menyediakan satu Garispanduan Pengguna untuk memastikan kelancaran pelaksanaan aktiviti-aktiviti ini dan peningkatan kepuasan pelanggan bagi perkhidmatan-perkhidmatan yang disediakan.

All MACRES staff were required to participate in MACRES internal colloquium, scheduled every Saturday from 9.00 am to 10.30 am. The colloquium provides forum for staff to discuss technical issues, exchange experiences as well as to provide exposures in public speaking in English language. Where possible, MACRES also took advantages of visiting technical experts by inviting them to conduct ad-hoc talks in areas of their expertise. There were 40 colloquium and 4 ad-hoc talks organized in 1997.

MACRES managed to secure funding from the MOSTE S&T Funds to conduct two workshops and a basic remote sensing course for user agencies. The workshops and short training courses were successfully conducted separately in the month of July, August and September-November respectively. It was encouraged to note that requests from government user agencies to participate in these training activities were overwhelming, however the attendance had to be limited to only 26 participants to ensure for course effectiveness.

Once again, MACRES registered an increased in requests from local universities for industrial trainings of their students, as well as users' requests for technical and facilities' services. As more institutions were utilizing the services, MACRES formulated a Customer Guideline to ensure smooth implementation of these activities, that would subsequently be translated into customer's satisfaction.

Pembangunan Fisikal dan Kemudahan

Bangunan Baru MACRES

Y.B. Menteri Sains, Teknologi dan Alam Sekitar telah merasmikan Majlis Perletakan Batu Asas Bangunan Pejabat Baru MACRES pada 22 April, 1997. Majlis tersebut turut dihadiri oleh Y.B. Timbalan Menteri Sains, Teknologi dan Alam Sekitar dan Ketua Setiausaha Kementerian. Pembinaan bangunan yang telahpun mencapai 40% dijangka akan disiapkan pada bulan September 1998.

Physical Development and Facilities

MACRES New Headquarters

The Honourable Minister of Science, Technology and the Environment, Datuk Law Hieng Ding officiated the Ground Breaking Ceremony of MACRES new headquarters held on 22 April 1997. The ceremony was also attended by the Honourable Deputy Minister of Science, Technology and the Environment and the Secretary - General of the Ministry. The construction of the building which recorded a progress of 40% at the end of the year was scheduled to be ready for occupation in September 1998.

Y.B. Menteri sedang merasmikan Majlis Perletakan Batu Asas

The Honourable Minister of Science, Technology and the Environment officiating the Ground Breaking Ceremony



Taklimat kepada Y.B. Menteri Sains, Teknologi dan Alam Sekitar berkenaan Bangunan Baru MACRES.

The Honourable Minister of Science, Technology and the Environment being briefed on the new MACRES new HQ.

Kemajuan terkini pembinaan bangunan baru MACRES

Latest development of MACRES new HQ under construction

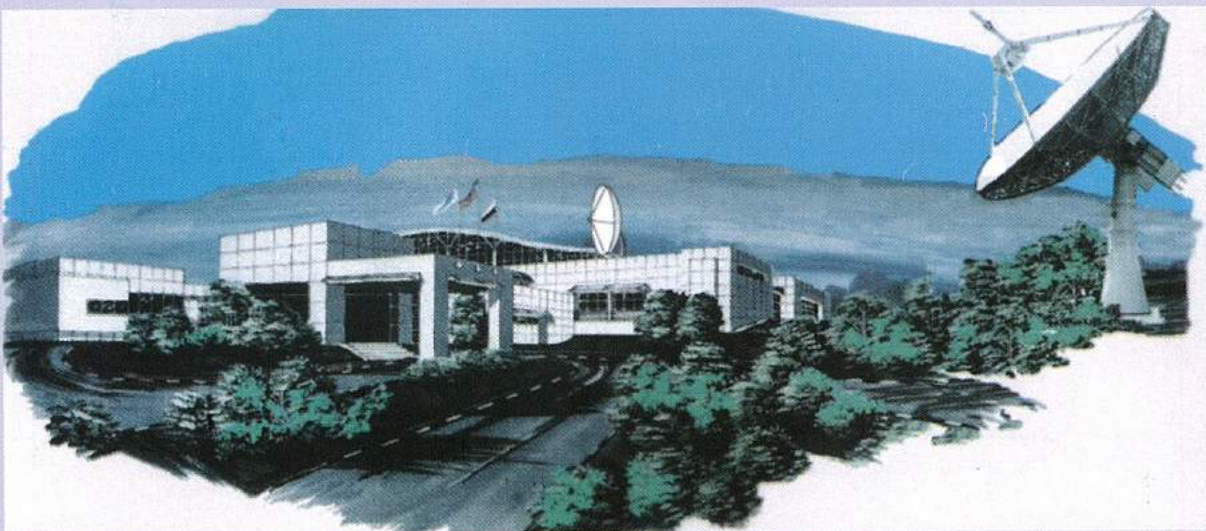


Kompleks Stesen Bumi

Projek Stesen Bumi yang melibatkan pembinaan bangunan pejabat untuk menempatkan peralatan dan kemudahan canggih, dan kediaman kakitangan telah mula dilaksanakan. Kerja-kerja tanah di kawasan seluas 100 ekar di Temerloh, Pahang dimulakan pada bulan Disember. Projek ini dijangka akan siap sepenuhnya pada akhir tahun 1999.

Ground Receiving Station Complex

The Ground Receiving Station project which comprises a building housing sophisticated equipment and facilities, and staff quarters was being implemented. Earthworks on the 100 acres site in Temerloh, Pahang commenced in December. The complex was scheduled for completion by the end of 1999.



Gambaran artis terhadap kopleks stesen bumi di Temerloh, Pahang
Artist impression of the ground receiving station complex in Temerloh, Pahang

Makmal Kartografi

Makmal Kartografi terus memberikan perkhidmatan kartografi dan grafik serta sokongan dalam aktiviti penyelidikan dan operasi kepada bahagian-bahagian lain di MACRES. Peta topografi berdigit tambahan telah diperolehi dalam tahun 1995. Jumlah dokumen-dokumen terhad dan tidak terhad yang kini berada dalam simpanan makmal ini adalah seperti di bawah.

Cartographic Laboratory

Cartographic laboratory continued to provide cartographic and graphic services and assistance in research and operations activities to all the divisions in MACRES. Additional topographic digital data were procured during the year. The total number of restricted and non-restricted documents currently in the laboratory's archive are as shown below.

Jumlah Dokumen-dokumen Terhad dan Tidak Terhad/ Total Number of Restricted and Non-Restricted Documents

Jenis/Type		Jumlah(keping) Total (copies)
1	Peta topografi siri L7030 (Skala 1:50 000) Topographic map L7030 series (scale 1:50 000)	392
2	Peta topografi siri L7010 (Skala 1:63 360) Topographic map L7010 series (scale 1:63 360)	136
3	Peta topografi siri T735 (Skala 1:50 000) Topographic map T735 series (scale 1:50 000)	337
4	Data topografi berdigit siri L7030 (Skala 1:50 000) Digital topographic data L7030 series (scale 1:50 000)	12
5	Data topografi berdigit siri T735 (Skala 1:50 000) Digital Topographic data T735 (scale 1:50 000)	36
6	Data topografi berdigit siri T738 (Skala 1:50 000) Digital topographic data T738 series (scale 1:50 000)	2
7	Data topografi berdigit siri T8028 (Skala 1:25 000) Digital topographic data series T8028 (scale 1:25 000)	5
8	Gambar udara hitam putih Black and White aerial photographs	
	Skala/scale 1: 40 000	1684
	Skala/scale 1: 25 000	6
	Skala/scale 1: 20 000	21

Peningkatan Sistem

Untuk meningkatkan kemampuan pemrosesan data pengguna, MACRES telah memperoleh kemudahan komputer *client server* UNIX sebagai tambahan kepada komputer VAX-VMS yang sedia ada. Perisian yang diperolehi tersebut merangkumi sistem maklumat geografik (GIS), perisian pemrosesan imej (IPS) dan sistem pengurusan pangkalan data (DBMS). Sistem pemrosesan imej adalah jenis PCI yang dilengkapi dengan kemudahan pemrosesan optikal dan radar. Satu latihan berkaitan dengan aplikasi perisian telah dilaksanakan.

Panel IRPA telah meluluskan 12 projek penyelidikan yang menggunakan data AIRSAR untuk dilaksanakan tahun ini. Sebagai penyelar projek, MACRES telah memperoleh satu lagi set kemudahan berkomputer. Perolehan baru ini turut merangkumi dua unit stesenkerja Silicon Graphics dengan keupayaan menyimpan 60GB dan 12 unit komputer mikro yang bernilai RM815,000. Sistem baru ini dilengkapi dengan IRIX dan sistem operasi Windows 95. Perisian pemrosesan imej yang dibeli bagi tujuan ini termasuk dua lesen ENVI-IDL untuk UNIX dan 11 unit ENVI-IGL untuk Windows 95. Sejumlah RM65,940 telah dibelanjakan dalam tahun 1997 untuk membeli tiga *notebooks* bersama-sama dengan perisian pemrosesan imej ENVI-IDL bagi tujuan menyokong aktiviti-aktiviti penyelidikan terutamanya verifikasi lapangan.

System Upgrading

To strengthen its capability in data processing service for clients, MACRES acquired and commissioned a UNIX-based client server computer facilities in addition to the existing VAX-VMS computer. The softwares acquired in this tender included geographic information system (GIS), image processing software (IPS) and database management system (DBMS). The image processing system installed was PCI with full compliment of modules for both optical and radar processings. A series of familiarisation training related to these application softwares were conducted.

There were 12 research projects using AIRSAR data approved by IRPA panel for implementation in 1997. Being the coordinator of the project, MACRES took initiative to acquire a new set of computing facilities to meet the requirement of this project. The new procurement included two unit of Silicon Graphics workstations with 60GB storage capacity, and 12 unit of microcomputers with a total cost of RM815,000. The new system was equipped with IRIX and Windows 95 operating systems. The image processing softwares purchased for this purpose include two licenses of ENVI-IDL for UNIX and 11 units of ENVI-IGL for Windows 85. A sum of RM65,940 was spent in 1997 to acquire three notebooks together with ENVI-IDL image processing software to support other research initiatives especially in the field verification activities.

Penerimaan Data

Canada Centre for Remote Sensing (CCRS), juruperunding projek Stesen Penerimaan Bumi MACRES telah melaksanakan hampir 70% kerja-kerja yang telah dijadualkan dalam Kontrak Khidmat Rundangan. Pakej-Pakej Kerja 1(*Analysis of E-O Satellite Programme*), 2 (*Site Selection and Preparation of Building Requirements*), 3 (*Preparation of Detailed Specification and Tender Documentation*) dan 4 (*Tender Evaluation*) telah diselesaikan manakala Pakej 5 (*System Installation, FAT dan On-Site*) telah ditangguhkan ke pertengahan tahun 1998. Pakej Kerja 6 (*Human Development Plan*) telahpun dalam peringkat pelaksanaan manakala Pakej Kerja 7 sedang disediakan.

MACRES telah mengeluarkan tender antarabangsa untuk melaksanakan kerja *Design, Supply, Installation, Integration, Testing, Commissioning, Training and Spares* bagi sistem Stesen Penerimaan Bumi pada bulan Mei 1997 dan Kementerian Kewangan akan membuat pemilihan bagi penender yang berjaya.

Kerajaan telah meluluskan tapak stesen bumi berkenaan di Temerloh, Pahang dan mengarahkan supaya ianya beroperasi sebelum Sukan Komanwel (SUKOM '98) yang akan berlangsung pada September 1998. Ini adalah bertujuan untuk mengawalselia kejadian jerebu kerana kebakaran hutan semasa musim kering di antara bulan Jun hingga September.

Data Reception

Canadian Centre for Remote Sensing (CCRS), the consultant for MACRES Ground Receiving Station Project (MGRS), completed 70% of the scheduled work in the Consultancy Services Contract. Work Packages 1(*Analysis of E-O Satellite Programme*), 2 (*Site Selection and Preparation of Building Design Requirements*), 3(*Preparation of Detailed Specification and Tender Documentation*) and 4(*Tender Evaluation*) were fully completed. Work Package 5 (*System Installation, FAT and On-Site*) was deferred for completion in mid-1998. Work Package 6 (*Human Development Plan*) was in the implementing stage, while Work Package 7 was being prepared.

MACRES successfully called for an international tender for the "Design, Supply, Installation, Integration, Testing, Commissioning, Training and Spares " for MACRES MGRS system in May 1997. Tender evaluation was completed in July and the Ministry of Finance has yet to make selection for the successful bidder.

The Government gave an approval for the MGRS to be built in Temerloh, Pahang and directed for the MGRS to be operational before the Commonwealth Games (SUKOM'98) which will be held in September 1998. The purpose is to build up capability for haze monitoring due to forest fires during the dry months of June to September.

Perkhidmatan Pengguna

Bagi memenuhi keperluan pengguna teknologi remote sensing di Malaysia, MACRES telah menyediakan dua jenis perkhidmatan iaitu perkhidmatan data remote sensing dan khidmat nasihat/maklumat.

Perkhidmatan data merangkumi dua aktiviti utama iaitu perolehan data satelit remote sensing daripada pembekal luar negara dan pemprosesan data satelit mengikut keperluan dan spesifikasi pengguna. Sejumlah RM826,000 telah dibelanjakan untuk perolehan data optikal dan radar yang terdiri daripada *Landsat TM*, *SPOT* dan *Radarsat*. Pembelian data tahun 1997 telah ditumpukan kepada kawasan negeri Selangor berdasarkan permohonan pengguna dan bagi memenuhi keperluan projek-projek penyelidikan MACRES.

Tahun 1997 juga telah menunjukkan peningkatan dalam kesedaran terhadap potensi penggunaan teknologi remote sensing di Malaysia. Ini dapat dilihat dalam pertambahan jumlah permohonan data oleh pengguna dalam aktiviti pengurusan sumber asli dan alam sekitar, dan perancangan strategik negara. Sebanyak 90 permohonan telah diterima dari pengguna untuk 203 *scenes* (cetak kekal dan digital).

User Services

In its endeavour to fulfill Malaysian remote sensing user requirements, MACRES continuously provided two types services namely, remote sensing data services and advisory/information services.

Data services comprised two main activities which were acquisition of remote sensing satellite data from ground stations outside the country and the processing and distribution of these data according to user needs and specifications. A total of RM826,000 was spent to acquire optical and radar satellite data such as *Landsat TM*, *SPOT* and *Radarsat*. Data acquisition in 1997 was focussed on Selangor to meet the requirement of users and MACRES research projects.

1997 had also shown a significant increase in awareness on the potential use of remote sensing technology in Malaysia. This is indicated in the number of requests from users for applications in natural resources and environmental management as well as in strategic planning. A total of 90 user requests for hardcopies and digital remote sensing data were received which encompassed 203 scenes.

Pembelian data satelit dalam tahun 1997
Satellite data purchase in 1997

Jenis data Data types	Jumlah scene Total scenes
Landsat TM	19
Spot	45
Radarsat	11

Aktiviti Antarabangsa

Malaysia, melalui MACRES, menyertai dan memberi sumbangan aktif dalam usaha-usaha di peringkat antarabangsa bagi meningkat dan memperluaskan penggunaan teknologi angkasa untuk pembangunan mapan. Di bawah disenaraikan aktiviti-aktiviti yang di sertai MACRES dalam 1997 :

International Activities

Malaysia, through MACRES, participated and contributed actively in international efforts in promoting space technologies applications for sustainable development. Listed below are activities participated by MACRES in 1997:

Tarikh Date	Aktiviti Activity	Negara Country
20-22 Jan.	Dialogue on Policies Concerning Harmonization of Various Initiatives for Promoting Regional Cooperation in Space Technology Development & Applications in the Asia-Pacific Region	Beijing, China
19-22 Feb.	Second Meeting of Regional Group on Space Sciences & Technology applications	Singapore
03-06 Mar.	Second Meeting of The Regional Working Group on Satellite Communication Applications	Bali, Indonesia
17-19 Mar.	Asia Pacific Regional Space Application Forum (APRSAP-4)	NASDA, Japan
08-11 Apr.	Regional Working Group on Meteorological Satellite Applications & Natural Hazards Monitoring	Phuket, Thailand
12-17 May	Meeting of The Regional Working Group on Remote Sensing , GIS, & Satellite-based Positioning	Taejon, Korea
15 May	Meeting of The Inter-agency Subcommittee On Space Applications For Sustainable Deveploment In Asia & The Pacific	Taejon, Korea
16-17 May	Third Session of The Intergovernmental Consultaive Committee (ICC) on The Regional Space Applications Programme for Sustainable Development Of The ESCAP	Taejon, Korea

Tarikh Date	Aktiviti Activity	Negara Country
26-28 Jun.	Tenth Meeting Of Asean Experts Group On Remote Sensing (AEGRS)	Bangkok, Thailand
22-30 Aug.	Malaysia-Russia Cooperation In Remote Sensing	Russia
11-13 Dec.	Dialogue On Policies Concerning Harmonization Of Various Initiatives For Promoting regional Cooperation On Space Applications For Sustainable Development In Asia &	Chiang Mai, Thailand

The 18th Asian Conference on Remote Sensing

Malaysia sekali lagi telah diberi penghormatan untuk menganjur *The 18th Asian Conference on Remote Sensing* (ACRS). Konferen ini telah diadakan di Kuala Lumpur pada 20-24 Oktober. ACRS adalah satu forum tahunan Persatuan Remote Sensing Asia di mana objektif utamanya ialah untuk membincangkan isu-isu terkini tentang aplikasi teknologi remote sensing dan GIS serta perkembangan teknologi-teknologi berkenaan di peringkat antarabangsa. Konferen tersebut juga bertujuan untuk meningkatkan penyebaran maklumat dan kerjasama serantau dalam bidang berkaitan. Sejumlah 330 peserta dari 31 negara Asia dan bukan Asia teramsuk 165 peserta Malaysia telah menyertainya. Konferen ini turut disertai oleh 20 syarikat antarabangsa yang mengambil bahagian dalam pameran komersil yang diadakan disepanjang tempoh konferen. Sejumlah 153 kertas teknikal, termasuk 53 dari Malaysia telah dibentangkan. Tiga peserta Malaysia telah memenangi anugerah penyampaian kertas teknikal terbaik dalam konferen kali ini.

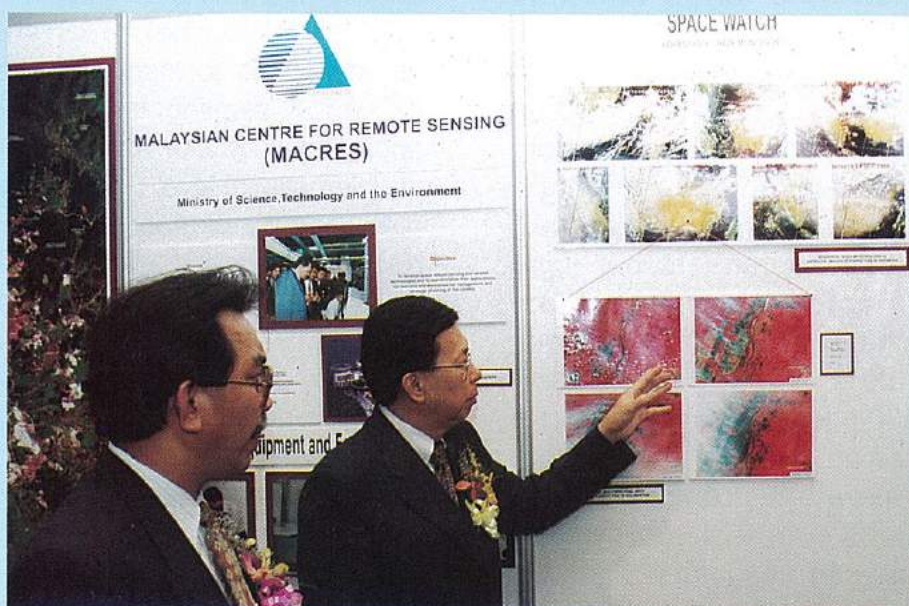
The 18th Asian Conference on Remote Sensing

Malaysia was again given the honour to host The 18th Asian Conference on Remote Sensing. It was held on 20-24 October in Kuala Lumpur. This international conference was a major annual event of the Asian Association on Remote Sensing (AARS) and its main objective was to discuss current issues on remote sensing technology and GIS applications as well as their development at international level. The conference was also aimed at increasing information dissemination and regional cooperation in related fields. A total of 330 professionals from 31 Asian and non-Asian countries participated in the conference, of which 165 were from Malaysia. 20 foreign companies also took part in the commercial exhibition organised during the conference. A total of 153 technical papers, including 53 from Malaysia, were presented in the conference. The highlight of this conference was that three Malaysians won the best technical paper presenter awards.



Y.B. Menteri Sains, Teknologi dan Alam Sekitar merasmikan *The 18th Asian Conference on Remote Sensing (ACRS)*, 20-24 Oktober, 1997, di Kuala Lumpur

The Honourable Minister of Science, Technology and the Environment, officiating *The 18th Asian Conference on Remote Sensing (ACRS)*, 20-24 October, 1997, in Kuala Lumpur



Y.B. Menteri Sains, Teknologi dan Alam Sekitar sedang melawat ke gerai pameran semasa *The 18th Asian Conference on Remote Sensing (ACRS)*

The Honourable Minister of Science, Technology and the Environment visiting an exhibition booth during *The 18th Asian Conference on Remote Sensing (ACRS)*

Bengkel *AIRSAR PACRIM*

MACRES, dengan kerjasama NASA, Amerika Syarikat telah menganjurkan dua bengkel seminggu dengan objektif meningkatkan kefahaman methodology dan aplikasi teknologi AIRSAR di kalangan agensi-agensi pengguna di Malaysia. *The Second AIRSAR PACRIM Workshop*, telah diadakan di Kuala Lumpur pada 11 - 13 Ogos 1997. Bengkel ini telah dihadiri oleh seramai 61 peserta yang terdiri daripada 25 peserta pelbagai agensi tempatan, 16 peserta luar negara dan 20 pakar rujuk.

AIRSAR PACRIM Workshops

MACRES co-organised two 1-week workshops on AIRSAR applications and methodologies with NASA with the objectives to increase understanding in

AIRSAR technologies application methodologies for user agencies in the country. The Second AIRSAR PACRIM Workshop was organised on

11 - 13 August 1997. The workshop was attended by 61 participants,

comprising 25 participants from various local agencies, 16 international participants and 20 resource persons.



Peserta *National Workshop on Malaysian AIRSAR PACRIM Programme* di MACRES

Participants in the *National Workshop on Malaysian AIRSAR PACRIM Programme* at MACRES

**Mesyyuarat Tenth Meeting of The
ASEAN Expert Group on
Remote Sensing**

The Tenth Meeting of the ASEAN Experts Group on Remote Sensing telah diadakan pada 26-28 Jun, 1997 di Bangkok. Mesyyuarat telah dihadiri oleh wakil delegasi dari negara anggota ASEAN - Brunei, Indonesia, Malaysia, Filipina, Singapura dan Thailand. Mesyyuarat juga dihadiri para delegasi jemputan dari organisasi yang aktif dalam bidang remote sensing seperti : *European Space Agency (ESA)*, *National Space Agency of Japan (NASDA)*, *National Remote Sensing Agency (NRSA) of India*, *Australian Centre for Remote Sensing (ACRES)*, *Canada Centre for Remote Sensing (CCRS)*, *Space Imaging EOSAT*, *SPOT Asia*, *RSAC* and *Earth Observation Consultants International (EOCI) of United Kingdom*, dan *ESCAP*. Malaysia adalah pengerusi mesyyuarat kumpulan pakar ini semenjak 10 tahun yang lalu.

Di antara lain, mesyyuarat telah memberi tumpuan kepada perbincangan agenda mengenai usaha bagi meningkatkan kerjasama ASEAN dalam bidang remote sensing dan teknologi angkasa lain yang berkaitan yang telah dicadangkan oleh Malaysia dalam Mesyyuarat *The Ninth Meeting of ASEAN Experts Group* di Jakarta, Indonesia.

**Tenth Meeting of The ASEAN
Expert Group on
Remote Sensing**

"The Tenth Meeting of the ASEAN Experts Group on Remote Sensing" was held in Bangkok, during June 26-28, 1997. The meeting was attended by delegates from ASEAN member countries: - Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand. The meeting was also attended by invited delegates from interested organizations in remote sensing namely: *European Space Agency (ESA)*, *Nasional Space Development Agency of Japan (NASDA)*, *National Remote Sensing Agency (NRSA) of India*, *Australian Centre for Remote Sensing (ACRES)*, *Canada Centre for Remote Sensing (CCRS)*, *Space Imaging EOSAT*, *SPOT Asia of Singapore*, *RSAC* and *Earth Observation Consultants International (EOCI) of United Kingdom*, and *ESCAP*. Malaysia has been the chairman of this expert group meeting for the past 10 consecutive years.

The meeting, among others, focussed on further discussion on "Enhancing ASEAN Collaboration on Remote Sensing and Related Space Technologies" which was first presented by Malaysia in the *Nineth Meeting of ASEAN Experts Group on Remote Sensing* in Jakarta, Indonesia.

Mesyuarat telah juga membincangkan aktiviti-aktiviti utama *ASEAN Experts Group on Remote Sensing* yang turut merangkumi Kerjasama ASEAN-EU/ESA, Projek Asean-China, *Technology for Updating Maps using Remote Sensing*, *Elevation of the ASEAN Experts Group on Remote Sensing to a Sub - Committee Level under COST*, dan *AIRSAR PACRIM Programme*.

The Meeting also discussed the progress of major activities of the ASEAN Experts Group on Remote Sensing which included the ASEAN-EU/ESA Cooperation, Asean-China Project, *Technology for Updating Maps using Remote Sensing*, *Elevation of the ASEAN Experts Group on Remote Sensing to a Sub - Committee Level under COST*, and *AIRSAR PACRIM Programme*.



Peserta Mesyuarat "Tenth Meeting of The ASEAN Expert Group on Remote Sensing" pada 26-28 Jun, 1997 di Bangkok

Participants of the Tenth Meeting of The ASEAN Expert Group on Remote Sensing" held on 26-28 June, 1997 in Bangkok

PENTADBIRAN DAN KEWANGAN ADMINISTRATION AND FINANCE

KEWANGAN

FINANCE

Peruntukan dan Perbelanjaan

Allocation and Expenditure

Prestasi perbelanjaan MACRES mencapai tahap 94% bagi peruntukan mengurus dan 87% bagi peruntukan pembangunan. Prestasi keseluruhan perbelanjaan ialah 90% yang bernilai RM13,481,907 berbanding dengan jumlah peruntukan RM15,008,370 yang diluluskan.

MACRES expenditure performances were 94% and 87% for operating and development budgets respectively. The total expenditure is RM13,481,907 from the total allocation of RM15,008,370. Overall, MACRES expenditure performance for 1997 was 90%.

Kedudukan Peruntukan dan Perbelanjaan 1997 1997 Budget and Expenditure Status

Peruntukan Allocation	Lulus Approved	Belanja Spent	%Perbelanjaan Expenditure
Peruntukan Mengurus Operating Budget	4,897, 870	4,618, 089	94
Peruntukan Pembangunan Development Budget	10,110,500	8,863,818	87
Jumlah Total	15,008,370	13,481,907	90

Hasil

Kutipan hasil MACRES pada tahun 1997 telah meningkat sebanyak 19% iaitu dari RM 77,382.81 pada tahun 1996 kepada RM 91,926.30 bagi tahun 1997.

Revenue

MACRES revenue in 1997 was increased by 19%, an increase from RM 77,382.91 in 1996 to RM 91,926.30 in 1997.

Kedudukan Hasil 1997 / Revenue 1997

Akaun/ Account	1996	1997
Akaun Amanah/Trust Account	47,511	79,970
Akaun Hasil Kerajaan Government Revenue Account	29,872	145,363
Jumlah/Total	77,383	225,333

Pengambilan Kakitangan

MACRES telah diberi kelulusan bagi 137 jawatan seperti yang terkandung dalam Buku Anggaran Belanjawan Mengurus Persekutuan 1997. 64% daripada jawatan kosong ini telah diisi dalam tahun 1997. Kebanyakan jawatan yang diisi adalah dalam Kumpulan Sokongan yang meningkat sehingga 56%. Kesukaran mengisi kekosongan adalah disebabkan kurangnya calon berkelayakan dan berpengalaman terutamanya bagi jawatan Pegawai Penyelidik dan jawatan kenaikan pangkat.

Recruitment

MACRES was approved 137 posts as stated in the book of Federal Operating Budget 1997. In 1997, 64% of these posts were filled. Most of the posts that were filled in 1997 belonged to the Supporting Group with an increase of 56%. Difficulties in recruitment of staff were due to lack of qualified and experienced candidates, especially for Research Officer and other promotional posts.

Pengisian Jawatan / Recruitment

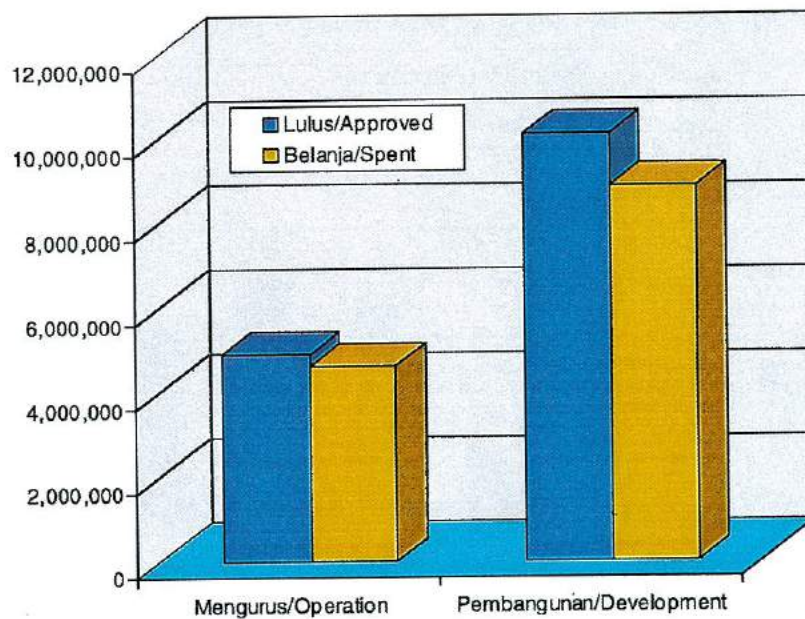
Kumpulan Group	Bil Jawatan No. of posts	1996	1997
Kumpulan Pengurusan dan Profesional Management and profesional Group	76	54	53
Kumpulan Sokongan Supporting Group	61	36	34
Jumlah Total	137	90	87

PETUNJUK PRESTASI
PERFORMANCE INDICATORS

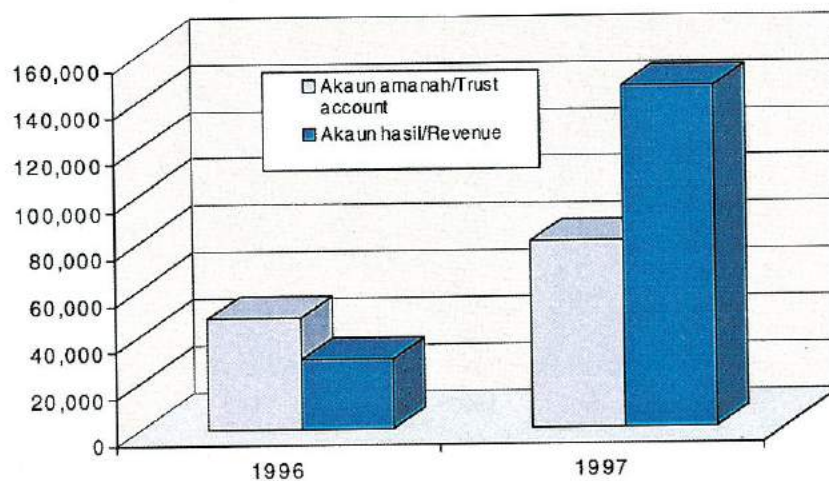
Perbelanjaan Pembangunan MACRES
MACRES Development Expenditure

Projek Project	Diluluskan Approved	Dibelanjakan Expenditure	Prestasi Performance %
1. Bangunan baru New building	6,700,000	5,600,225	89
2. Khidmat perunding stesen bumi Consultancy for Ground Station	1,100,000	117,0935	106
3. Pembangunan tenaga manusia Human resource development	500,000	480,294	96
4. Pengurusan Sumber Asli (NAREM) Natural Resources Management (NAREM)	550,000	405,696	74
5. Peta Imej Satelit (SIM) Satellite Image Map (SIM)	550,00	50,864	18
6. Perolehan sistem remote sensing pesawat Acquisition of airborne remote sens- ing system	50,000	19,737	40
7. Perolehan data satelit Satellite data acquisition	1,126,000	826,265	74
8. Peningkatan sistem System upgrading	900,000	900,000	100
Jumlah keseluruhan Overall			87%

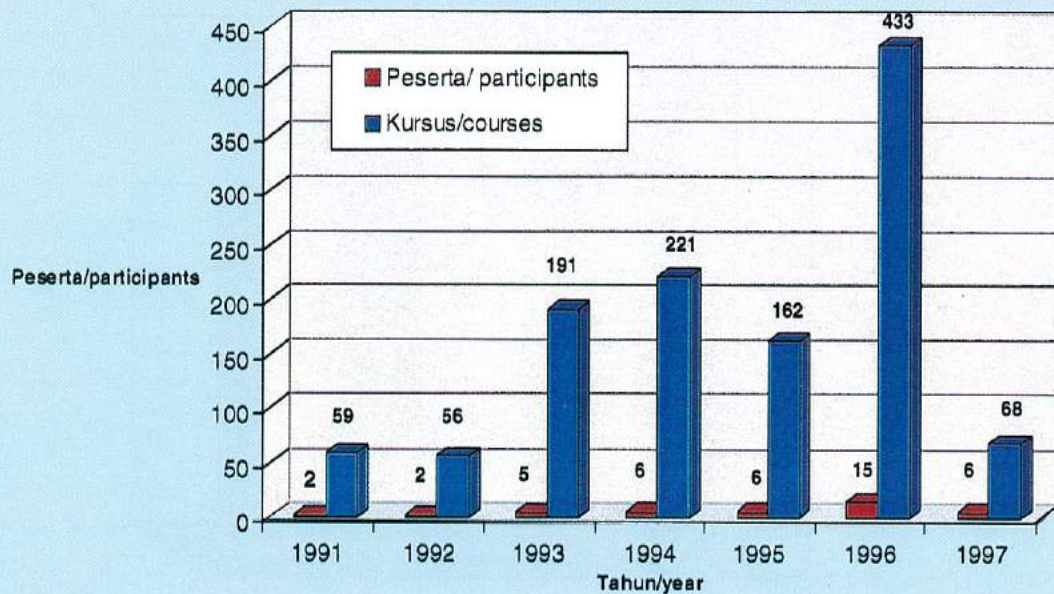
Peruntukan & Perbelanjaan 1997
Allocation & Expenditure 1997



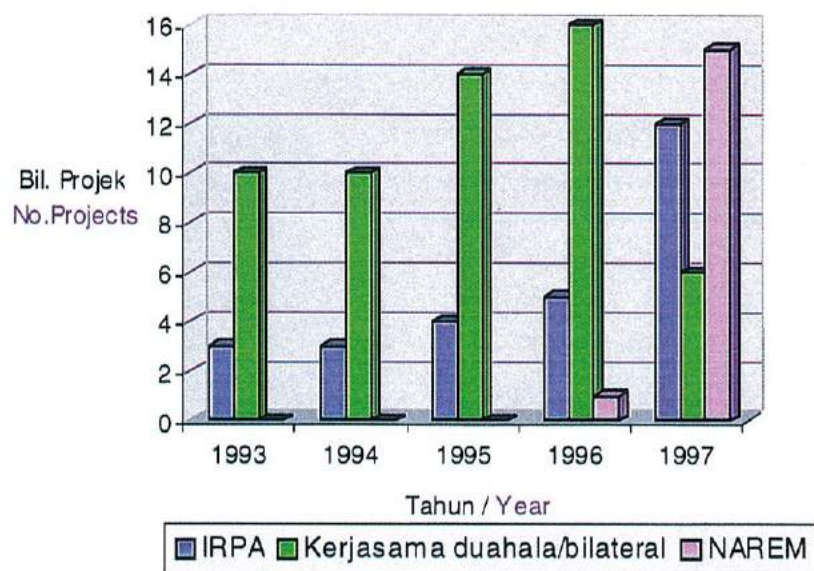
Hasil 1997
Revenue 1997



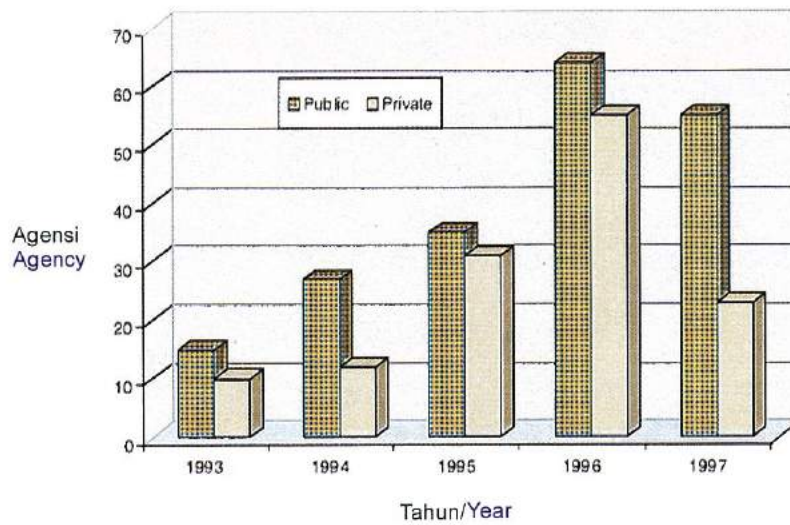
Bilangan peserta anjuran kursus/seminar MACRES
 Number of participants in courses/seminars organised by MACRES



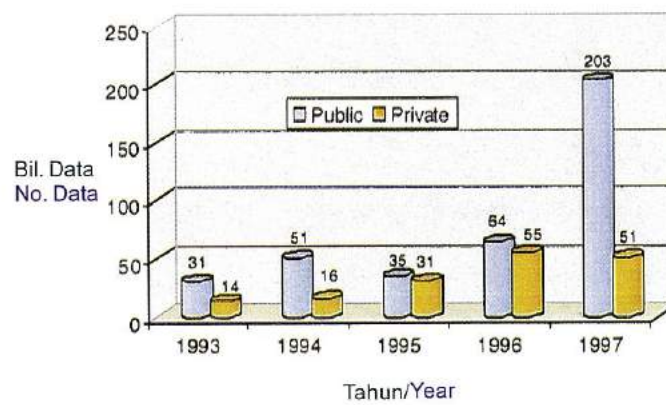
Projek-projek penyelidikan MACRES
 MACRES research projects



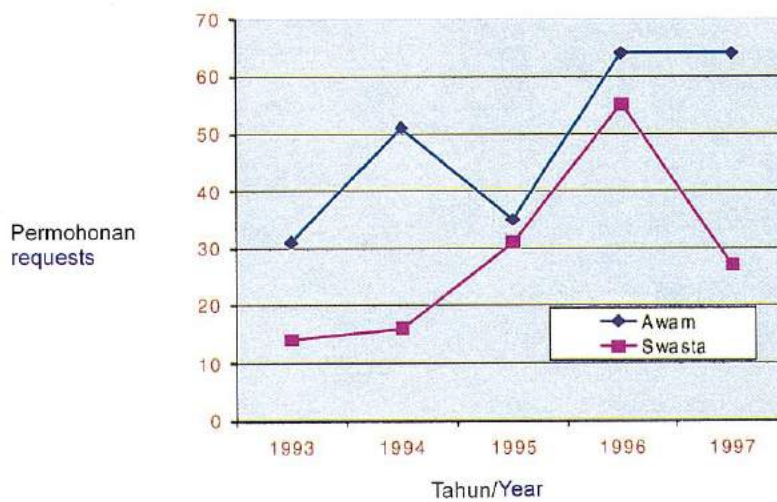
Bilangan Agensi Pengguna Untuk Perkhidmatan Data
Number of User Agencies For Data Services



Bilangan data remote sensing yang dipohon
Number of remote sensing data requested



Permohonan Data Remote Sensing
Remote Sensing Data Requests



SENARAI PELAWAT RASMI MACRES1997
MACRES OFFICIAL VISITORS' LIST 1997

Tarikh/Dates	Tetamu/visitors	Bilangan/Number
14/01/97	Julia McMorro (University of Manchester)	1
24/01/97	Dato' Dr. Yusof Basiron, Ketua Pengarah PORIM	2
13/03/97	Kakitangan Jabatan Perhutanan Indonesia	8
19/03/97	Pelajar (Universiti Putra Malaysia - Perhutanan)	25
2/05/97	Kakitangan Angkatan Tentera Malaysia (Bhg. Kom. & Elektronik)	22
6/05/97	Shi Bin Xiang (China Remote Sensing Centre)	4
15/07/97	Pelajar (Universiti Putra Malaysia - Perhutanan)	53
24/07/97	Scott D.Thornton (Intermap Technologies)	2
29/07/97	Pelajar (Universiti Putra Malaysia - Perhutanan)	43
8/08/97	Kakitangan (Angkatan Tentera Malaysia)	24
16/08/97	Pelajar (Universiti Teknologi Malaysia - Kejuruteraan Elektrik)	40
11/09/97	Robert Schuman (ERIM International)	2
16/9/97	N. Sawpath (ED Antrix) , Bob Noack (Space Imaging EOSAT)	2
19/09/97	Prof. Michel (French Embassy)	4
23/09/97	Prof. John Richard (ADFA , Australia)	1
28/10/97	Bob Irwin (AUSLIG, Australia)	1
29/10/97	David Froom (Raytheon)	1
1/11/97	J. Courbourles (CMES - Scpt Couseil)	1
4/11/97	Sanjai Kumar (American Embassy) , Josh Foster (NOAA-OGP) N. Graham (University of California)	3
6/11/97	Bernard Claudinon (MMS)	1
7/11/97	Peter Goodwin (Map Factory)	4
8/11/97	Kroezem (Fokker Space)	1
10/11/97	Pelajar (Universiti Putra Malaysia)	30

SENARAI PEROLEHAN DATA REMOTE SENSING REMOTE SENSING DATA ACQUISITION LIST

LANDSAT TM *(Source : NRCT, Bangkok, Thailand & LAPAN, Indonesia)*

1.	117/56Q3	22.05.97	3917
2.	117/57Q3	22.05.97	3917
3.	118/56Q3	14.06.97	2307
4.	119/57Q3	05.06.97	5416
5.	120/59Q1	09.04.97	1589
6.	121/59Q4	19.06.97	3411
7.	121/59Q3	19.06.97	3411
8.	123/57Q4	01.06.97	5211 (P. Natuna)
9.	125/58Q3	15.06.97	5937
10.	126/57	27.06.97	2030
11.	126/58Q3	22.06.97	3007
12.	127/56	13.06.97	0221
13.	127/57Q3	28.05.97	1705
14.	127/58	26.04.97	0000
15.	128/56	28.02.97	1121
16.	128/57Q2	28.02.97	7186
17.	129/56Q2	07.03.97	5075
18.	128/55	16.03.97	6410
19.	126/56	23.09.96	1202
20.	126/58	23.09.96	0044

SPOT DATA - 1997*Batch 1/97-SpotAsia Singapore**Media : Computer Compatible Tape (CCT's)***A: (Multispektral -3 Bands)**

Bil	Scene Id	Acquisition Date	Cloud Cover (%)
1.	266/338	01.01.97	AAAAAAAA
2.	266/339	01.01.97	AAAAAAAA
3.	266/340	01.01.97	AAAAAAAA
4.	267/339	01.01.97	ACBCCBCB
5.	267/341	01.01.97	BBBBBABA
6.	267/342	01.01.97	BBCBDBEC
7.	269/343	28.01.97	ABBBBBBA
8.	269/344	28.01.97	BABABBBB
9.	270/344	28.01.97	BCABABAA
10.	270/345	28.01.97	AAAABAAA
11.	274/347	06.03.97	CBCBCBCB
12.	294/341	28.03.97	AAAAAAAA
13.	294/342	28.03.97	AAABAAAA
14.	294/343	28.03.97	BBBBCBCB
15.	296/342	28.03.97	ACAABABA
16.	296/343	28.03.97	BABBBBCB
17.	296/344	28.03.97	CBBDDBCBB
18.	296/345	28.03.97	BBBCCCCC
19.	299/337	14.11.96	BCBCBDBD
20.	302/338	28.07.96	AAAAAAAA

B: (Pankromatik -1 Band)

21.	267/340	27.01.97	CBBCBBBB
22.	266/339	06.03.97	BAAAAAAB
23.	266/340	06.03.97	ABABABAB
24.	268/342	27.03.97	CBDBCCCB
25.	268/341	27.03.97	CEBDDDBC
26.	265/337	01.03.97	AAAAAABB*
27.	266/337	03.01.97	AAAAAAA*
28.	266/340	06.03.97	ABABABAB*
29.	266/340	02.03.97	BBBBBBAB*

* stereo-pair

SPOT DATA - 1997*Batch 2/7-SpotAsia Singapore**Media : CD-ROM***A: Multispektral – 3 Bands**

Bil	Scene Id	Acquisition Date	Cloud Cover (%)
1.	301/337	01.06.97	BBCBBACB
2.	301/342	03.07.97	CCBCBDCC
3.	270/343	29.05.97	AAAACBDD
4.	269/342	28.01.97	CDBDBDBD
5.	269/339	13.06.97	CCBCBCCB
6.	268/343	27.03.97	BBBBBBBB
7.	264/337	29.02.96	AAAAAAA
8.	302/339	22.06.97	BDBBBBBB
9.	271/343	29.05.97	DDCCAABB

B: Pankromatik – 1 Band

10.	268/340	06.03.97	BCACBCBC
11.	267/341	14.01.97	BBBCBBBB
12.	268/339	06.03.97	BBBBBBBB

RADARSAT DATA 1997

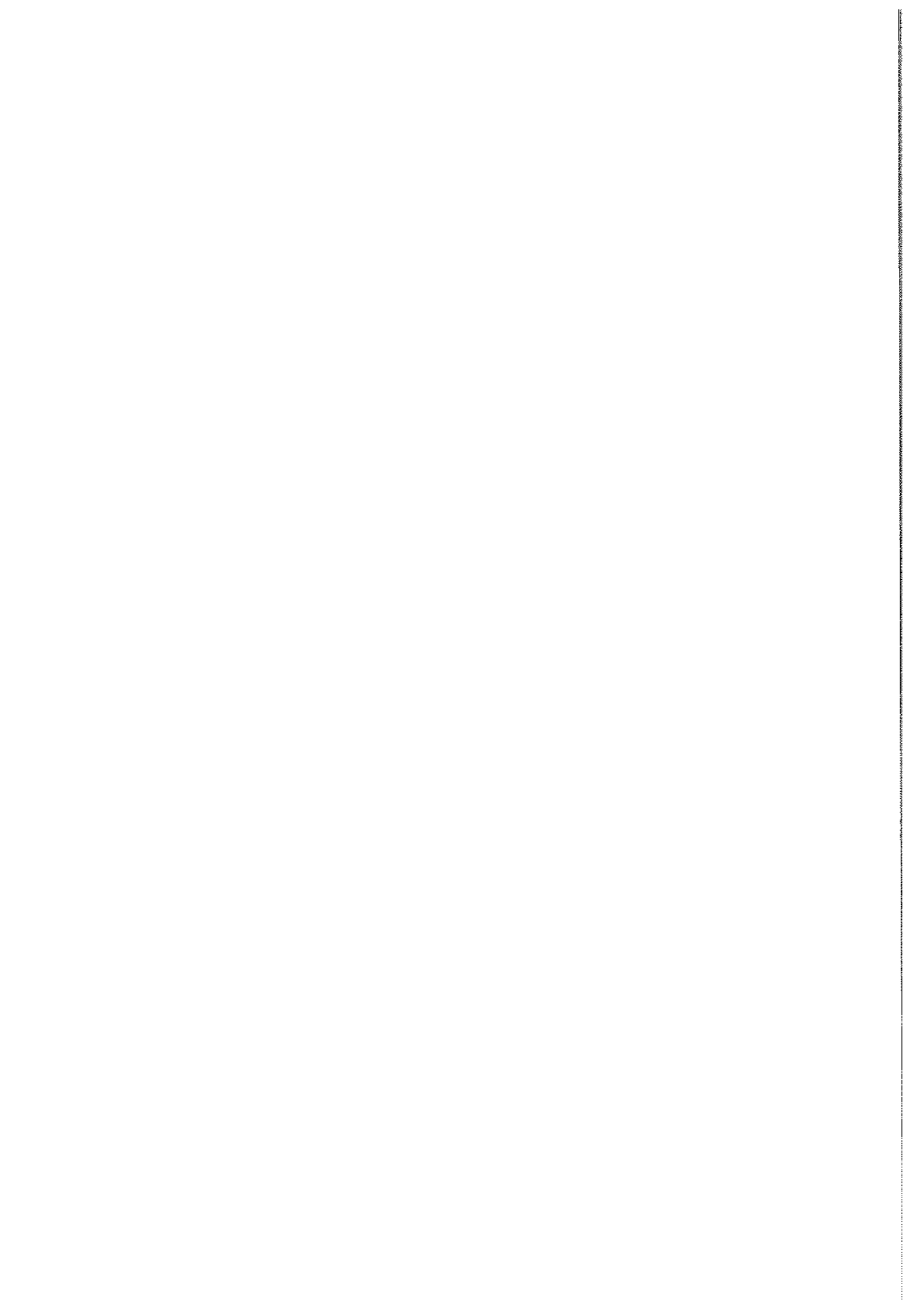
Product Type : Path Image

Format : Radarsat CEOS

Media : CR-ROM

Area	Centre lat/lon	Beam Mode	Acq. Date
1. P. Klang/Klang/Shah Alam Petaling/Subang/P.Jaya/ K.Lumpur Wilayah Persekutuan	3 25'N / 101 32'E	S4 Asc	28 Aug 1996
2. "	3 23'N / 102 09'E	S3 Asc	19 Feb 1997
3. Hulu Sel./Hulu Langat/ K. Lumpur P. Jaya/Shah Alam/ Teluk Datuk/K. LangatSepang	3 41'N /101 51'E	S7 Desc	29 Aug 1997
4. "	2 52'N /101 41'E	S7 Desc	29 Aug 1997
5. "	2 51'N /101 46'E	S3 Desc	24 Nov 1996
6. "	3 39'N /101 56'E	S3 Desc	24 Nov 1996
7. Keningau, Sabah	5 16'N / 16 18'E	S6 Desc	09 Mar 1997
8. Slim River, Perak	4 08'N /101 59'E	Fine 2Far Desc	02 Nov 1997
9. Slim River, Perak	3 48'N / 101 17'E	Fine 1Far Desc	15 Aug 1997
10. "	3 45'N / 101 55'E	Fine 2Far Desc	02 Nov 1997
11. "	4 13'N / 101 22'E	Fine 1Far Desc	15 Aug 1997

QUADILATERAL FRAMES WITH RESPECT TO WRS (PATH/ROW)





Malaysian Centre for Remote Sensing (MACRES)
Ministry of Science, Technology and The Environment
Letter Box 208, 5th Floor, City Square Centre,
Jalan Tun Razak, 50400 Kuala Lumpur, MALAYSIA.
Tel: 603-2645640 Fax: 603-2645646