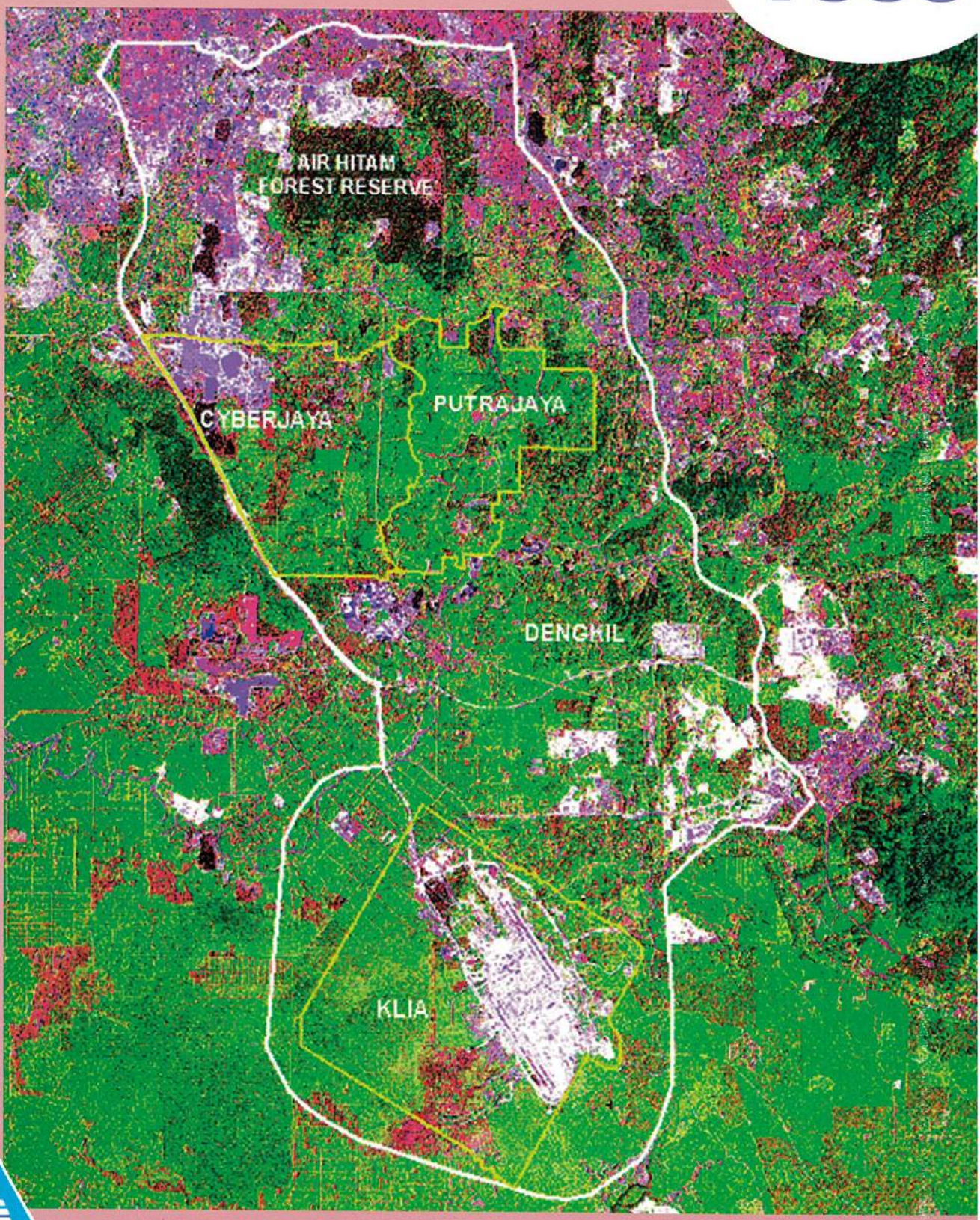
LAPORAN TAHUNAN
ANNUAL REPORT
1996



MACRES

MACRES

PROFIL / PROFILE

Pusat Remote Sensing Negara (MACRES) ditubuhkan pada Ogos 1988 dan mula berfungsi pada Januari 1990. MACRES bertanggungjawab untuk membangunkan remote sensing angkasa dan teknologi-teknologi yang berkaitan serta memperkembangkan penggunaannya bagi tujuan pengurusan sumber semulajadi dan alam sekitar, dan perancangan strategik negara. MACRES juga adalah penyelaras bagi perlaksanaan Nasional (PRSN), yang disertai oleh semua agensi pengguna yang berkaitan.

MACRES melaksanakan dua program iaitu :

- program P&P
- program operasi

MACRES dilengkapkan dengan kemudahan peralatan komputer pemposesan imej satelit dan sistem maklumat geografi (GIS). Sebuah stesen bumi bagi penerimaan data satelit remote sensing secara langsung juga sedang dalam proses pembinaan.

The Malaysian Centre for Remote Sensing (MACRES) was established in August 1988 and became operational in January 1990. It has the objective of developing space remote sensing and related technologies and to operationalise their applications for natural resource and environmental management, and strategic planning of the country. MACRES acts as the focal point for the implementing of the National Remote Sensing Programme (NRSP) which is being participated by all government user agencies. Two major programmes are implemented:

- R&D programme
- operations programme

MACRES is equipped with facilities for satellite image processing and geographic information system (GIS). Satellite ground receiving station for direct remote sensing data reception is also being constructed.

Visi / Vision

Menjadi peneraju dalam bidang remote sensing dan teknologi-teknologi yang berkaitan serta membimbing negara ke arah kecemerlangan di peringkat antarabangsa dalam bidang-bidang yang berkaitan.
To be a leader in the field of remote sensing and related technologies and to lead the nation to international exellence in these areas.

Misi / Mission

Berusaha mencapai tahap berdikari di negara dan kecemerlangan di peringkat antarabangsa dalam bidang remote sensing angkasa dan teknologi-teknologi yang berkaitan
Attain national self-reliance and international exellence in the field of space remote sensing and related technologies

Mengoperasikan penggunaan remote sensing angkasa dan teknologi-teknologi yang berkaitan bagi tujuan pengurusan sumber semulajadi dan alam sekitar serta perancangan strategik negara dengan berkesan
Operationalise the use of space remote sensing and related technologies for effective natural resources and environmental management, and strategic planning of the nation

Membantu dan menyokong industri tempatan untuk bersaing di pasaran terbuka
Assist and support the local industry to compete in the open market place

KANDUNGAN / CONTENTS

PERUTUSAN PENGARAH *DIRECTOR'S MESSAGE*

Teknologi satelit innovatif telah memberi banyak maklumat tentang Bumi. Penggunaan pakej pemprosesan imej berkomputer dan GIS telah diterima sebagai alat untuk menyelidik, mengawalselia dan mengurus sumber Bumi dengan berkesan.

Innovative satellite technologies have in the past provided the world with a wealth of Earth's information. Computerised image processing and GIS packages are accepted as a capable tool to explore, monitor and manage Earth's resources efficiently.

Dengan wujudnya kesedaran terhadap kepentingan data angkasa bumi dalam pembangunan sosial dan ekonomi serta pengurusan sumber dan alam sekitar, kerajaan telah memberi keutamaan tinggi bagi memastikan remote sensing digunakan dengan meluas dan berkesan untuk pembangunan negara yang mapan. Dalam Rancangan Malaysia Ke-7, yang bermula pada tahun 1996, MACRES telah dipertanggung jawab untuk melaksanakan sembilan projek bagi meningkatkan aplikasi teknologi remote sensing angkasa yang memberi penekanan kepada pembangunan sumber manusia dan infrastruktur. Ini termasuk pembinaan ibu pejabat MACRES yang baru, stesen penerimaan bumi satelit, perolehan sistem remote sensing "airborne", penubuhan

Realising the importance of Earth's space data in social and economic development as well as in natural resources and environmental management, the government has continued to give high priority to ensure a wider and efficient use of remote sensing for sustainable development of the country. In the 7th Malaysian Plan, which began in 1996, MACRES is entrusted to implement nine projects to further develop space remote sensing technologies applications focusing on the building capacity of both human resource and infrastructural development. These include construction of MACRES new office building, satellite ground receiving station, acquisition of airborne remote sensing systems, establishment of a

makmal remote sensing gelombangmikro dan pelaksanaan Program Pengurusan Sumber Asli dan Alam Sekitar (NAREM).

microwave remote sensing laboratory and implementation of Natural Resources and Environmental Management Programme (NAREM).

Sebagai satu lagi langkah untuk menggalakkan pembangunan remote sensing melalui pemindahan teknologi dan pertukaran maklumat, MACRES telah memulakan dan mengambil bahagian secara aktif dalam pelbagai projek dan aktiviti dengan agensi antarabangsa, khususnya aktiviti yang dianjurkan oleh program Aplikasi Angkasa Serantau, UN-ESCAP, Agensi Angkasa Eropah (ESA) dan Agensi Pentadbiran dan Angkasa Nasional (NASA), Amerika Syarikat.

As another measure to expedite development of remote sensing technology through technology transfer and information exchange, MACRES has initiated and participated actively in various bilateral projects with foreign partners as well as in projects and activities of international agencies, especially those of the Regional Space Application Programme of UN-ESCAP, European Space Agency (ESA) and National Administrative and Space Agency (NASA) of U.S.A.

Kerjasama teknikal dalam rangkakerja dua-hala atau serantau masih diteruskan dalam tahun 1996. MACRES telah bekerjasama dengan Kanada, China, Sweden, Australia dan Kesatuan Europah melaksanakan beberapa projek remote sensing untuk tujuan pemindahan teknologi.

Technical cooperation within the framework of bilateral or regional arrangements is continously pursued in 1996. MACRES has cooperated with Canada, China, Sweden, Australia and European Union to implement a number of remote sensing projects to effect technology transfer.

MACRES juga mengambil bahagian secara aktif dalam aktiviti yang dianjurkan di bawah Program Kerjasama Remote Sensing ASEAN dan Persatuan Remote Sensing Asia.

MACRES also participated actively in ASEAN Cooperation Programme on Remote Sensing and Asian Association of Remote Sensing.

Dalam tahun 1996, Malaysia melalui MACRES, telah dipilih sebagai tuan rumah kepada mesyuarat "Second Session of the Intergovernmental Consultative Committee (ICC) on Regional Space Applications Programme for Sustainable Development in Asia and the Pacific". Sesi ini telah diadakan di Kuala Lumpur pada 7-8 Jun 1996. Objektif sesi ini ialah untuk menilai semula pelaksanaan Peristiharaan Beijing mengenai aplikasi teknologi angkasa untuk pembangunan mapan di rantau Asia-Pasifik. Ini adalah kali kedua MACRES diberi penghormatan untuk menganjur sesi tersebut.

In 1996, Malaysia through MACRES, was chosen to host the Second Session of the Intergovernmental Consultative Committee (ICC) on the Regional Space Applications Programme for Sustainable Development in Asia and the Pacific. The session was held in Kuala Lumpur on 7-8 June 1996. Objectives of the session were to review the iimplementation of the Beijing Declaration on the application of space technology for sustainable development in the Asia-Pacific region. This is the second time that Malaysia was given the honour to organised such a session.

Persatuan Remote Sensing Malaysia (MRSS) telah ditubuhkan secara rasmi pada Mac 1996. Objektif utamanya ialah untuk menyokong dan mencepatkan perkembangan remote sensing dan teknologi yang berkaitan dalam negara melalui kerjasama rapat sektor kerajaan dan swasta. MRSS sedang giat berusaha meningkatkan jumlah keahliannya. Sebagai aktiviti terulungnya, MRSS telah menganjurkan Persidangan Remote Sensing Nasional yang pertama pada 25 November 1996 di Kuala Lumpur.

The Malaysian Remote Sensing Society (MRSS) was officially established in March 1996. Its main objective is to support and facilitate development of remote sensing and related technologies in the country through the concerted efforts of both the public and private sectors. MRSS is currently embarking an intensive membership drive. As its first major activity, MRSS has organised the First National Remote Sensing Conference on 25 November 1996 in Kuala Lumpur.

Akhir sekali, dengan semangat kakitangan yang tinggi dan sokongan kerajaan yang kukuh, saya yakin bahawa MACRES akan terus bergerak maju untuk membangunkan penggunaan remote sensing dan teknologi yang berkaitan di Malaysia.

Lastly, with the existing high spirit among MACRES staff and strong support from the government, I am confident that MACRES will continue to achieve its objectives in developing remote sensing and related technologies applications for national development.

NIK NASRUDDIN MAHMOOD,FRSS
Pengarah MACRES
MACRES Director

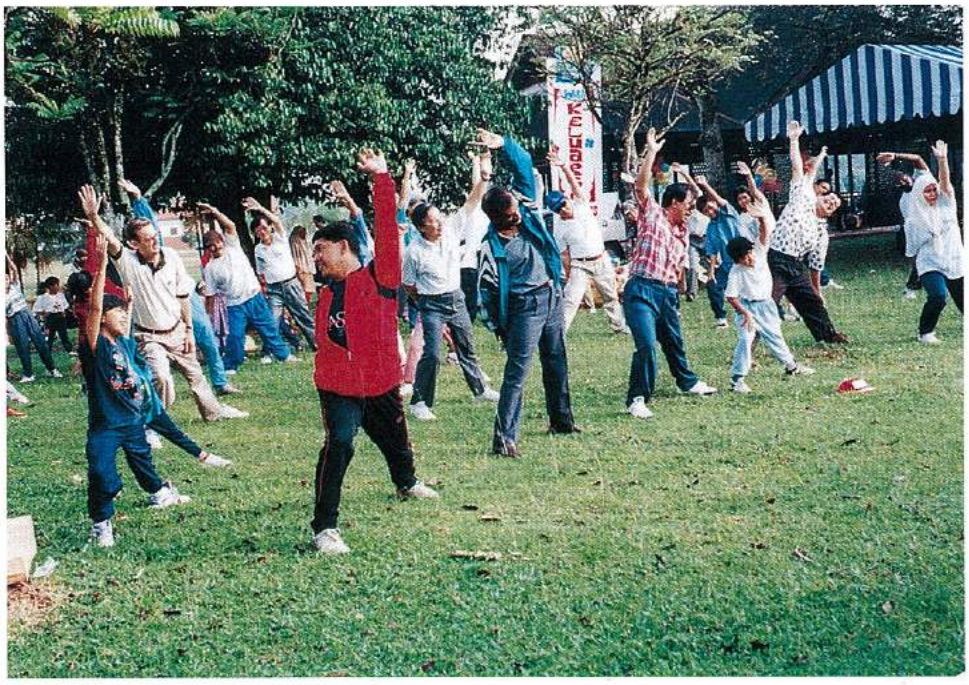
13-18 Mei 1996
Para peserta Bengkel Aplikasi Radarsat yang diadakan di MACRES.
Participants of Radarsat Applications Workshop held in MACRES.

22 May 1996
Lawatan pegawai-pegawai MACRES ke Jabatan Ukur dan Permetaan Negara.
A visit to the Department of Survey and Mapping by MACRES staff.

24 July 1996
A visit to FRIM, Kepong, Kuala Lumpur by MACRES staff.
Lawatan kakitangan MACRES ke FRIM, Kepong, Kuala Lumpur.

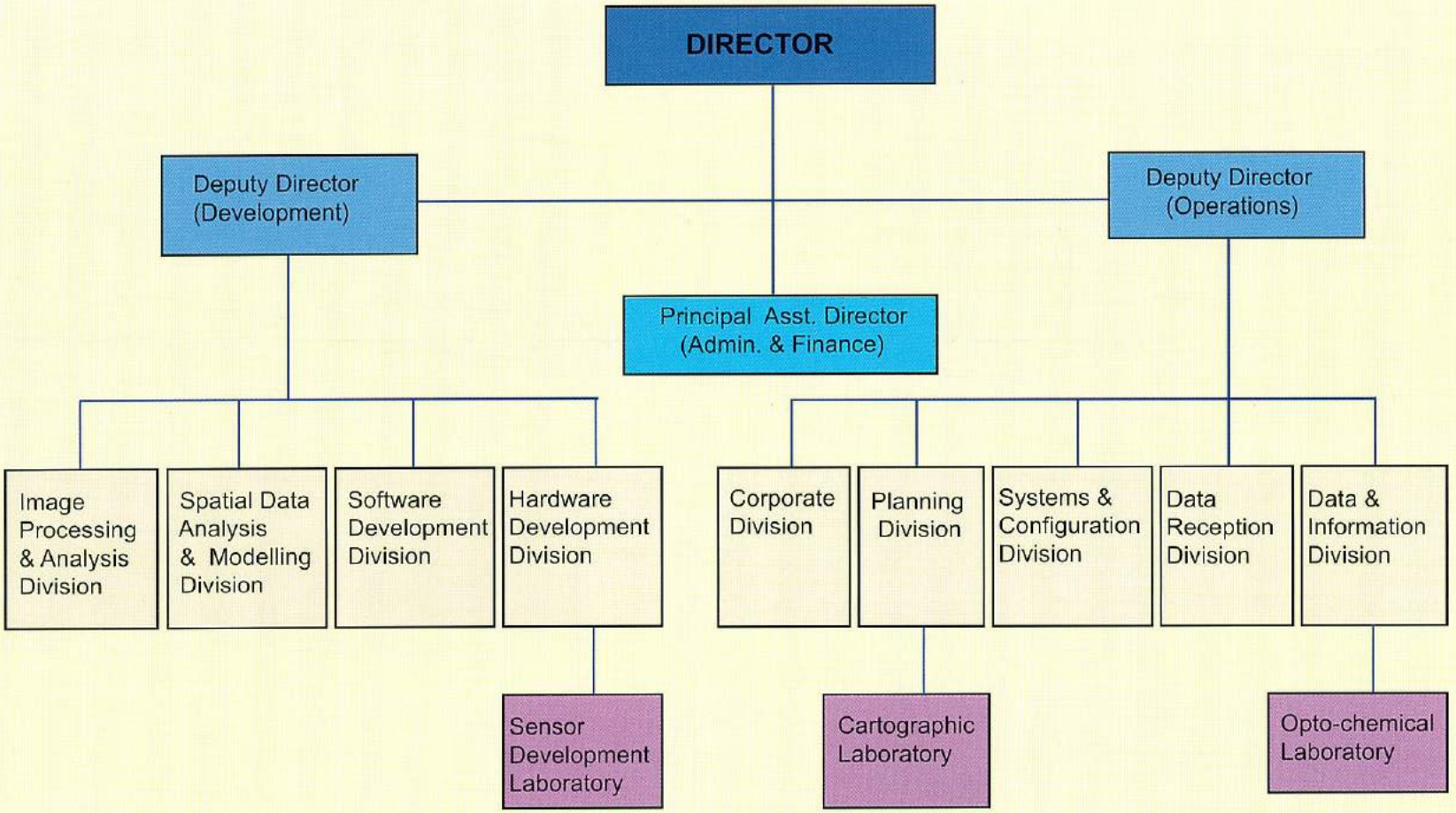
5 Oct. 1996
En. Darus Ahmad bergambar bersama urusetia dan peserta Seminar Perkembangan Industri Teknologi Satelit dan Remote Sensing Dalam Pembangunan Negara yang berlangsung di Politeknik Ungku Omar, Ipoh, Perak.
Mr.Darus Ahmad with the organising committee and participants of the Seminar on Satellite and Remote Sensing Technology Industry in Nation's Development held in Politeknik Ungku Omar, Ipoh, Perak.

25-27 Nov. 1996
YB Datuk Law Hieng Ding, Menteri Sains, Teknologi dan Alam Sekitar merasmikan persidangan pertama MRSS mengenai Remote Sensing dan GIS di Kuala Lumpur.
The Honourable Minister of Science, Technology and the Environment, Malaysia, Datuk Law Hieng Ding officiating the first MRSS Conference on Remote Sensing and GIS held in Kuala Lumpur.



8 Dis. 1996
Hari Keluarga MACRES
MACRES Family Day

CARTA ORGANISASI MACRES / MACRES ORGANISATION CHART



PENYELIDIKAN DAN PEMBANGUNAN *RESEARCH AND DEVELOPMENT*

Kerajaan telah menubuhkan MACRES pada tahun 1988 dengan tujuan untuk mempromosikan aplikasi remote sensing dan teknologi berkaitan di negara ini. Selaras dengan misi dan objektif MACRES, program Penyelidikan dan Pembangunan (P&P) dilaksana berasaskan tiga tema utama berikut:

- ∞ MACRES akan terus memainkan peranan utama dalam pembangunan aplikasi remote sensing dan Sistem Maklumat Geografi (GIS).
- ∞ MACRES akan terus bekerjasama dengan rakan luar negara untuk pembangunan kapasiti - pembangunan infrastruktur dan tenaga manusia.
- ∞ Aktiviti-aktiviti yang berhubungkait dengan teknologi angkasa membuka peluang kepada pembangunan industri dan pertumbuhan ekonomi Malaysia.

Berasaskan perkara-perkara tersebut, strategi dan aktiviti-aktiviti yang dirangkumi dalam program P&P MACRES adalah :

- membangunkan dan memberi perkhidmatan mengenai aplikasi remote sensing, pemodelan data ruang, keupayaan dalam penulisan perisian dan pembuatan perkakasan.
- memudahkan penglibatan industri Malaysia dalam perkhidmatan remote sensing dan GIS.

MACRES was established in 1988 to promote the use of space remote sensing and related technology in the country. To achieve its mission and objectives, the implementation of MACRES research and development (R&D) programme is guided by three main themes viz:

- MACRES will play the role as a leading edge user in the development of space remote sensing and GIS applications.
- MACRES will continue to collaborate with foreign partners for capacity building - infrastructure and human resource development.
- Space-technology related activities offer opportunities for industry development and economic growth of Malaysia.

The above considerations guides MACRES in recommending an R&D programme which includes strategies and actions to:

- develop and demonstrate remote sensing application services, spatial data and modelling, and software hardware manufacturing capabilities.
- facilitate the involvement of Malaysian industry in the delivery of remote sensing and GIS services

memperkukuhkan polisi MACRES dalam aplikasi remote sensing, industri perkhidmatan 'value added' dan bidang teknologi dan penyelidikan utama yang boleh dikomersialkan dalam jangka masa sederhana.

strengthen MACRES position in respect of access to remote sensing applications and value added service industries,as well as in key research and technology areas with medium term commercial prospects

MACRES telah mengenalpasti satu projek bersepadu yang berkepentingan kepada negara (PNI) bagi menghasilkan faedah-faedah tertentu dalam perancangan ekonomi dan strategi untuk Malaysia. Projek NAREM dan SIM diambilkira sebahagian komponen PNI. MACRES berkeyakinan penuh PNI akan meningkatkan industri remote sensing di Malaysia hasil dari usaha-usaha yang telah dilaksanakan bagi memperkukuhkan keupayaan operasional bagi projek-projek remote sensing nasional pada tempoh 1997-1998 dan seterusnya.

MACRES has defined a unified Project of National Interest (PNI), which would integrate the R&D activities in achieving economic and strategic planning advantages for Malaysia. This involves the funding of NAREM and SIM projects for implementation in the Seventh Malaysia Development Programme (RM7). MACRES strongly in the view that there is a real window of opportunity for Malaysia within the boundaries of this project to achieve a place in the remote sensing industry based upon efforts to strenghthen the operationalization capacity for committed national space remote sensing projects in 1997-98 and subsequent years.

PNI merupakan program innovatif yang berhubungkait dengan teknologi informasi yang tersedi ada dan terbaru. Teknologi remote sensing merupakan satu komponen penting dalam infrastruktur lebuhraya informasi di masa hadapan.

The PNI is an innovative project, which is linked directly to both existing and new information technology. Satellite remote sensing technology will be a significant part of the Malaysian infrastructure underpinning the information superhighway of the future.

Projek NAREM dan SIM boleh menjadi asas bagi membangunkan lagi koordinasi usaha P&P

Progress in NAREM and SIM projects to this stage has convinced MACRES of the need to develop further

MACRES. Kelulusan kerajaan terhadap pelaksanaan projek-projek berkenaan merupakan langkah pertama bagi memenuhi tanggungjawab MACRES dalam mengkoordinasi dan bekerjasama dengan individu, organisasi dan badan-badan berkanun dalam pembangunan dan pelaksanaan program P&Pnya.

coordination of the total MACRES R&D effort. The approval of such projects by the government recently was a first step in meeting the obligation placed on MACRES to coordinate, consult and cooperate with persons, organizations and bodies in developing and implementing MACRES's R&D.

Prioriti utama P&P MACRES adalah untuk menjayakan PNI dan memaksimumkan perbelanjaan peruntukan. Struktur P&P di MACRES dapat dibahagikan mengikut enam bidang berikut:

The first priority of MACRES R&D is to realise the objectives of PNI and to utilise the available funds to its maximum. The structure of MACRES R&D has been centered on the following six areas:

- Projek P&P berperingkat Nasional
- Projek P&P utama MACRES
- Projek IRPA
- Projek IRPA di bawah JKRSN
- Projek MACRES-Universiti
- Projek Dua-Hala atau Serantau

- R&D Project of National Interest
- MACRES R&D Priority Projects
- IRPA Projects
- NRSP/IRPA projects
- MACRES-University Projects
- Bilateral/Multilateral Projects

PROJEK P&P PERINGKAT NASIONAL

Dua projek yang berkepentingan kepada

R&D PROJECT OF NATIONAL INTEREST

Two projects of national interest, i.e. Natural Resource and

negara iaitu Pengurusan Sumber Asli dan Alam Sekitar (NAREM) dan Peta Imej Satelit (SIM) telah dirancang untuk pelaksanaan di peringkat nasional. Sehingga kini, penyelidikan dalam bidang litupan bumi, hakisan tanah, perhutanan, geologi dan pertanian telah dijalankan bagi dijadikan asas untuk pelaksanaan projek NAREM.

Projek peta imej satelit dilaksanakan untuk melengkapkan peta topografi yang tersedia ada untuk kegunaan para perancang dan profesional di Malaysia. Projek ini telah mendapat peruntukan sebanyak RM 1 juta dalam Rancangan Malaysia Ke-7. Projek ini telah mula dilaksanakan dalam tahun 1996 di kawasan Lembah Kelang dan Perak/Kedah.

Data-data 'Ground Control Point' telah juga dikutip untuk tujuan 'registration'. Projek ini dirancang selesai pada tahun 2020 bagi seluruh Semenanjung Malaysia.

Environmental Management (NAREM) and Satellite Image Map (SIM) were planned for implementation at the national level. To-date, basic research in land-use cover, soil erosion, foresty, geological and agricultural mapping has been conducted to provide basis for the establishment of NAREM database.

The Satellite Image Map (SIM) project was initiated as a complementary for topographical map for planners and professionals. The project was approved for implementation in the 7th Malaysian Development Plan with the total allocation of RM1,000,000. The project started in 1996 in the two pilot project areas namely Klang Valley and Perak/ Kedah.

Field works had also been carried out in these areas to collect GPS data to be used as ground control points for image registration. The project is scheduled until the year 2020 to cover the whole of Peninsular Malaysia.

PROJEK-PROJEK P&P UTAMA MACRES

Pembangunan Perkakasan

Objektif projek ini ialah

MACRES PRIORITY R&D PROJECTS

Hardware Development

The objectives of this project is to develop and

untuk membangun dan merekabentuk penderia optik, satu 'synthetic aperture radar' (SAR) dan satu sub-sistem telemetri, pengesanan dan kawalan (TT&C).

Aktiviti utama bahagian Pembangunan Perkakasan dalam tahun 1996 ialah bekerjasama dengan Bahagian Penerimaan Data dalam membangunkan Stesen Penerimaan Bumi MACRES (MGRS). Kakitangan Bahagian ini terlibat dalam meneliti spesifikasi fungsi dan spesifikasi terperinci sistem MGRS.

Mobile Microware Monostatic Radar Scatterometer

Objektif projek ini ialah untuk membina sebuah makmal dan alat scaterometer bagi tujuan menjalankan pengukuran pantul balik in situ permukaan bumi termasuk hutan, tumbuh-tumbuhan dan permukaan tanah.

Pembangunan Perisian

Objektif bahagian ini adalah untuk memberi sokongan kepada kerja-kerja penyelidikan di MACRES (dan dalam jangka panjang) untuk membangunkan perisian bagi kegunaan

design optical sensors (OPS), a synthetic aperture radar (SAR) and a Telemetry, Tracking and Command (TT&C) Subsystem.

In 1996, the main activity of the division has been to work in close cooperation with the Data Reception Division for the establishment of the MACRES Ground Receiving Station (MGRS). The members of the Division have been involved in the review of the functional specifications and the detailed specifications of the MGRS system.

Mobile Microware Monostatic Radar Scatterometer

The project was implemented to develop both laboratory and field scatterometers to conduct in situ radar backscatter measurements of the earth surface including forest, agricultural fields and soil surfaces.

Software Development

The objectives of this project are to support on-going research activities in MACRES as well as (in the longer term) to develop software packages for use in the imaging, remote sensing and GIS (Geographical Information

dalam bidang pengimejan, remote sensing dan GIS (Geographical Information System) yang berupaya untuk dipasarkan secara komersil.

System) field, which can also be commercially exploited.

Dalam Projek Kerjasama Malaysia-Vietnam yang melibatkan dua pakar dari Institute of Physics, Vietnam satu pakej perisian yang diberi nama **DIP** (Digital Image Processing) telah dibangunkan di dalam persekitaran DOS. Sebaliknya, perisian **VM-Image Processing** yang dibangunkan di bawah program yang sama adalah di dalam persekitaran WINDOWS 95.

In Malaysia-Vietnam collaboration project where two Vietnamese specialists from the Institute of Physics in Vietnam are involved, a software package called **DIP** (Digital Image Processing) was developed in DOS environment. **VM Image Processing** on the other hand, developed under the same programme operates under the WINDOWS 95 environment.

Beberapa modul seperti paparan grafik, pencetakan imej, klasifikasi imej dan pertukaran data di antara format raster dan vektor telah dibangunkan di dalam kedua-dua perisian ini. Pembangunan seterusnya perisian tersebut akan diambil-alih oleh bahagian ini untuk menyokong projek-projek penyelidikan di MACRES.

Some modules such as on graphic display, image printing, image classification and conversion between raster format and vector format have been developed for both software packages. Further development of these software will be undertaken by the division to support research projects in MACRES.

Pengukuran lapangan menggunakan alat GPS (Global Positioning System) adalah dalam format koordinat WGS84. Transformasi datum di antara WGS84 dan KERTAU (digunakan di Semenanjung Malaysia) atau TIMBALAI (digunakan di Sabah/Sarawak) telah diimplimentasikan dalam pakej perisian **MAPPROJ** yang dibangunkan oleh

Field measurements made by GPS (Ground Positioning System) receivers are in WGS84 coordinates. The datum transformation between WGS84 and KERTAU datum (used in Peninsular Malaysia) or TIMBALAI datum (used in Sabah/ Sarawak) was implemented in a software package called **MAPPROJ** developed internally by the

bahagian ini. Transformasi peta unjuran juga telah diimplementasikan di dalam perisian ini. Terdapat dua jenis unjuran yang disokongnya pada masa kini: (i) UTM (Universal Transverse Mercator); dan (b) RSO (Rectified Skew Orthomophic, unjuran yang biasa digunakan di Malaysia).

Bagi tujuan memudahkan penyelidikan dan pengajaran dalam bidang transformasi datum dan unjuran peta, satu pakej perisian **GEOLAB** telah dibangunkan.

division. In addition, a map projection transformation has also been implemented in this software. Two types of map projections are supported at present: (i) UTM (Universal Transverse Mercator), and (ii) RSO (Rectified Skew Orthomophic, a map projection system used in Malaysia).

To facilitate research and teaching in the field of datum transformation and map projection, a flexible software package, **GEOLAB** has been developed.

PROJEK DUA HALA DAN PELBAGAI HALA

BILATERAL/ MULTILATERAL PROJECTS

Program Penyelidikan dan Pembangunan

Research and Development Programme

Projek-projek P&P di bawah mekanisma dua-hala/pelbagai-hala memberi fokus kepada perolehan maklumat terkini dalam perkembangan teknologi melalui pelaksanaan projek-projek aplikasi kerjasama dengan pihak-pihak asing untuk pembangunan keupayaan negara dalam bidang remote sensing dan teknologi berkaitan di Malaysia.

The R&D projects under bilateral/multilateral arrangement focussed on keeping abreast with the latest technological advancement worldwide via application projects with foreign partners to develope indigenous capability in remote sensing and related technologies .

Projek Aplikasi Dua Hala

Bilateral and Multi-lateral

Projek Aplikasi Dua Hala dan Pelbagai Hala.

Bilateral and Multi-lateral Application Projects

MACRES telah menyertai dalam projek dua-hala dan pelbagai hala sejak tahun 1991 bagi tujuan

MACRES has participated in bilateral and multi-lateral projects since 1991 to effect transfer of relevant

JADUAL1 /*TABLE 1* : Ringkasan projek dua-hala (1993-1996)
Summary of bilateral projects (1993-1996)

No.	Country	Projects	1993	1994	1995	1996
1	Thailand	Complementary Nature of JERS-1 and Optical Data or Landcover/Use Mapping-Johore				started
2	China	1. Soil Erosion Risk Modelling 2. Hydrological Modelling			started	completed
3	Russia	1. Landcover 2. Geology 3. Environment				started
4	Brazil	1. Forestry 2. Geology				started
5	Australia	1. Forestry				started
6	Japan	Characterization of Land Cover SAR Signatures: 1. Kedah 2. Johore	started	on-going	on-going	on-going
7	EC-ASEAN	Complementary Nature of ERs-1 & Optical Data for Land Cover/Use Studies-Johore	started	on-going	on-going	completed
8	Canada (Globesar)	1. Agriculture 2. Geology 3. Forestry 4. Topography 5. Marin	started	on-going	on-going	on-going
9	ASEAN	Book-ASEAN From Space				started
10	Vietnam	1. Geology 2. Land Cover			started	completed
11	USA (NASA)	Airsar Programme				started

pemindahan teknologi berkaitan daripada negara-negara yang maju dalam bidang remote sensing dan GIS. Kebanyakan projek-projek ini dilaksanakan dengan penglibatan aktif agensi-agensi kerajaan yang berkaitan.

technologies from countries advanced in remote sensing and GIS to Malaysia. These projects were implemented by MACRES with active participation from relevant government agencies.

Jadual 1 menunjukkan projek -projek yang dilaksanakan dalam tahun 1996 dimana sebahagiannya telah bermula pada 1993.

Table 1 gives the summary of the projects implemented in 1996. Some of these projects commenced as far back as 1993.

Tiga projek dengan China, Vietnam dan EC- ASEAN telah selesai dilaksanakan dalam tahun 1996. Projek-projek dengan Jepun dan GlobeSAR Kanada tidak dapat diselesaikan seperti yang dijadualkan dalam tahun 1996 kerana pegawai-pegawai penyelidik yang terlibat tidak begitu mahir dalam teknik-teknik pemprosesan data SAR.

Three projects with China,Vietnam and EC-ASEAN were completed in 1996. The other two projects withJapan and Canada (Globesar), scheduled for completion in 1996 could not be finalized due to unfamiliarity of the researchers with the processing techniques of SAR data.

Tiga lagi projek dengan Thailand, Russia dan ASEAN mula diimplementasikan dalam tahun 1996 dan dijadualkan selesai dalam tahun 1997.

Three other projects with Thailand, Russia and ASEAN, commenced implementation in 1996 and were scheduled for completion in 1997.

Ringkasan Penting dalam Projek-Projek yang Telah Selesai Dilaksanakan

Highlights of the completed projects

Projek EC- ASEAN

EC-ASEAN Programme

Laporan terakhir projek telah siap dan dihantar

The final report of the project was submitted to

kepada pihak EC pada Jun 1996. Antara lain, projek ini telah menghasilkan keputusan analisa 'SAR Backscatter ' pelbagai jenis litupan bumi di Johor (Jadual 2) dan juga menunjukkan potensi data ERS-1 untuk mengesan perubahan litupan bumi.

EC in June , 1996. Among others, the project has provided useful results on SAR backscatter analysis of common land cover types in Johore (Table 2) and the potential use of ERS-1 data for land cover change detection.

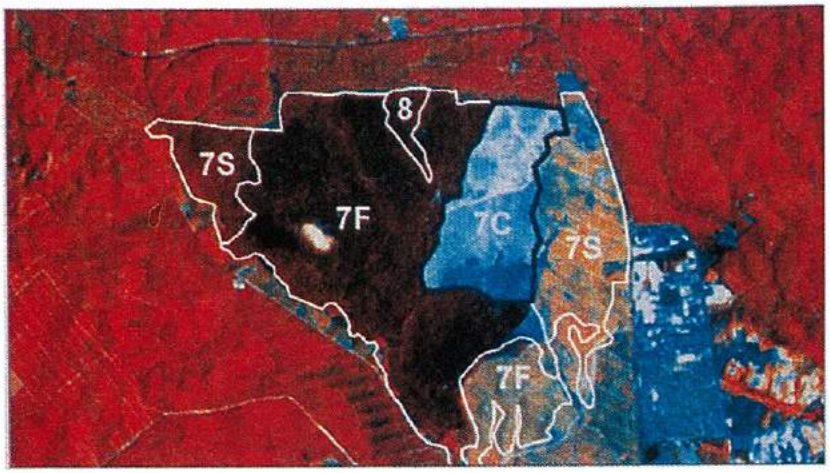
Hasil projek telah menunjukkan bahawa tidak wujud banyak perbezaan pantulan daripada beberapa jenis litupan melainkan tanaman pisang dan kawasan perbandaran yang memberi nilai pantulan yang tinggi berbanding dengan litupan bumi lain. Ini membuktikan bahawa data 'single-date ERS-1' tidak begitu sesuai untuk pemetaan litupan bumi.

The results indicated that there was little differentiation among backscatter returns from land cover types except for banana and urban areas, which registered significantly higher returns. This concludes that single-date ERS-1 data by themselves have limited use in land cover mapping.

Cover Types	Decibels
Matured oil palm	-7.8
Pineapple	-7.0
Banana	-3.9
Forest	-7.0
Rubber	-7.7
Coconut	-5.9
Urban	-1.6
Mangrove	-7.9

JADUAL 2/*TABLE 2*:

Nilai purata "ERS-1 Backscatter" bagi beberapa jenis litupan bumi di Malaysia
Average ERS-1 SAR Backscatter Values of Some Land Cover Types in Malaysia



Landsat TM (RGB-453)-11/03/91 overlaid with 1990 Land Use Vector data

ERS-1 SAR (RGB-04/01/94, 25/01/94 and 18/2/94) indicating change from forest to oil palm

View to forest remnant across newly planted oil palm

LAND USE CODES

30 : Oil Palm
7F : Forest
7s : Scrub
$: Wetland forest
7c : Cleared land

Rajah 2/*Figure 2* : Pengesanan perubahan guna tanah menggunakan data Landsat TM dan ERS-1 SAR.
Land use change detection Landsat TM and ERS-1 SAR Data

Walau bagaimanapun projek ini telah menunjukkan komposit ERS-1 berbagai tarikh adalah sesuai bagi tujuan pengesanan perubahan litupan bumi. Oleh itu, data pelbagai tarikh radar sangat sesuai untuk memperkemaskinikan data-data digital litupan bumi yang telah diperolehi dari data optikal.

Temporal composites of SAR data however have shown promise in land cover change detection and are therefore useful in updating existing digital land use / cover information derived from optical data.

Projek China

Projek ini telah menghasilkan teknologi untuk pemodelan hakisan tanah dengan penggunaan remote sensing dan GIS. Model 'Universal Soil Loss Equation ' telah dapat

China Project

This project has generated a technology for soil erosion risk modeling using the integration of remote sensing and GIS technologies. The Universal Soil Loss Equation has

Rajah 3/*Figure 3* : **Simulasi projek empangan bakun menggunakan (Landsat TM image bands 5, 4, 3 (RGB) 1994)**
Simulation of Bakun Dam using (Landsat TM image bands 5, 4, 3 (RGB) 1994)

diubahsuai mengikut keadaan di Malaysia. Pengubahsuaian model ini di verfikasikan di kawasan empangan hidro-elektrik, Bakun kerana risiko hakisan tanah yang ramalkan dalam model ini tidak banyak berbeza dengan yang diperolehi oleh pakar perunding projek Bakun.

been modified to suit Malaysian conditions. It was tested satisfactorily in the Bakun's Hydro-Electric Dam area as the results obtained did not differ much from those predicted by the consultants of Bakun.

Di bawah projek ini 'Digital Elevation Model ' telah dihasilkan bagi tujuan kajian keluasan dan isipadu kawasan yang dibanjiri air empangan pada paras 223m, 228m,dan 195m seperti yang ditentukan oleh pakar perunding BAKUN.

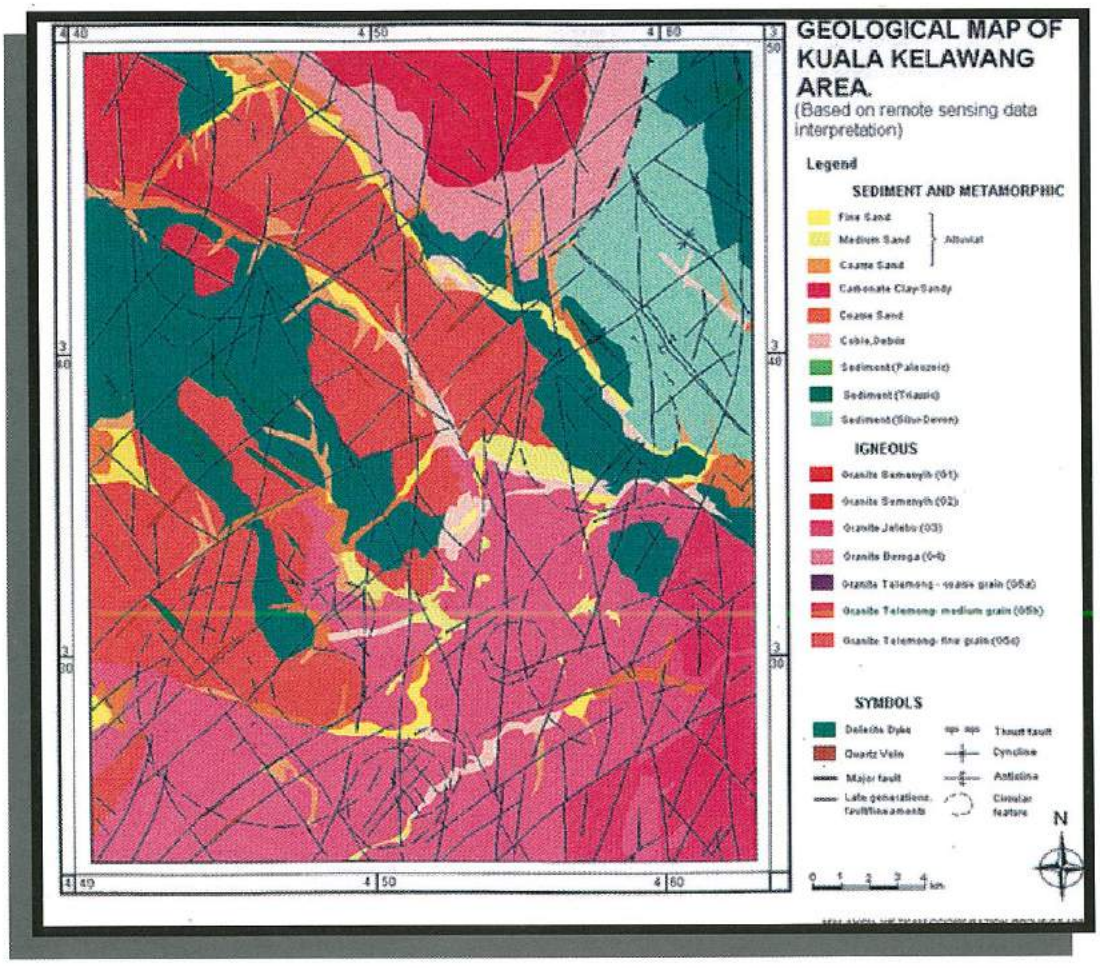
Under the project, a Digital Elevation Model was also generated to study the extent of inundation and the corresponding water volume requirements over the Bakun area based on three flood levels -233m, 228m and 195m as proposed by the Bakun consultants.

Projek Vietnam

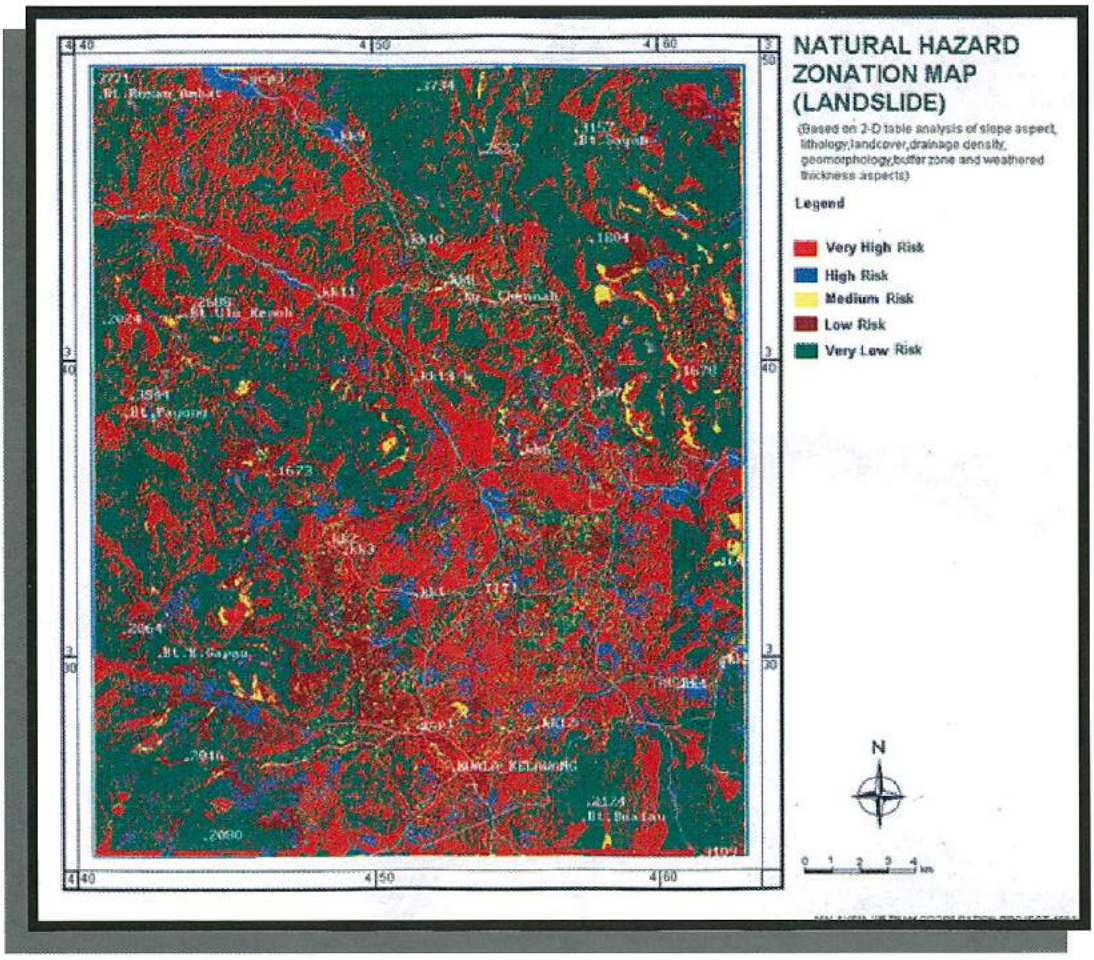
Satu perisian yang mengandungi modul remote sensing dan GIS telah dihasilkan dalam projek ini. Walaupun perisian ini tidak mempunyai keupayaan remote sensing dan GIS yang lengkap, ia telah diuji dan didapati berkesan dalam pemprosesan dan penkelasan imej, dan pertukaran 'vector-raster'.

Vietnam Project

A software encompassing remote sensing and GIS modules was developed. Although it did not comprise the full complement of remote sensing and GIS capabilities, the software was tested satisfactorily for image processing, classification and vector-raster conversion.



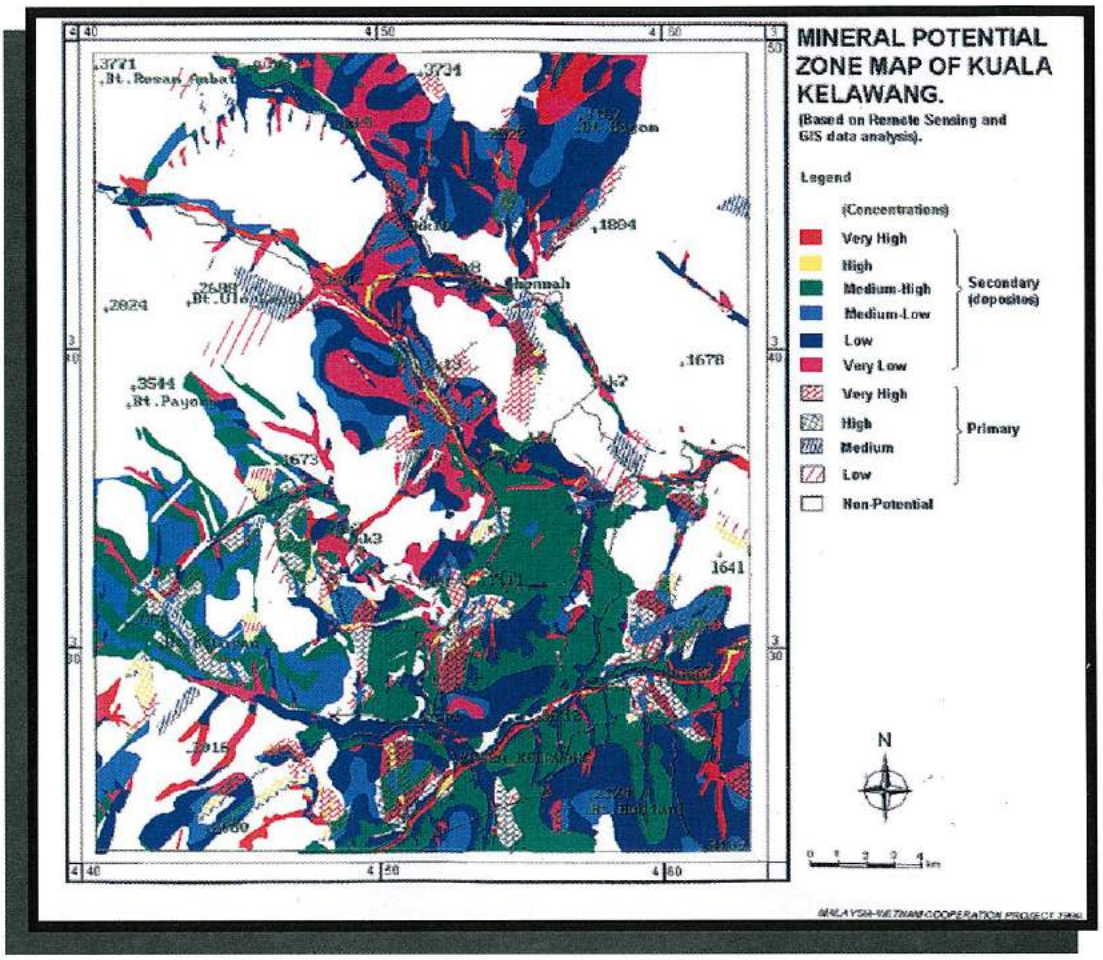
Rajah 3/*Figure 3* : **Peta Geologi Bagi Kawasan Kuala Kelawang (Projek Malaysia-Vietnam)**
***Geological Map* of Kuala Kelawang Area (Malaysia-Vietnam Project).**



Rajah 4/*Figure 4* : **Peta Zon Bencana Alam Semulajadi (Hakisan) Bagi Kawasan Kuala Kelawang (Projek Malaysia-Vietnam)**
***Natural Hazard Zonation Map (Landslide)* of Kuala Kelawang Area (Malaysia-Vietnam Project)**

Projek ini juga menghasilkan gabungan teknologi remote sensing dan GIS untuk aplikasi geologi, potensi mineral dan kestabilan cerun di kawasan Kuala Kelawang, Negeri Sembilan.

The project has also addressed remote sensing - GIS application technologies for geology, mineral potential and slope stability mapping in Kuala Klawang, Negeri Sembilan.



Rajah 5/*Figure 5* : **Peta Zon Berpotensi Mengandungi Mineral Bagi Kawasan Kuala Kelawang (Projek Malaysia-Vietnam)**
Mineral Potential Zone Map of Kuala Kelawang Area (Malaysia-Vietnam Project)

PROJEK- PROJEK IRPA MACRES

Sehingga kini, MACRES telah menjalankan 5 projek IRPA yang memberi fokus kepada pembangunan keupayaan MACRES dalam remote sensing dan GIS untuk aplikasi pengurusan sumber dan alam sekitar di Malaysia. Jadual 3 memberi ringkasan kemajuan pelaksanaan projek-projek ini.

MACRES IRPA PROJECTS

To-date, MACRES has undertaken 5 IRPA projects which focussed on developing indigenous remote sensing and GIS techniques for resource and environmental applications under Malaysian conditions. Table 3 gives a summary of the progress of these projects.

Projek pengezonan agro-ekologi tidak dapat diselesaikan walaupun dijadualkan tamat dalam tahun 1996. Ini adalah kerana penyelidik-penyelidik yang terlibat mengikuti kursus lanjutan. Walau bagaimanapun, kedua-dua projek bertajuk pemetaan geologi dan pengezonan sensitiviti alam sekitar telah diselesaikan.

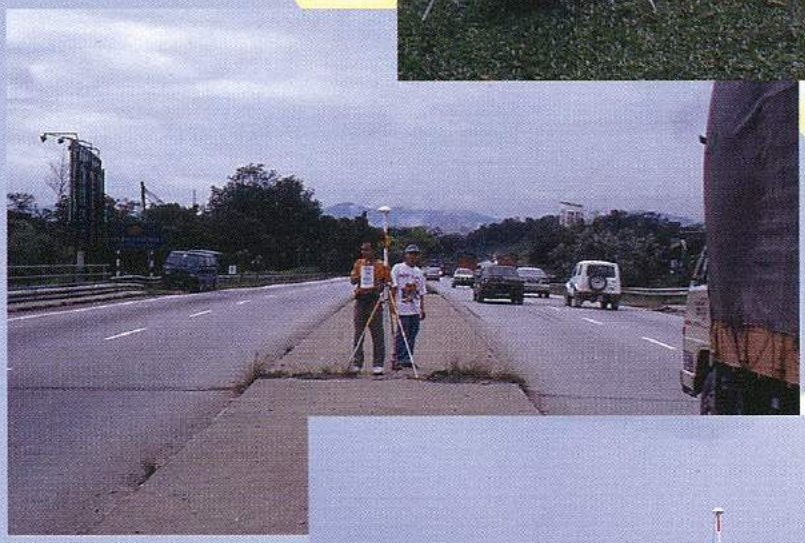
The project on agro-ecological zonation was not able to be completed in 1996 as scheduled because of the responsible officer were undergoing advanced studies. Both the projects on geology mapping and environmental sensitivity zoning were completed in 1996.

Peruntukan IRPA bagi projek "Peta Imej Satelit" yang diterima dalam tahun 1995, adalah memadai bagi perolehan perisian PCI dan mesin pencetak untuk memulakan projek. Dalam tahun 1996, projek ini diteruskan di bawah peruntukan MACRES.

IRPA funding for project Satellite Image Map (SIM), scheduled for completion in 2000, was only given for the year 1995, which was only sufficient to purchase a PCI software and printer to start the project in that year. In 1996, the project was continued using MACRES internal funding.

Projects	1993	1994	1995	1996
Agro-ecological zonation	started	on-going	on-going	on-going
Geological mapping	started	on-going	on-going	completed
Environmental sensitivity zoning	started	on-going	on-going	completed
Satellite image map (SIM)			on-going	on-going
AIRSAR-TOPSAR Programme (12 Application Projects)				started

JADUAL 3/*TABLE 3* : **Ringkasan projek IRPA (1993-1996)**
Summary of IRPA Projects (1993 - 1996)



Kerja lapangan untuk menentukan titik-titik kawalan bumi (Projek Peta Imej Satelit).

Fieldwork to collect ground control points (Satellite Image Map project).

Kerja lapangan telah dijalankan untuk menentukan titik-titik kawalan bumi di negeri-negeri Perak dan Selangor bagi penyediaan Peta Imej Satelit.

Under Satellite Image Map project, fieldwork was conducted to collect relevant ground control points in both Perak and Selangor areas .

MACRES telah juga menerima peruntukan IRPA sebanyak RM459,600 dalam akhir tahun 1996 bagi memulakan program AIRSAR-TOPSAR yang dijadualkan selesai pada tahun 1999. Program ini mengandungi 12 projek aplikasi dan melibatkan jumlah peruntukan RM2.625 juta.

MACRES has also obtained approval of RM459,600 from IRPA in late 1996 for the implementation of the AIRSAR-TOPSAR project. This programme, comprising 12 application projects, is expected to be completed in 1999 under the 7th Malaysian Plan involving a total funding of RM 2.625 million.

Ringkasan Pencapaian projek-projek IRPA

Highlights of the completed IRPA projects

Pemetaan Geologi

Geological Mapping

Maklumat struktur dan litologi telah dikenalpasti berdasarkan analisa sinoptik corak lineamen (positif dan negatif) yang telah dihasilkan melalui "direction filters" di kawasan Timur-Laut Selangor. Bagi tujuan analisa ini, data-data topografi dan geologi sedia ada telah juga digunakan.

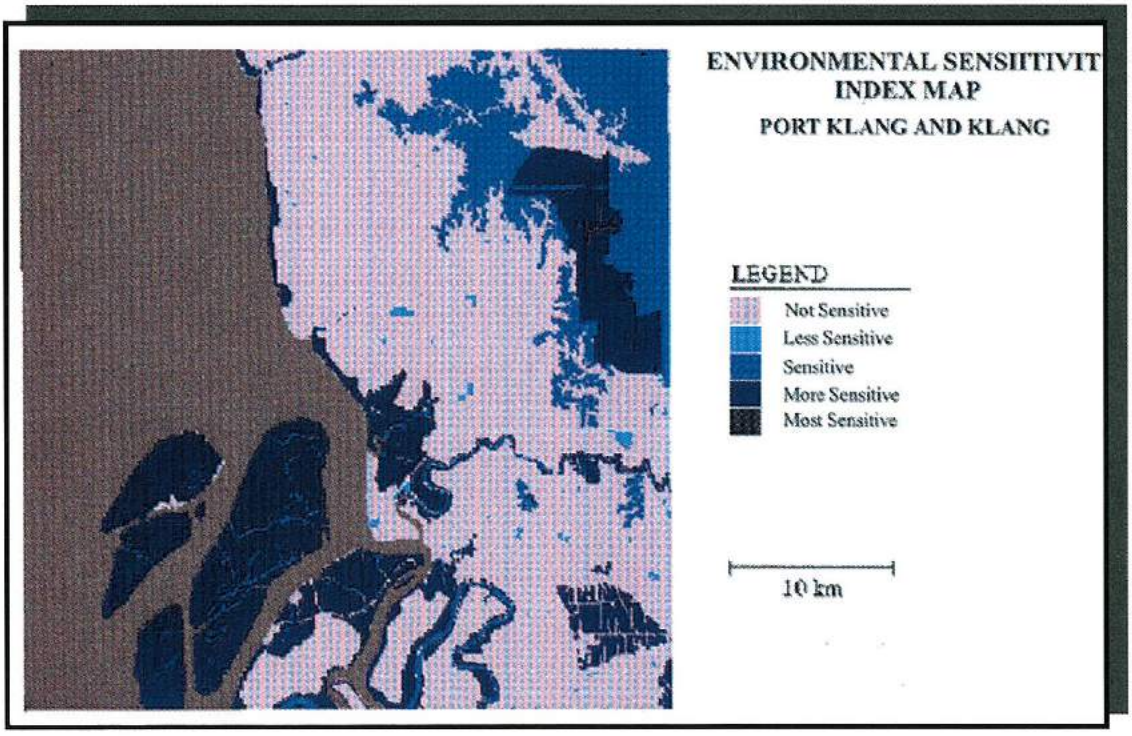
Based on synoptic lineament patterns analysis through special directional filters (positive and negative) available in enhanced Landsat TM data, the lithology-structure information were extracted and mapped in the North-East Selangor area . Existing ancillary topographical and geological information and ground truths data were used to assist in the interpretation.

Pengezonan Sensiviti Alam Sekitar

Peta zon sensitiviti alam sekitar Port Kelang telah dihasilkan berasas lima kriteria - bentuk rupabumi, pelitupan/penggunaan tanah, komuniti tumbuh-tumbuhan, jenis tanah dan kawasan resab tadahan air yang dikenalpasti pada imej satelit.

Environmental Sensitivity Zoning

The environmental sensitivity index map of Port Klang was generated based on five parameters - landform, land cover/use, vegetation community, soil types and water catchment reservations extracted from satellite imagery.



Rajah 6/*Figure 6* : **Peta Indeks Zon Sensitiviti Port Kelang dan Kelang**
Environmental Sensitivity Index Map of Port Klang and Klang

PEMBANGUNAN TENAGA MANUSIA
HUMAN RESOURCE DEVELOPMENT

Program pembangunan tenaga manusia melibatkan kakitangan MACRES mengikuti program latihan dan pemindahan teknologi dalam bidang remote sensing angkasa dan teknologi yang berkaitan.

The human resource development programme entails MACRES personnel to undergo training and technology transfer programme in areas related to space remote sensing and related technologies.

Program pemindahan teknologi menekankan perolehan ilmu pengetahuan dan pengalaman bekerja melalui kursus latihan secara sangkut bagi tujuan meningkatkan pengetahuan dan kemahiran pegawai dalam melaksanakan projek-projek penyelidikan dan pembangunan bidang remote sensing dan teknologi-teknologi yang berkaitan. Program ini juga melibatkan pengambilan pakar-pakar luar negara untuk bekerjasama dengan pegawai MACRES.

Transfer of technology programme emphasizes on acquiring knowledge and practical experience through attachment training to enhance officers knowledge and skills in implementing research and development activities in remote sensing and related technologies. The programme also involved recruitments of foreign experts to work hand in hand with MACRES staff.

Dalam tahun 1996, 16 ceramah teknikal telah dianjurkan oleh MACRES dan dihadiri oleh kakitangan MACRES dan peserta dari agensi-agensi pengguna. Pegawai dan

In 1996, 16 ad-hoc seminars were organised by MACRES which were attended by both MACRES staff and participants from user agencies. MACRES also participated in 39 courses,

Pegawai penyelidik MACRES menghadiri latihan sambil belajar di ACRES, Australia.
Research officer of MACRES attending job training in ACRES, Australia..

kakitangan MACRES juga telah menghadiri 39 seminar dan konferen tempatan dan luar negara sebagai usaha untuk mempertingkatkan pengetahuan dan kemahiran dalam menjalankan pelbagai projek penyelidikan dan pembangunan termasuk tugas-tugas pengurusan dan pentadbiran.

MACRES juga mengadakan kolokium pada setiap hari Sabtu untuk memberi peluang kepada pegawai-pegawainya membentangkan isu-isu spesifik dan semasa untuk. Skop pembentangan juga tidak hanya terhad kepada isi kandungan kursus yang mereka hadiri, tetapi juga mengenai projek penyelidikan dan topik-topik lain yang berkaitan.

seminars and conferences both locally and abroad to enhance their knowledge and skills in undertaking various research and development projects as well as management and administrative assingments.

Colloquia were conducted on every Saturday for officers to present current and specific issues. The scope of presentation is not only on the courses that they have attended, but also on their research projects and other relevant topics. As most of the staff in MACRES are still relatively inexperience, the forum is also intended for improving officers ability in public speaking and making presentation.

Kolokium hari Sabtu di MACRES.
Saturday colloquim at MACRES

Jadual 5/*Table 5* : **Seminar ad-hoc yang diadakan di MACRES dalam tahun 1996.**
Ad-hoc seminars organised by MACRES in 1996.

1. Ceramah 'Image Enhancement' oleh Prof. Li Jing pada 13 Jan. 1996.
2. 'CCRS Human Resource' oleh Mr. Rejean Simart, CCRS pada 18 Jan. 1996.
3. Ceramah 'Enhancement for Visualizing Images and Interactive Data Language' oleh Scott Good Year pada 19 Jan. 1996.
4. Ceramah 'Introduction to Neural Network and Its Applications in Remote Sensing' oleh Prof. Madya Dr. Chuah Hean Teik pada 3 Feb. 1996.
5. Ceramah 'Use of Satellite to Track Elephant Movement' oleh Dr. Michael Stuewe, USA pada 13 Feb. 1996.
6. Ceramah 'Direct Digital Panoramic Optics of the 21st Century - Proven and Available Today-Basic Characteristic' oleh Dr Neil Birch, Nasa, USA pada 14 Mac 1996.
7. Introductory Course on MICSIS oleh Prof. Li Jing pada 2-8 Apr. 1996.
8. Bengkel Applikasi Radarsat pada 13-18 Mei 1996.
9. Kursus 'Microwave Remote Sensing' oleh Prof. Madya Dr. Chuah pada 12 Jul. 1996.
10. Ceramah 'Application in Geology' oleh Dr Nguyen Ngoc Thach, Vietnam pada 13 Jul. 1996.
11. Ceramah 'Improve and Develop Remote Sensing System' oleh Dr. Ky pada 9 Ogos 1996.
12. Ceramah 'The Applications of New Multispectral Tools to Environmental Monitoring in Southeast Asia' oleh Mr. Thomas W. Wagner pada 3 Sept. 1996.
13. Ceramah 'Utility of IRS-1C Satellite Data for Natural Resources Mapping and Management - An Indian Experience oleh Dr R.S. Rao pada 14 Okt. 1996.
14. Ceramah 'RS and GIS Approaches to Slope Stability Studies' oleh Prof. Dr. J.J Nossin, ITC pada 19 Okt. 1996.
15. Kursus GPS pada 9-11 Dis. 1996.
16. Pembentangan Kursus Latihan di INPE oleh wakil dari INPE, Brazil pada 14 Dis. 1996.

Jadual 6/*Table 6* : Kursus/seminar/konferen/bengkel yang telah disertai MACRES di luar negara.
Overseas courses/seminars/conferences/workshops participated by MACRES

PARTICIPANTS	COURSE/SEMINAR /SYMPOSIUM	VENUE	DATE
Dr Kamaruzaman Jusuf En Mansor Abd Rahaman	8th Australian Remote Sensing Conference.	Canberra, Australia	25 - 29 Mar
En Ab Rahim Hj Saleh	Regional Working Group Meeting on Space Sciences &Technology Applications.	Taejon, Korea	30 Apr - 3 May
Cik Faiza Ismail Cik Zubaidah Mansur	Training for Environment & Resourse Planning, Remote Sensing and GIS Technology.	Uni. of York, United Kingdom	13 July-27 Sept
En Nik Nasruddin Mahmood En Ahmad Nadzri Mohamed	9th ASEAN Experts Group on Remote Sensing Meeting.	Jakarta, Indonesia	22 - 24 July
En Nik Nasruddin Mahmood	ASEAN-COST Meeting.	Bandung, Indonesia	25 - 27 July
Pn Zainul Izzah Ahmad Pn Salmah Kassim	'ERS : Application of Microwave RS to Disasters - A Workshop/Seminar'.	AIT, Bangkok, Thailand	19 - 31 Aug
Cik Mardiana Shafiee	UN/ESA Symposium on Space Technology Application for the Benefit of Developing Countries.	Graz, Austria	9 - 12 Sept
En Loh Kok Fook	Workshop on Sustainable Rural Development using Integrated RS & GIS.	Hyderabad, India	17 - 21 Sept
En Nik Nasruddin Mahmood En Soo Soong Kwan	UN/IAF Workshop on Education and Awareness :SpaceTechnology & Applications in the Developing World.	Beijing, China	3 - 6 Oct
En Zuraimi Suleiman En Abd Halim Abd Aziz	Remote Sensing Course.	GDTA, Perancis	7 - 25 Okt
En Aidy Muslim En Ahmad Shukri Hj Haron	'Job Training in Photographic Laboratory Maintenance and Operation'.	ACRES, Australia	14 - 28 Okt
Cik Hasni Halim	'Training Course on the Integrated Use of Remote Sensing and GIS for Landuse Planning'.	Yogyakarta, Indonesia	21 Okt - 20 Dis
En Nik Nasruddin Mahmood	'High-Level Seminar on Integrated Uses of Space Applications for Poverty Alleviation and Rural Development'.	Bangkok, Thailand	21 - 24 Oct
Pn Noraini Surip	International Conference on Geography and the Development of Southeast Asia Region.	Chiangmai, Thailand	21 - 24 Oct
Cik Lee Choo Har	'Seminar on Geo-Information Systems for Coastal Zone Development Planning'.	Colombo, Sri Lanka	4 - 8 Nov
En Nik Nasruddin Mahmood En Darus Ahmad	The 17th Asian Conference on Remote Sensing.	Colombo, Sri Lanka	4 - 8 Nov

Jadual 6/*Table 6* : Kursus/seminar/konferen/bengkel yang telah disertai MACRES di dalam negara.
Local courses/seminars/conferences/workshops participated by MACRES

PARTICIPANTS	COURSE/SEMINAR /SYMPOSIUM	VENUE	DATE
EnNik Nasruddin Mahmood Dr. Yapo Salehuddin	Remote Sensing Seminar	Dewan Saroja, Kelab Golf Perkhidmato\an Awam, M'sia,K.L.	11 Mar
En. Nik Nasruddin Mahmood Cik Mardiana Shafiee En. Darus Ahmad En. Mansor Abd. Rahaman	Seminar on "The management & conservation of highland areas"	Crown Princess Hotel	16 Jan
Pegawai MACRES, agensi pengguna dalam & luar negara	Radarsat application workshop	MACRES training room	13 -18 May
En. Ahmad Nadzri Mahamed Cik Siti Atikah Mohd Hashim	Spatiial modelling using GIS	USM, Pulau Pinang	24 -26 June
En. Khairul Anam Musa Cik Azmah Alli	Satellite data processing & analisis	UPM, Serdang	25 -26 June
En. Darus Ahmad Cik Mardiana Shafiee Pn. Salmah Kassim Cik Nik Mazlina Nik Mustapha Cik Rosliina Samad	Seminar on "Instiitutional strengthening for shoreline management - Jab. Pengaliran & Saliran M'sia	Port Dickson, N. Sembilan	2 July
MACRES research officers	Microwave remote sensing course	MACRES training room	12 July
MACRES research officers & user agencies	Microwave remote sensing for urban applications	MACRES training room	4 -17 Sept.
En. Adnan Ismail	2nd annual GIS Asia Pacific regionwide conference & exhibition	PWTC, K.L.	18 -20 Sept.
En. Azman Ahmad En. Achmad Qamal Siatan	Remote sensing course	UTM, Skudai	1 Oct. - 23 Nov.
MACRES research officers	1st MRSS conference on remote sensing	Crown Princess Hotel, K.L.	25 -27 Nov.
En. Muhammed Kamal Azidy En. Ibrahim Selamat Cik Norizan Abd. Patah	AIFM conference on transboundary pollution & the sustainability of tropical forest fire management	Renaissance Hotel, K.L.	2 - 4 Dec.
MACRES research officers	GPS course	MACRES training room	9 -11 Dec.

PEMBANGUNAN FIZIKAL
PHYSICAL DEVELOPMENT

Pembinaan bangunan baru MACRES, yang bernilai RM28.5 juta, bermula pada bulan Oktober. Oleh kerana kerja-kerja pembinaan masih di peringkat permulaan, kemajuan fizikal yang dicapai sehingga akhir tahun ialah hanya 2%.

The construction of MACRES new building, at a cost of RM28.5 million, commenced in October. As the construction work was still at its preliminary stage, the project recorded a physical progress of only 2% at the end of the year.

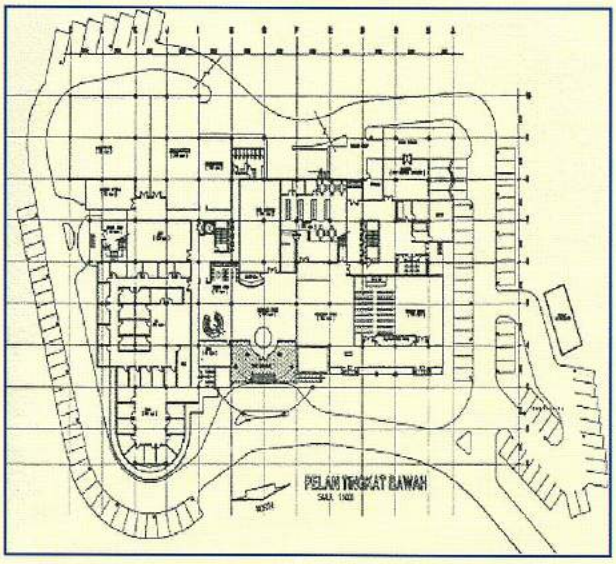
Makmal Kartografi terus memberikan perkhidmatan kartografi dan sokongan kepada aktiviti penyelidikan kepada bahagian-bahagian lain di MACRES. Pelbagai bahan terhad tambahan seperti data topografi berdigit dan gambar udara telah diperolehi pada tahun ini. Jumlah bahan-bahan terhad yang kini berada dalam simpanan makmal ini adalah seperti yang tertera di Jadual 7.

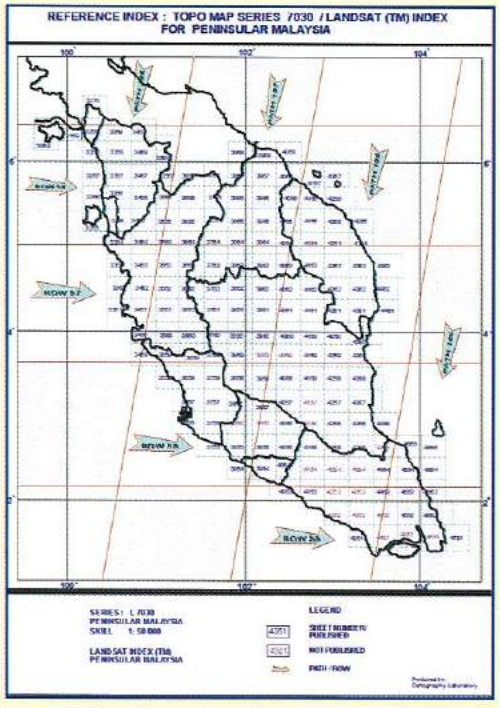
Cartographic laboratory continued to provide cartographic services and assistance in research activities to all divisions in MACRES. Additional restricted materials such as topographic digital data and aerial photographs were procured during the year. The total number of restricted materials currently in the laboratory's archive are shown in Table 7.

Kerja-kerja pembersihan dan penyediaan tapak untuk bangunan baru MACRES
Site clearing and site preparations for MACRES new office building

JADUAL7/TABLE 7 : Jumlah bahan-bahan terhad dalam simpanan makmal kartografi.
Total number of restricted materials archived in cartographic laboratory.

No.	Jenis/Type	Jumlah/Total
1	Peta topografi siri L7030 (Skala 1:50 000) Topographic map L7030 series (Scale 1: 50 000)	398 lembar 398 sheets
2	Peta topografi siri L7010 (Skala 1:63 360) Topographic map L7010 series (Scale 1: 63 360)	136 lembar 136 sheets
3	Peta topografi siri T735 (Skala 1:50 000) Topographic map T735 (Scale 1: 50 000)	337 lembar 337 sheets
4	Data topografi berdigit siri T 735 (Skala 1: 50 000) Digital topographic data T735 series (Scale 1: 50 000)	36 lembar 36 sheets
5	Data topografi berdigit (Skala 1: 25 000) Digital topographic data (Scale 1: 25 000)	23 lembar 23 sheets
6	Gambar udara Aerial photographs	271 set 271 sets





KEMUDAHAN PEMPROSESAN DATA
DATA PROCESSING FACILITIES

Oleh kerana sistem komputer yang digunakan sudah lama dan mudah mengalami kerosakan, MACRES telah memulakan proses bagi perolehan satu sistem komputer baru untuk pemprosesan imej satelit dan analisis data ruang setelah memperolehi kelulusan untuk pembelian pada bulan Ogos 1996.

As the computer system being used is old and subjected to frequent failures, MACRES started acquisition process for a new computer system for satellite image processing and spatial data analysis immediately after getting the necessary approval in August 1996.

Objektif utama perolehan sistem baru ini ialah untuk meningkatkan keupayaan MACRES bagi memenuhi permohonan data remote sensing yang semakin meningkat dari agensi-agensi pengguna, dan menyediakan perkakasan dan perisian yang sesuai bagi memproses dan menganalisa data remote sensing serta GIS bagi tujuan penyelidikan di MACRES. Peningkatan sistem ini bernilai RM1,800,000.

The primary objective of this acquisition is to enhance MACRES capability to meet the increasing requests for satellite data by the user agencies and to provide suitable hardwares and softwares for researches in MACRES. The tendering for the system started in November and a contract was subsequently awarded in December. The total cost for this system is RM1,800,000.

Beberapa mikrokomputer yang mempunyai perisian pemprosesan imej dan GIS telah dikonfigurasikan kepada jaringan bagi tujuan pemindahan data di antara sistem-sistem berkenaan di samping meningkatkan kemudahan pemprosesan secara remote. Pencetak tambahan, "plotter" berwarna serta beberapa jenis alat penstoran data turut juga dibeli. Perisian yang diperolehi dari tender ini termasuklah sistem pemprosesan imej, GIS, sistem pengurusan pangkalan data serta

Several microcomputers running image processing and GIS softwares were linked in a network to allow for automatic data transfer between the two systems, besides to upgrade remote processing capabilities. Additional printers, colour plotter and several types of external storage devices were also incorporated. Softwares acquired through the tender range from image processing system, GIS, database management system and also cartographic

perisian untuk kerja-kerja kartografi. Sistem berasaskan UNIX ini berbentuk "client-server" dalam jaringan tempatan.

software.This new UNIX-based system is configured as a client-server in the local area network.

MACRES juga sedang dilengkapkan dengan kemudahan internet melalui pembelian "server" internet. "Server" ini adalah untuk pembangunan 'homepage' MACRES dan pusat 'on-line' bagi maklumat remote sensing dan teknologi-teknologi yang berkaitan untuk agensi-agensi pengguna dan orang ramai. Projek ini dijangka diteruskan dalam 1997 kerana MACRES juga sedang berusaha untuk menyewa satu talian dari Syarikat Telekom Malaysia. "Server" internet ini yang dilengkapkan dengan perisian yang berkaitan, bernilai RM38,000.

MACRES is also installing its own internet facilities by purchasing an internet server. This electronic communication facility will be used for development of MACRES homepage and a centre for on-line remote sensing and related technologies information for user agencies and the public.This project is expected to continue in 1997 as MACRES is still acquiring a high-speed lease line from Syarikat Telekom Malaysia. The internet server, completed with the relevant software, costed RM38,000.

Beberapa peningkatan kecil pada mikrokomputer yang sediaada juga telah dibuat dalam tahun 1996. Ini termasuk peningkatan memori pada komputer "notebook", perkakasan dan "magneto-optical drive". Sebanyak RM75,000 telah dibelanjakan untuk tujuan ini.

Small upgrading activities for existing microcomputers were also carried out in 1996. These include upgrading of memory for notebook, harddisk and magneto-optical drive. A sum of RM75,000 was spent for this purpose.

KHIDMAT PENGGUNA
USER SERVICES

Dalam memenuhi keperluan pengguna Malaysia di dalam bidang remote sensing, MACRES telah menyediakan dua jenis perkhimatan iaitu perkhidmatan data remote sensing dan khidmat nasihat/maklumat.

Perkhidmatan data

Perkhidmatan data MACRES merangkumi dua aktiviti utama iaitu perolehan data satelit remote sensing daripada pembekal luar negara dan pemprosesan data satelit mengikut keperluan dan spesifikasi pengguna.

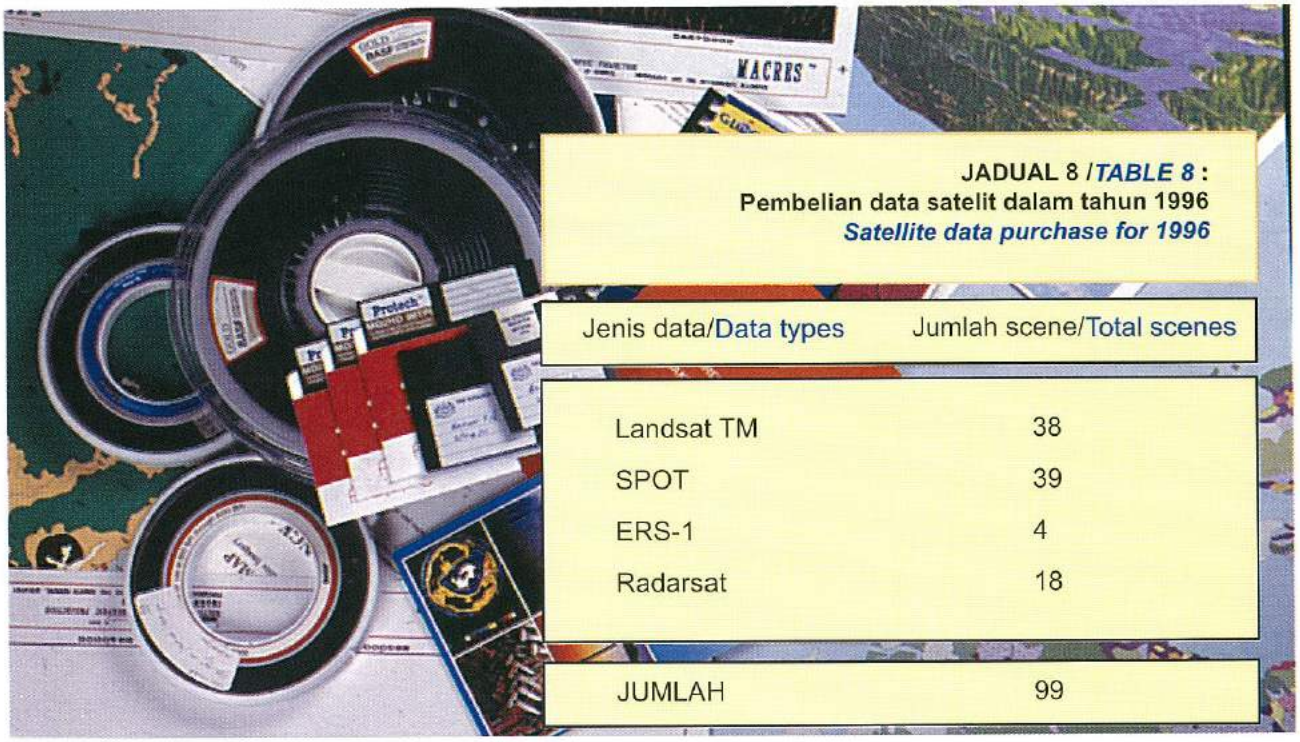
Dalam tahun 1996, MACRES telah membelanjakan RM740,000 untuk perolehan data optikal dan radar iaitu Landsat TM, SPOT, ERS-1 dan Radarsat (JADUAL 8).

In its endeavour to fulfill Malaysian remote sensing user requirements, MACRES continously provides two types of services, namely remote sensing data service and advisory/information service.

Data service

MACRES data service comprises two main activities which are acquisition of remote sensing satellite data from outside sources and the processing of these data according to user needs and specifications.

In 1996, MACRES spent RM740,000 to acquire optical and radar data such as Landsat TM, SPOT, ERS-1 and Radarsat (TABLE 8).



JADUAL 8 /*TABLE 8* :
Pembelian data satelit dalam tahun 1996
Satellite data purchase for 1996

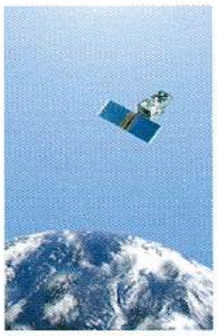
Jenis data/Data types	Jumlah scene/Total scenes
Landsat TM	38
SPOT	39
ERS-1	4
Radarsat	18
JUMLAH	99

Tahun 1996 juga telah menunjukkan peningkatan kesedaran akan potensi penggunaan teknologi remote sensing di Malaysia. Ini dapat dilihat dalam pertambahan jumlah permohonan data oleh pengguna-pengguna untuk digunakan dalam aktiviti-aktiviti pengurusan sumber asli dan alam sekitar serta perancangan strategik. Jadual 8 menunjukkan jumlah data yang dipohon dalam tahun 1996 telah meningkat kepada 119 berbanding hanya 31 dalam tahun 1991. MACRES juga turut menyumbang data secara percuma kepada penuntut universiti untuk menggalak dan memudahkan penyelidikan dalam bidang remote sensing.

The year 1996 had also showed a significant increase in the awareness on the potential use of remote sensing in Malaysia. This is indicated by the increase in the number of requests from users for applications in natural resources and environmental management as well as in the strategic planning. As shown in Table 8, the total number of data requests in 1996 had increased to 119 as compared to 31 in 1991. MACRES had also continued to provide free data to students to support and facilitate research in remote sensing.

JADUAL8/ *TABLE 8* : Bilangan data satelit remote sensing yang dipohon bagi tempoh 1991-1996
Number of remote sensing data requested for the period of 1991-1996

Tahun/Year	1991	1992	1993	1994	1995	1996
Awam/Public	25	34	31	51	35	64
Swasta/Private	6	10	14	16	31	55
JUMLAH/TOTAL	31	44	45	67	66	119



Khidmat Nasihat dan Maklumat

Selaras dengan objektifnya untuk menjadi sebuah pusat rujukan maklumat remote sensing, MACRES sedang merancang untuk menubuhkan sebuah Pusat Maklumat Remote Sensing Nasional. Pada peringkat permulaan, pangkalan data pusat maklumat ini akan terdiri dari tiga komponen

Advisory and infomation services

In line with its objective to be a reference centre for remote sensing information, MACRES is planning to establish a fully on-line National Remote Sensing Information Centre. The database will initially comprise three components of information on user and library services

Lawatan pelajar-pelajar UTM, Johor.
Visit by students from UTM, Johore.

maklumat untuk perkhidmatan pengguna dan perpustakaan serta sebuah 'homepage' yang komprehensif. Sementara itu, MACRES telah menyediakan 'homepage' sementaranya yang memuatkan maklumat mengenai aktiviti-aktiviti MACRES. Pengguna boleh menghubungi homepage ini melalui 'homepage' MASTIC

as well as a comprehensive homepage. In the meantime, MACRES has established its temporary homepage in the internet to provide access for information on MACRES activities which can be accessed through MASTIC-homepage.

.MACRES juga telah memulakan penyediaan versi kedua inventori remote sensing nasional yang akan diedarkan kepada komuniti remote sensing di negara ini. Inventori ini merupakan satu sumber maklumat mengenai kakitangan remote sensing, perkakasan dan perisian yang berkaitan, data dan projek remote sensing yang dilaksanakan oleh pelbagai agensi kerajaan termasuk institusi pengajian tinggi di negara ini.

MACRES had also started preparation for the second edition remote sensing inventory which will be distributed to the remote sensing community in the country. The inventory contains information pertaining to remote sensing personnel, facilities, data and projects in various government agencies including the institutes of higher learning in the country.

Lawatan Y. Bhg. Tan Sri Prof. Omar Abd. Rahman, Penasihat Sains dan Teknologi kepada Perdana Menteri.
A visit by the Science Advisor to the Prime Minister, Y. Bhg. Tan Sri Prof. Omar Abd. Rahman.

MACRES juga menerbitkan 'newsletter', brosur dan 'leaflets' mengenai MACRES dan 'What is Remote Sensing' untuk mendedahkan pengguna kepada teknologi remote sensing.
MACRES telah mengambil bahagian dalam lima pameran di sepanjang tahun 1996 : MINDEX/ INNOTEX, Hari-Q, ITX, pameran sempena konferen MRSS dan pameran sempena konferen AIFM. MACRES telah menerima 332 pelawat yang ingin mendapatkan pelbagai

MACRES also produced a newsletter, brochure and leaflets on "MACRES" and "What is remote sensing" to increase public awareness on the technology.
MACRES participated in five exhibitions during the year: MINDEX/INNOTEX, Q-Day, ITX, MRSS and AIFM conferences.
MACRES also received 332 visitors throughout the year to acquire various information pertaining to both the technologies and the Centre.

Lawatan pelajar-pelajar ITM, Shah Alam.
Visit by students from ITM, Shah Alam.

Lawatan Menteri Sains dan Teknologi, Brazil
A visit by the Minister of Sains and Teknologi of Brazil

AKTIVITI ANTARABANGSA
INTERNATIONAL ACTIVITIES

Malaysia, melalui MACRES, menyertai dan memberi sumbangan aktif dalam usaha-usaha di peringkat antarabangsa bagi meningkat dan memperluaskan penggunaan teknologi angkasa untuk pembangunan mapan. Ini termasuklah penglibatan dalam "Experts Group Meeting on Space Technology Applications for Sustainable Development in Asia and the Pacific" di Thailand, "Consultative Group Meeting of Science Experts Preparatory to the Ministerial Level Conference on Space Applications for Development in Asia and

Malaysia, through MACRES, participates and contributes actively in international efforts in promoting space technologies applications for sustainable development. These include 'Experts Group Meeting on Space Technology Applications for Sustainable Development in Asia and the Pacific' in Thailand; 'Consultative Group Meeting of Science Experts Preparatory to the Ministerial Level Conference on Space Applications for Development in Asia and the Pacific in Bangladesh, 'ASEAN Experts Group on Remote Sensing - ASEAN

Para peserta Mesyuarat ke 9 Asean Expert Group on Remote Sensing yang diadakan pada 22-24 Julai 1996 di Jakarta, Indonesia.
Participants of the Ninth Meeting of the Asean Experts Group on Remote Sensing held on 22-24 July 1996 in Jakarta, Indonesia.

Para peserta mesyuarat 'Intergovernmental Consultative Committee (ICC) of the Regional Space Application Programme in Asia and the Pacific' di Kuala Lumpur pada 3-8 Jun 1996.
Participants of Intergovernmental Consultative Committee (ICC) of the Regional Space Application Programme in Asia and the Pacific held in Kuala Lumpur from 3-8 June 1996.

the Pacific" di Bangladesh, "ASEAN Experts Group on Remote Sensing - ASEAN Committee on Science and Technology" di Brunei dan "Meeting of the Working Group On the Regional Information Service and Education Networks for the Regional Space Application Programme of UN-ESCAP" di Thailand, "Workshop on Earth Science Information Networks', 'UN-ESCAP Regional Meeting on Coastal Zone Management', dan Konferens Remote Sensing Asia di Sri Lanka.

Committee on Science and Technology' in Brunei; 'Meeting of the Working Group on the Regional Information Service and Education Networks for the Regional Space Application Programme of UN-ESCAP' in Thailand; 'Workshop on Earth Science Information Networks', 'UN-ESCAP Regional Meeting on Coastal Zone Management' and '17th. Asian Conference on Remote Sensing' in Sri Lanka.

MACRES juga telah mempengerusi dan menjadi tuan rumah kepada "UN-ESCAP ICC (Intergovernmental Consultative Committee) Session on Regional Remote Sensing Programme" yang diadakan di Kuala Lumpur pada 3-8 June 1996.

MACRES has also chaired and hosted the UN-ESCAP ICC (Intergovernmental Consultative Committee) Session on Regional Space Application Programme held in Kuala Lumpur on the 3-8 June 1996.

Selain itu, MACRES juga memberi sumbangan dalam bentuk persembahan teknikal, dalam lima seminar dan bengkel antarabangsa. Ini termasuklah "GlobeSAR Regional Seminar" di China, "EC-ASEAN ERS-1 Final Results Workshop" di Thailand dan "Seminar on Technology for Updating Map Using Remote Sensing di Jakarta.

In additional, MACRES also contributed in the form of technical presentations, in five international seminars and workshops. These include the GlobeSAR Regional Seminar in China, EC-ASEAN ERS-1 Final Results Workshop in Thailand and Seminar on Technology for Updating Map Using Remote Sensing in Jakarta.

Peserta mesyuarat 'Economy & Social Comission for Asia Pacific (ESCAP) on Coastal Zone Management' yang diadakan pada 4-8 Nov. 1996 di Colombo, Sri Lanka.
Participants of Economy & Social Comission for Asia Pacific (ESCAP) meeting on Coastal Zone Management held on 4-8 Nov. 1996 in Colombo, Sri Lanka.

PERANCANGAN KORPORAT CORPORATE PLANNING

Dalam tahun 1996, usaha memperkukuhkan fungsi-fungsi Bahagian Korporat telah diambil selaras dengan usaha-usaha ke arah pengkorporatan MACRES. Usaha ini telah mengenaalpasti empat seksyen: Perancangan Korporat, Pengurusan Korporat, Pemasaran Korporat dan Pembangunan Korporat.

Perancangan Korporat

Bahagian ini bertanggungjawab untuk merancang dan merumus strategi pengurusan yang berkaitan dengan operasi MACRES. Bahagian Korporat telah mengumpul dasar angkasa pelbagai negara sebagai langkah permulaan untuk merumuskan Dasar Angkasa Malaysia. Selaras dengan keperluan Piawaian ISO 9000, usaha-usaha dokumentasi Manual Prosedur Kerja MACRES telah juga dimulakan. Sebagai langkah bagi pengkorporatan MACRES, beberapa lawatan telah dibuat ke MIMOS, SIRIM, MINT dan Taman Teknologi Malaysia untuk mempelajari pengalaman mereka sebagai agensi Kerajaan yang telah dikorporatkan.

Pengurusan Korporat

Bahagian ini juga melaksanakan tanggungjawab dalam hal-ehwal korporat, memorandum persefahaman/kontrak dan sebagai penyelaras dalam

In 1996, further consolidation efforts to streamline the line functions within the Corporate Division was undertaken and this has given rise to four sections namely: Corporate Planning , Corporate Management, Corporate Marketing, Corporate Resource Development.

Corporate Planning

The Corporate Division is entrusted to plan and formulate operational strategies for MACRES. The Division compiled space policies of several countries as an initial effort to formulate a space policy for Malaysia. In accordance with the requirements of ISO 9000, activities to document Manual Work Procedure for MACRES was also initiated. As for MACRES corporatisation efforts, visits were made to agencies such as MIMOS, SIRIM, MINT and the Malaysian Technological Park to learn on their experiences as corporating government agencies.

Corporate Management

The Division also undertakes responsibilities in corporate affairs, MOUs/ contracts and as coordinator for experts intake. It also responsible for the management of

urusan pengambilan pakar-pakar asing. Di samping itu, Bahagian ini melaksanakan aktiviti-aktiviti pengurusan aset dan maklumat yang berkaitan. Dalam tahun 1996, Bahagian ini telah menguruskan kemudahan logistik untuk dua pakar remote sensing dari China, dua saintis kanan dan lapan saintis muda dari yang terlibat dengan projek kerjasama dengan MACRES. Dokumen-dokumen untuk memperolehi kelulusan Kerajaan bagi penyertaan MACRES dalam beberapa persatuan remote sensing antarabangsa telah juga dikemukakan kepada pihak atasan. Bahagian Korporat telah melibatkan diri secara aktif dalam penilaian contoh kontrak daripada beberapa operator satelit sebagai langkah persediaan bagi MACRES menjadi operator satelit di negara ini.

Corporate Division asset and related information. In 1996, the Division managed the logistic requirement for the attachment of two remote sensing experts from China, and two senior and six junior scientists from Vietnam involved in collaborative projects with MACRES. Documents to obtain Goverment approval for MACRES membership to various international remote sensing societies has also been submitted. In preparing MACRES to qualify as a satellite operator, Corporate Division participated actively in the assessment and review of sample contracts from various satellite operators.

Pemasaran Korporat

Seksyen ini pula bertanggungjawab dalam pembangunan peluang perniagaan untuk MACRES. Pada peringkat permulaan, polisi pemasaran, penetapan harga, garis panduan pengguna dan strategi yang berkaitan telah mula dirumuskan oleh seksyen ini. Seksyen ini akan beroperasi sepenuhnya apabila MACRES dikorporatkan.

Corporate Marketing

This section asssumes the responsibility to develop business prospect for MACRES in which, marketing policy, pricing, user guidelines and related strategy are formulated. This section will be fully operationalised when MACRES is corporatised.

Perbelanjaan MACRES untuk 1996 mencapai 98% bagi peruntukan mengurus dan 98% bagi peruntukan pembangunan. Prestasi perbelanjaaan keseluruhan adalah 98.8%, iaitu bersamaan dengan RM11,343,067. **Jadual 10** menunjukkan ringkasan perbelanjaan MACRES bagi tahun 1996.

MACRES expenditure for the year was 98% for operational budget and 98% for development budget. The overall expenditure is 97.8%, equivalent to RM11,343,067. **Table 10** shows the summary of the MACRES 1996 expenditure.

JADUAL 10 : Peruntukan dan Perbelanjaan MACRES bagi 1996
TABLE 10 MACRES budget and expenditure for 1996

Peruntukan Budget	Lulus Approved	Belanja Spent	% Perbelanjaan % Expenditure
Mengurus Operation	4,842,800	4,732,415	97.72
Pembangunan Development	6,752,000	6,610,653	97.91
Jumlah/Total	11,594,800	11,343,067	97.82

Kutipan hasil MACRES pada tahun 1996 telah merosot sebanyak 58%, iaitu dari RM186,370 pada tahun 1995 kepada hanya RM77,382 dalam tahun 1996. Ini adalah disebabkan pengeluaran output utama MACRES iaitu imej cetak kekal terjejas kerana kerosakan kemudahan komputer dan peralatan makmal fotografi.

Revenue collection for 1996 decreased by 58%, i.e. from RM186.370 in 1995 to RM77,382 in 1996. This was due to the reduction in hardcopy outputs caused by mulfunctioning of related computer facilities and equipment in the photographic laboratory.

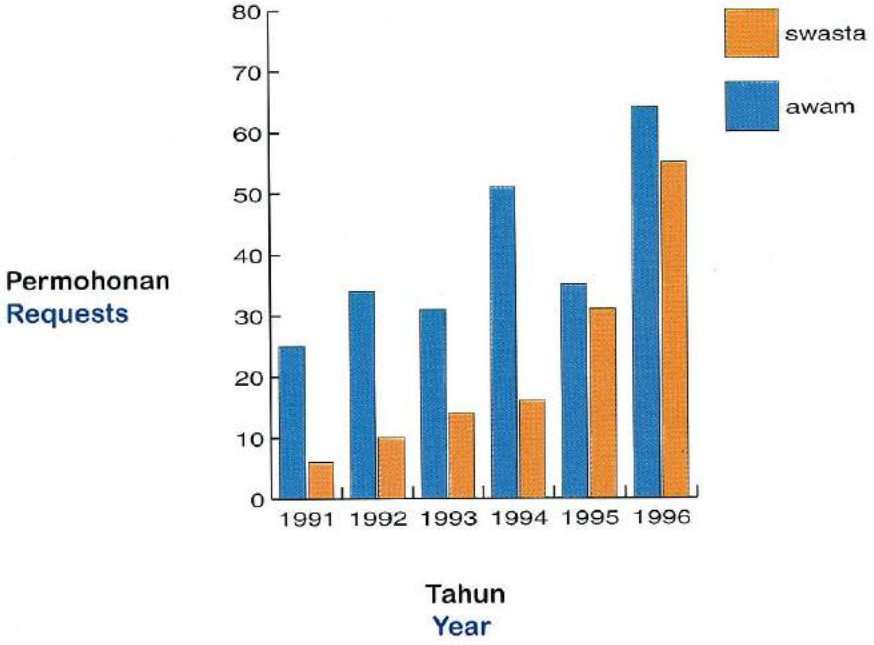
MACRES mendapat kelulusan 137 jawatan seperti yang terkandung dalam Buku Anggaran Belanjawan Mengurus Persekutuan 1996. Sehingga tahun 1996, 90 dari jawatan tersebut atau 66% telah dapat diisi. Pengisian jawatan dalam tahun 1996 ialah kebanyakannnya untuk 12 (50%) jawatan sokongan. Kesukaran mengisi kekosongan adalah disebabkan kurangnya calon berkelayakan dan berpengalaman, terutamanya bagi jawatan Pegawai Penyelidik dan jawatan-jawatan kenaikan pangkat.

MACRES was approved 137 posts as listed in the 1996 Federal Operating Budget Book, 90 posts or 66% of which were filled in 1996. Recruitment in 1996 was mainly for supporting staff , i.e. 12 posts (50%). Difficulties in recruitment was due to the lack of qualified and experienced candidates, especially for research officer and other promotional posts.

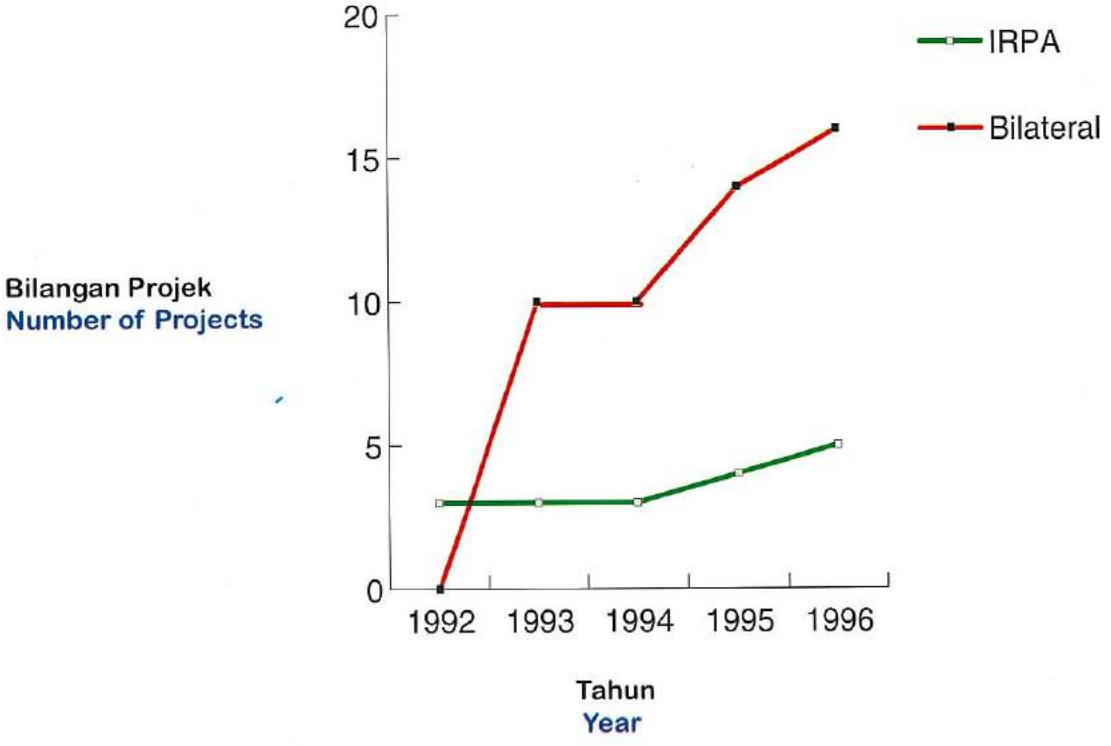
Jadual 11 /Table 11 : Kakitangan MACRES bagi 1995 dan1996
MACRES Personnel in 1995 and 1996

Kumpulan/*Group*	Jawatan/*Post*	1995	1996
Kumpulan pengurusan dan profesional *Management and professional group*	76	55	54
Kumpulan sokongan *Support group*	61	24	36
Jumlah/*Total*	137	79	90

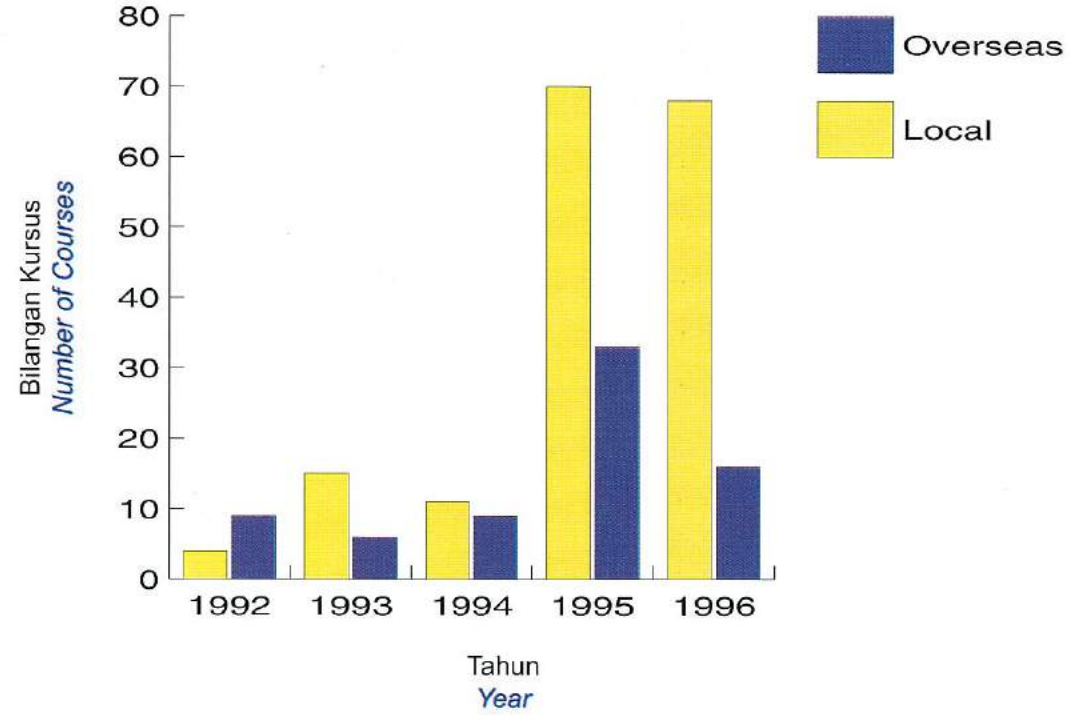
Bilangan data satelit remote sensing yang dipohon bagi tahun 1991-1996
Number of remote sensing satellite data requested for 1991-1996



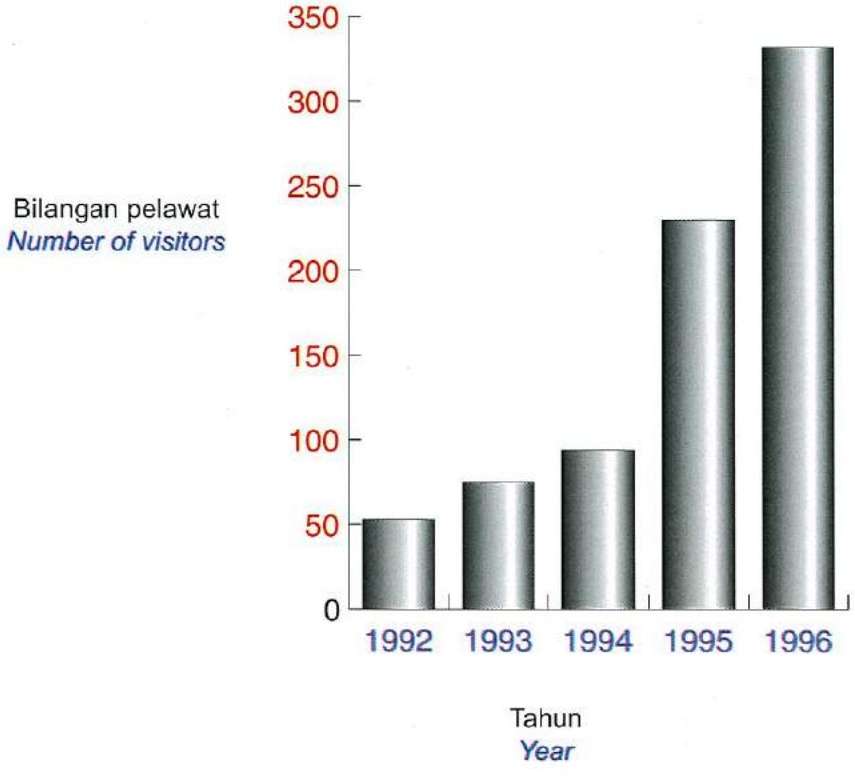
Jumlah projek penyelidikan
Number of Research Projects



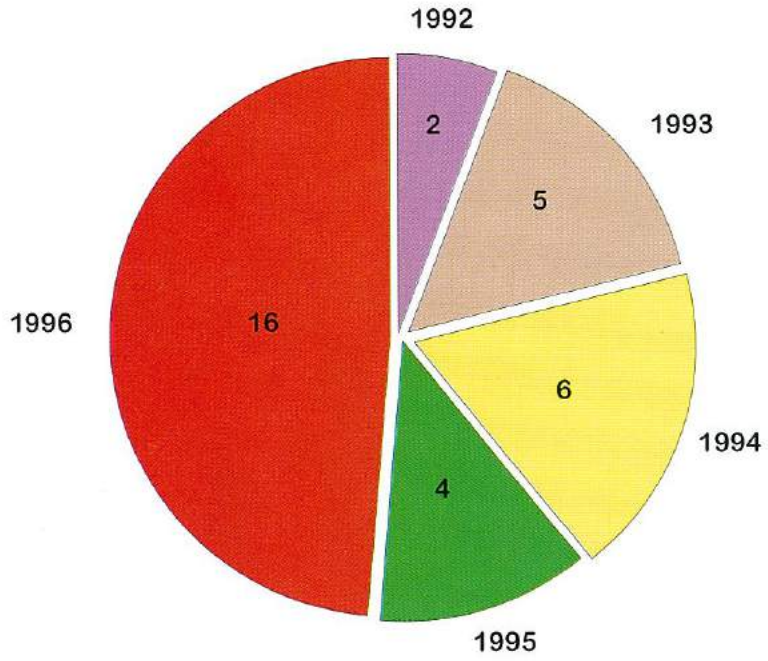
Kursus yang disertai oleh MACRES
Courses attended by MACRES



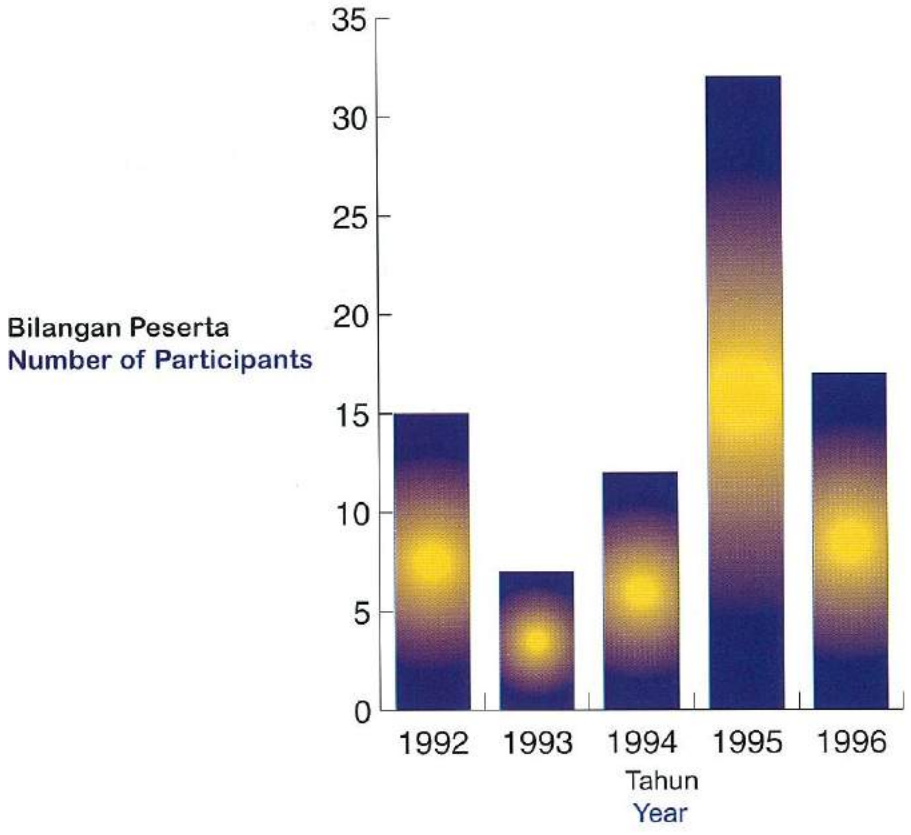
Pelawat MACRES
MACRES's Visitors



Seminar Anjuran MACRES
Seminar organised by MACRES



Jumlah Peserta MACRES di Forum Antarabangsa
MACRES Participants in International Forum



LAMPIRAN
APPENDIX

SENARAI DATA YANG DIPEROLEHI DALAM TAHUN 1996
LIST OF DATA ARCHIEVED IN 1996

(I) **LANDSAT TM**
(Sumber/*Source* : Thailand Remote Sensing Centre, NRCT)

NO.	SCENE ID.	ACQ. DATE	CLOUD COVER
1.	116/57Q2	10.04.96	4014
2.	117/55	07.08.96	0300
3.	117/56	07.08.96	1000
4.	118/56	13.07.96	2002
5.	118/57	13.07.96	0206
6.	119/54	18.07.95	0205
7.	119/58Q3	20.09.95	4203
8.	119/59	20.09.95	0501
9.	120/55	13.10.95	0011
10.	120/58	11.07.96	2212
11.	120/59	13.10.95	0202
12.	121/59Q1	03.08.96	0349
13.	121/59	18.07.96	5100
14.	126/56Q3	21.07.96	6716
15.	126/57Q1	19.06.96	0412
16.	126/57	18.05.96	2202
17.	126/58	18.05.96	0021
18.	126/59	27.01.96	0235
19.	127/56	18.01.96	0300
20.	127/57Q3	07.05.95	1404
21.	127/57	18.01.96	1132
22.	127/58	06.03.96	2120
23.	128/55	14.04.96	4500
24.	128/57Q2	14.04.96	5095

(II) **LANDSAT TM**
(Sumber/*Source* : LAPAN, Indonesia)

NO.	SCENE ID.	ACQ. DATE	CLOUD COVER
1	116/56	12.05.96	OO42
2	116/57	12.05.96	114O
3	117/57	07.08.96	3200
4	117/58	07.08.96	1234
5	118/55	27.06.96	O1O0
6	118/56Q4	29.07.96	O121
7	118/57Q2	29.07.96	1126
8	119/57	02.06.96	O141
9	123/57Q4	01.08.96	OOO1
10	125/59	27.05.96	3446
11	126/57Q4	18.05.96	2111
12	127/56Q2	18.01.96	11
13	127/58	25.05.96	01O1
14	128/57	03.07.96	O2O0

Note : O Ocean
- Indonesian country

(III) **SPOT** - Batch 1
(Sumber/*Source* : Spot Asia)

NO.	SCENE ID.	MODE	ACQ. DATE	CLOUD COVER
1.	269/343	XS	28.03.96	BBBCBB**
2.	296/341	XS	16.05.96	BBBBABBB
3.	301/340	XS	09.04.96	AAAAAAAA
4.	301/341	XS	09.04.96	BBBBBCBC
5.	268/338	XS	17.03.96	BCBCCCCC
6.	294/344	XS	28.04.96	CCCCCCCC
7.	296/339	XS	19.03.96	CBCDBBBC
8.	298/343	XS	23.07.96	AAAAAAAA
9.	301/342	XS	09.04.96	BBABBBBB
10.	298/337	XS	23.07.96	AAAAAAAA
11.	298/338	XS	23.07.96	BABBBBAB
12.	298/340	XS	23.07.96	ADABAAAA
13.	298/341	XS	23.07.96	AAAAABAB
14.	298/342	XS	23.07.96	AAAAAAAB
15.	298/344	XS	23.07.96	ABABACAB
16.	265/338	XS	30.10.96	BBBBBBBB
17.	266/338	P	07.04.96	ABBBABAB
18.	296/340	XS	22.09.96	BBBBBBCB
19.	302/338	XS	29.08.96	EEEDCCCC
20.	288/347	P	11.08.96	BBCBBBBB
21.	266/339 (stereo)	P	13.12.95	-
22.	265/339 (stereo)	P	03.05.96	BABABABA

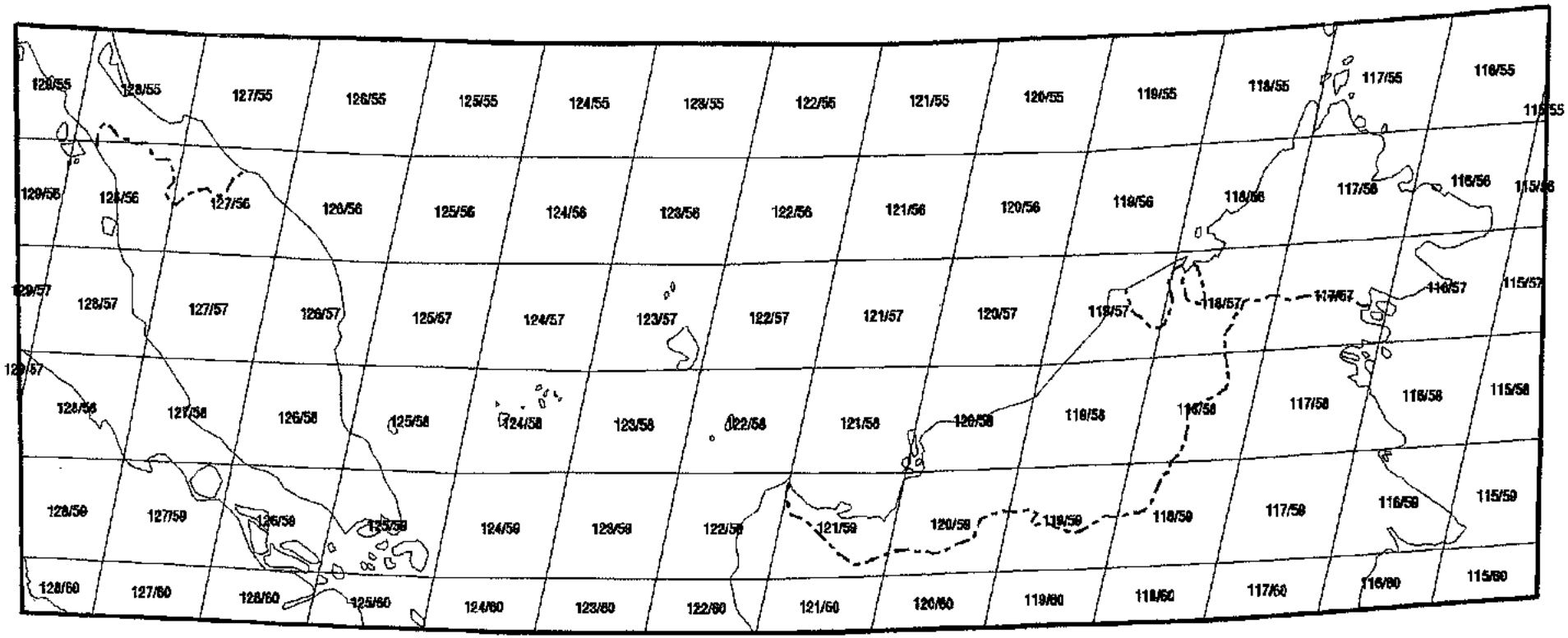
(IV) **SPOT** - Batch 2
(Sumber/*Source* : Spot Asia)

NO.	SCENE ID.	DATE	MODE	CLOUD COVER
1.	269/343	960328	X	BDBCBBBC
3.	270/339	960810	X	BCBBCCBC
2.	270/344	960317	X	BCAB****
4.	288/346	960811	P	CCCCBABB
5.	298/339	960723	X	ABABACAD
6.	300/338	960728	X	BACACACB
7.	300/339	960728	X	BBBCCCBA
8.	300/340	960728	X	BBBBBBBC
9.	301/339	960908	X	BBBBAAAA
10.	302/339	960728	X	AABBBDBD
11.	302/340	960929	X	BBBBCCCC
12.	302/341	960929	X	BBCBBCBB
13.	303/339	960923	P	BCCCBCBC
14.	304/339	960729	X	BBBBBBBB
15.	304/340	960729	X	CBCCBBDC
16.	304/341	960309	X	BABACADA
17.	268/341	960115	X	CBCBCCBC

(V) **RADARSAT**
(Sumber/*Source* : Radarsat International)

SITE	AREA	NO. OF FRAMES	BEAM MODE
# 1	Cameron Highland/Fraser's Hill/ Genting Highland	4	Standard 5 & 7
# 2	Johor State	6	Standard 4
# 3	K.L/ Shah Alam/Sepang/ P.D	2	Standard 3
# 4	MADA Area	1	Standard 2
# 5	Kuching	1	Fine 3
# 6	Kota Kinabalu	1	Fine 2
# 7	Sandakan/ LahadDatu/ Tawau/ Semporna	3	Standard 5

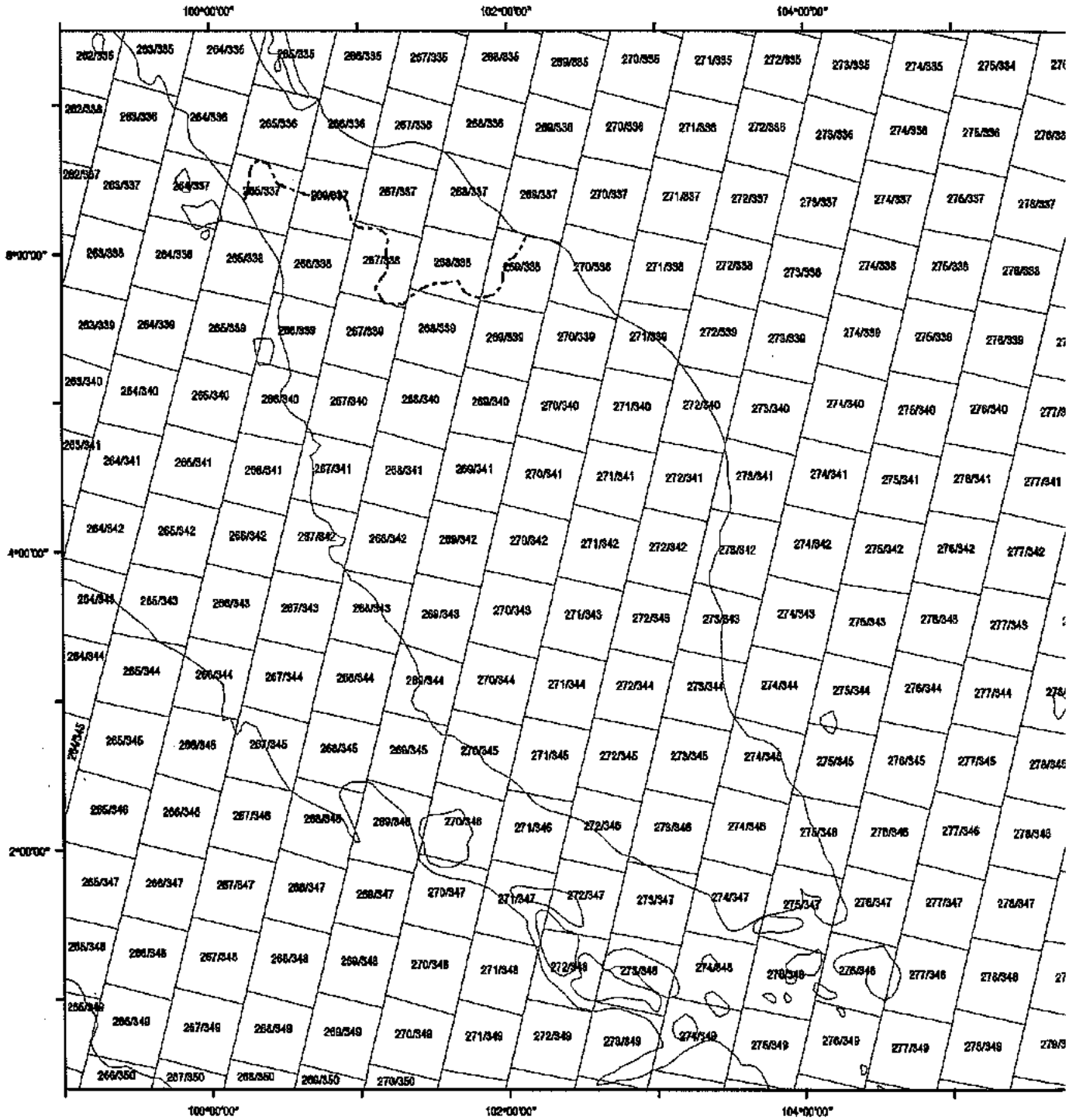
INDEX FOR LANGSAT 4 & 5 COVERAGE OVER MALAYSIA



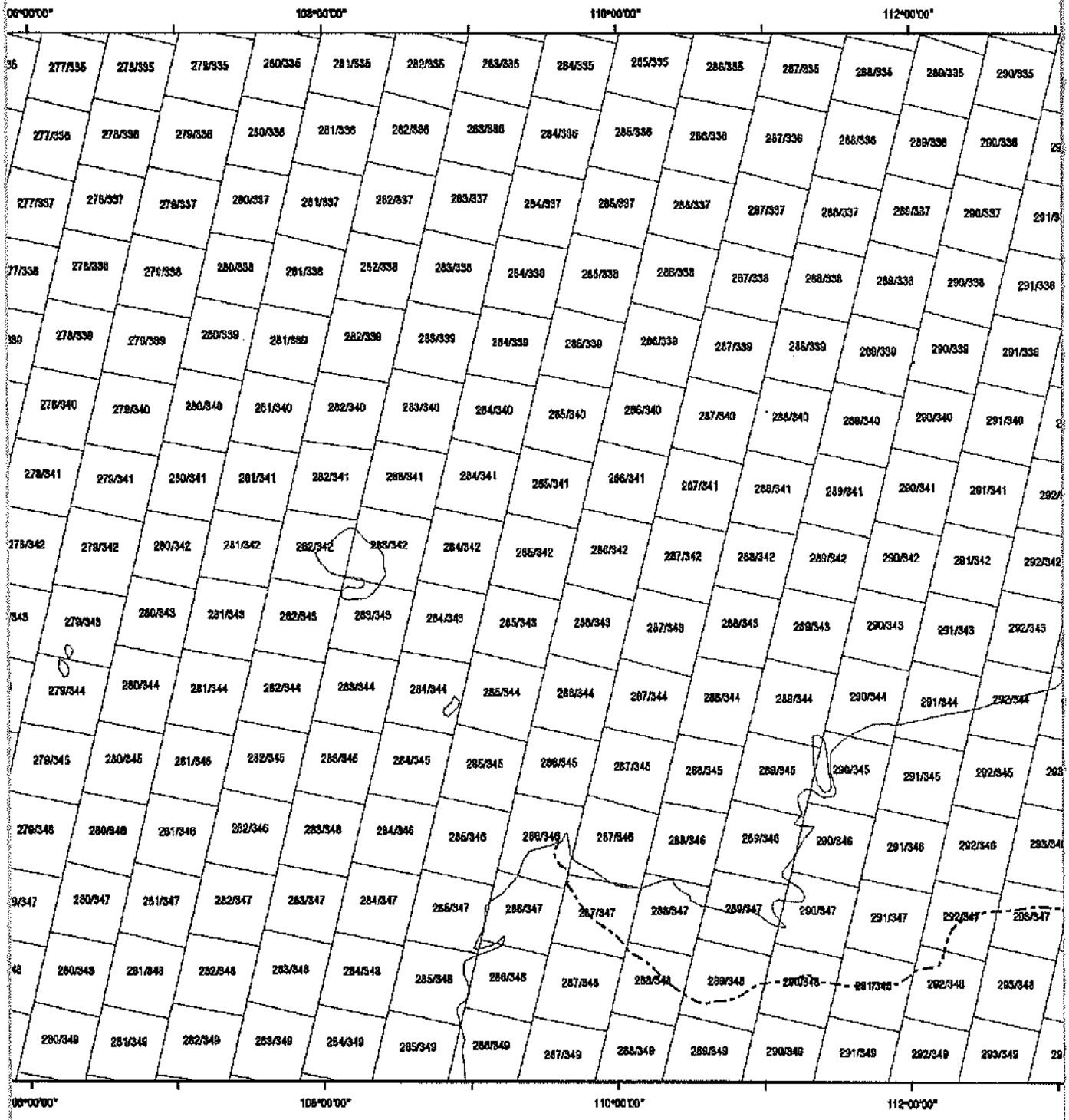
QUADILATERAL FRAMES WITH RESPECT TO WRS (PATH/ROW)

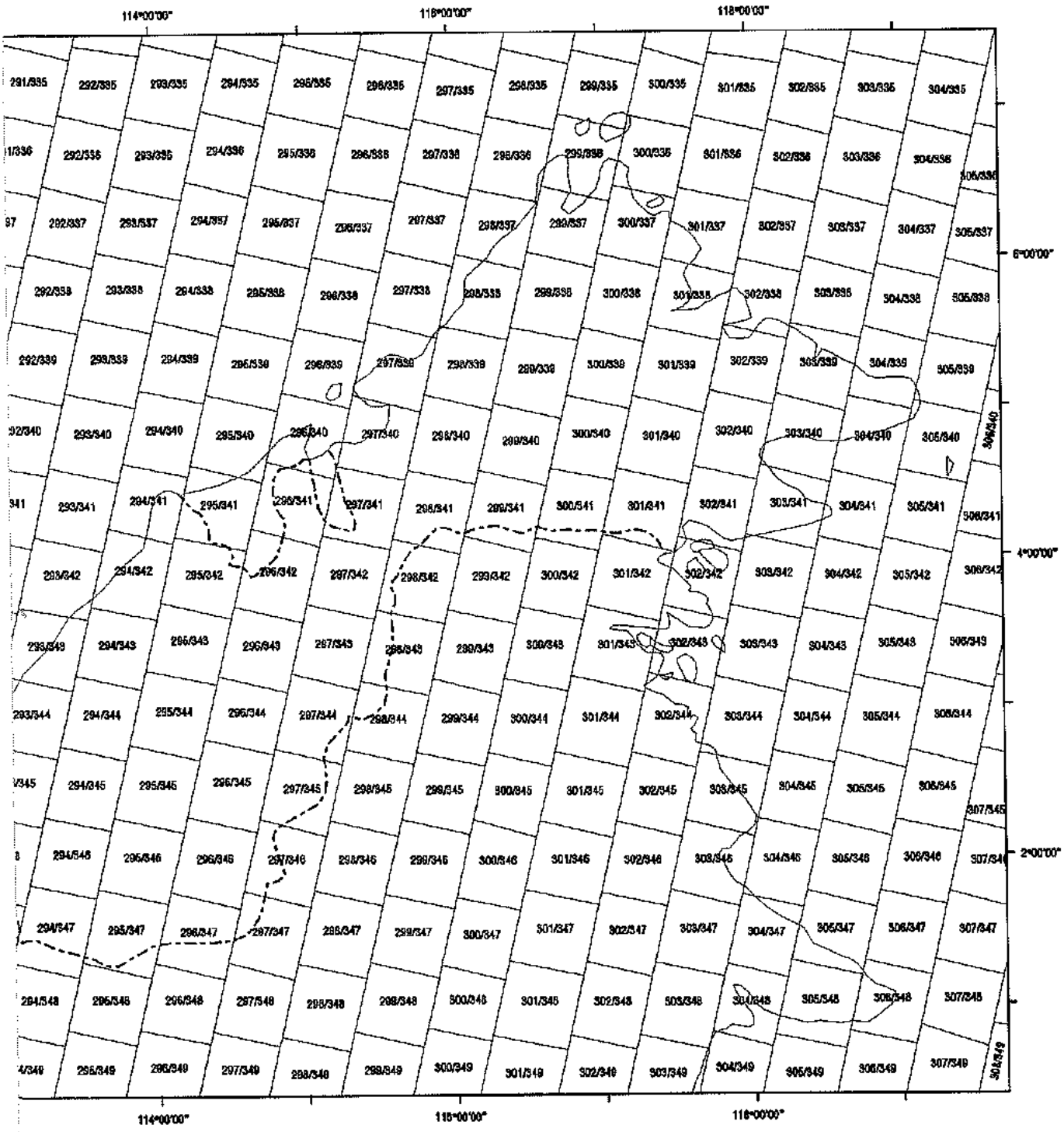
PELAWAT-PELAWAT MACRES
MACRES'S VISITORS

12 Jan	:	25 students from Land Survey Student Society (Persatuan Mahasiswa Ukur Tanah, PEMETA) of the Universiti Teknologi Malaysia.
19 Jan	:	Mr. Scott Goodyear from Research Systems, Inc, Mr. David Froom, Mr. PL Curtin and Mr. PJ Marshall from Raytheon Inc.
20 Jan	:	Mr. A.B. Collins, Mr. S.M. Till and Mr. L. Bronstein from Canadian Centre for Remote Sensing (CCRS).
24 Jan	:	Mr. Megat Sahrir Zainal from AIS Assoc. Town Planner and Dr. Rusell Arthur Smith from Rusell Arthur Smith Assoc.
31 Jan	:	Mr. Jese' Israel Vargas (The Honourable Minister Science Technology, Brazil), Mr. Sergio Barcellos Tellar (The Excellency Ambassador of Brazil), Mr. Lourival Carmo Monaco (President of FINEP), Mr. Carlos A. Pimentel (Head Adviser for International Affair, Ministry of Science and Technology, Brazil).
9 Feb	:	25 students from Remote Sensing Course, Faculty of Fishery and Marine Science, Universiti Pertanian Malaysia.
29 Feb	:	Dr. Shintaw Goto from Kanazawa Inst. of Technology.
11 Mar	:	42 Soil Survey Diploma students from Politeknik Ungku Omar, Ipoh, Perak.
13 Mar	:	Prof. Omar Abd. Rahim (Science Adviser, Prime Minister Dept.) and Mr. Adznir Mokhtar (MIGHT, JPM), Mr. Louis Van Der Merwe (Deputy Director - Development Information System, Gauteng, South Africa) and Mr. Sumali Amat (Deputy Director CSL, MAMPU).
14 Mar	:	Mr. J. Neil Binch (Engineer), Mr. James Allew Wills (President), and Mr. Nic Snare (Director of Sales) from MDA and Mr. T. Wagner from ERIM, USA.
19 Mar	:	10 officers of Royal Signal Regiment attending Telecommunication Engineering Course at Army Institute of Telecommunication and Electronic.
21 Mar	:	Students from Advanced Diploma in Soil Survey, Institut Teknologi MARA, Shah Alam, Selangor.
11 Apr	:	Dr. Nguyen Ngoc Thach and Dr. Nguen Van Ky from National Centre for Natural Science and Technology, Vietnam.
12 Apr	:	Ms Valerie Hood from International Relations, European Space Agency, Paris.
15 Apr	:	Mr. S. Ananda-Ku and Mr. F.A.Sanmi (senior officers from Department of Forestry, Nigeria).


100°00'00"
102°00'00"
104°00'00"
8°00'00"
4°00'00"
2°00'00"

INDEX FOR SPOT - 1 & 2 COVERAGE OVER MALAYSIA




114°00'00"
116°00'00"
118°00'00"
6°00'00"
4°00'00"
2°00'00"

19 Apr	:	Army officers attending Electronic Warfare Course at Army Institute of Telecommunication and Electronic.
24 Apr	:	Mr. S. Marzocchi from Thailand.
9 May	:	Dr. Wolfram Klaar (Germany) from Daimler-Benz Aerospace (Dasa) (M) Sdn. Bhd.
13 May	:	Mr. Firoz Versee (Radarsat International, Vancouver, Canada), Ms. Heather Gordon (Intermap Technologies, Ottawa, Canada), Mr. Bill Reid (Canadian High Commission), Mr. S.K. Srivastava (Scientist from Bangladesh - BCSIR), Dr. Suleman Ashraf (Assoc. Prof), Dr. K. Tenneboon (Research Officer), Mr. A.N.S. Baminikatt - Sri Lanka and Ms. Judy Johnson (Commonwealth Science Council).
25 May	:	Mr. Zaitseu Kulikev, Deputy Director General/Deputy Director Designer of Lavook-Kin Association, Russia and Mr. Alexandre Firioccbine, President Transuital Corporation.
27 May	:	Prof. Silvio Dottorini, Scientific Attache from Embassy of Italy, Canberra, Australia and Mr. Chandra P. Giri, Programme Specialist.
19 June	:	13 officers attending Advanced Intelligence Course at Intelligence Training Centre.
5 Aug	:	45 students of Dilpoma in Town and Regional Planning, Institut Teknologi MARA, Perak.
15 Aug	:	Prof. Korzeak, Prof. of Computer Science, Louis Pasteur University, Strasbourg, France and Dr. Ahmad Tajuddin Khader, Universiti Sains Malaysia.
16 Aug	:	20 officers attending Basic Electronic Warfare Course of Senior Ranks Officers at Army Institute of Telecommunication and Electronic.
20 Aug	:	Mr. Lelio Fellows Filho, Special Adviser to the Ministry of Science and Technology, Brazil, Mr. Ivan Moura Campos (Secretary for Informatics and Automation Policy), Mr. Arthur Joao Catto, (President, Technological Centre for Informatics Foundation), and Mr. Robert Pinto Martims (Coordinator for Informatics and Mocroelectrics) - Ministry for Science and Technology, Brazil, Mr. Marcis N. Barbosa (Director of INPE), Mr. Carlos Santana (Director of Engineering and Space Technology, INPE), Brazil, Mr. Luiza Silva, Head of S&T Sector, Embassy of Brazil, Kuala Lumpur and Ms. Lita Alia Abd. Malek, Assisstant Director (S&T Division), Ministry of Science, Technology and the Environment, Malaysia.
3 Sept	:	23 officers attending Strategic Intelligence Course at Intelligence Training Centre.
4 Sept	:	Mr. Bruce Forster from University of New South Wales, Australia, and Mr. Nguyen Xuan Lang, Mr. Dao Manh Hung, Mr. Nguyen Hong Son, Mr. Dinh Huong Lan, Mr. Nguyen Tuyen Ai, Mr. Doan Ha Phong and Mr. Lai Ann Khoi from Institute of Physics, Vietnam.

5 Sept	:	Mr. Christopher Cottam (R & D General Manager) and Mr. Mike Jones from World Geoscience Corp.
10 Sept	:	R. K. Buner from International Space University.
14 Okt	:	Dr. R. S. Rao from Andhra Pradesh State Remote Sensing Applictions Centre (ASPRAC), India.
18 Okt	:	Mr. P. Liece/S. Oziol, Cultural and Scientific Service, French Embassy, Kuala Lumpur.
31 Okt	:	Mr. Bob Ryesson (VP Terrain Resources Ltd. UN Mission, Canada), Mr. B. L. Deekshatulu (Distinguished Scientist and Director MRSA Hyd), Dr. Salem Mehmud (Chief Scientist and Scientific Advisor) and Dr. He Changchui (Chief Space Technolofy Appliction Section, ESCAP, UN Bangkok) -High Consultant Team from ESCAP.
4 Nov	:	Mr. Hiroyuki Shendo, Mr. Masakayo Soki, Mr. Noboru Yamaguchi (Jepun) and Mr. Chop Ai Kuay (Senior Engineer from Drainaage and Irrigation Dept. of Malaysia) - Pilot research group of "River Basin Information System" project.
6 Nov	:	Mr. Judibel Cadral from UPTA.
9 Nov	:	15 foresters from ASEAN countries attending Technical Working Group Meeting on Aplication of Remote Sensing and GIS in ASEAN Countries, Kuala Lumpur.
10 Nov	:	Mr. Todd Kushner from US Embassy, Kuala Lumpur.
23 Nov	:	Mr. Richard Carrule and Mr. Kenneth Debes from Harris.
25 Nov	:	Mr. Keizo Furukawa from ESTO/Japan.
28 Nov	:	Mr. Patrick Hanmer, Chief Technical Adviser for Malaysia-Europen Union (EU) projects on development of GIS.
11 Dec	:	Mr. Tomohiro Tanamura (JICA/STA/Japan), Mr. Setsuko Negishi (JICA/ RESTEC/Japan), Mr. Mizuho Maeda (JICA/TIC/Japan) and Mr. Kenji Tobita (JICA/Malaysia Office) - Follow-up Team Visit for Group Training Course in Remote Sensing Technology in Japan.
12 Dec	:	Mr. Joe Carlos N. Epiphania and Mr. Marcelo L. O. Souza from UNPE, Brazail and Ms. Luiza Lopes de Silve and Mr. Sangkar Bahadur from Embassy of Brazil, Kuala Lumpur.
19 Dec	:	Dr. Chaowalit Silapathony from National Research Centre of Thailand.

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