

**REQUEST  
FOR TECHNICAL CO-OPERATION  
FROM THE JAPANESE GOVERNMENT**

**PROJECT TYPE TECHNICAL COOPERATION PLAN  
(Duration 5 years)**

**PROJECT  
CENTER FOR DIGITAL PROCESSING OF IMAGES**

**2000**

**MTA**

**MADEN TETKİK ve ARAMA**



## Preface

The Republic of Turkey abounds in various kinds of mineral resources, which has contributed to the development of Turkey as a modern nation. The complicated geological situation, however, has prevented the nation from smooth development of these resources such as base metals, gold, antimony, and chrome. Mineral deposits outcropping on the surface have been already developed, therefore, it is apparent that discovery and development of buried deposits applying high technology for exploration is a pressing need.

On the other hand, sufficient water supply is necessary for production activities of mineral resources; therefore, estimation of available water resources is essential for the future activity. Metal refining processes, specially, release many kinds of gasses and liquids, which are required to monitor to fit environmental protection standards. It is the worldwide trend to protect the natural environment these days, especially it is forced since the Chernobyl accident.

Recently, the potential for oil resources in Turkey is paid attention, and requirement for regional topographic and geological detailed investigations in the potential districts is urged by the public.

One of the high technology measuring this kind of situation is the remote sensing technology, which has been continuously developed for the recent two decades. Platforms on their orbits have been exploring the whole area of the earth-surface, and their diagnostic capability has been improved year by year. Images created by the equipment are utilized for geological investigation, identification of potential areas of natural resources, exploration of water resources, environmental impact surveys etc.

Due to above-mentioned reasons, it is important that MTA of Turkey follows the high-technological development of the remote sensing and digital image processing. Therefore, it is proposed that MTA enrich technical centers of this field with adequate technical staff, and contribute to the implementation of geological exploration and environmental protection activities in private sectors.

### 1. Background and justification of the request for technical cooperation

The Republic of Turkey founded MTA in 1935. Since then, MTA has conducted many systematic geological exploration programs in the whole land of the country. In addition, MTA is conducting some multi-national programs with the coastal countries of the Black Sea in recent years. Under such situations, some projects required detailed geological surveys and environmental impact assessment surveys have been born. One of the techniques being used for those projects is the digital processing of satellite images, and this technique has accumulated many valuable experiences in this field. The scale and volume of the information for processing requires new technical innovations for equipment and facilities in this field, therefore, the Geographic Information System, GIS, which enables integration of geology, structural geology, geochemistry, geophysics, mineralogy, hydraulics, geo-hydrology, environmental factors, and relevant information, is required to be established.

It is heard that Japanese engineers and geologists are the top runners for the development of sensor platforms for remote sensing and identification of the composing materials of the earth surface, and digital processing techniques.

The Earth Remote Sensing Data Analysis Center, ERSDAC, founded by MITI of Japan in 1981, developed the sensor for the resources exploration satellite JERS-1, which was blasted off in 1992. Also ERSDAC recently has developed a new sensor called ASTER jointly with NASA of USA, with co-operation of Japanese and American universities and relevant air-space organizations. ASTER has been introduced in the EOS program, an Earth

Observation System, by NASA. Its operation is scheduled to start in the later period of 1999. This sensor provides high-quality band data of the near infrared rays area, with spatial resolution 15m/14 spectral bands. This means that the sensor has ability to read out detailed geological status and to detect some characteristic clay minerals associated with hydrothermal alterations around ore deposits.

When MTA is equipped by the requested facilities, MTA is able to access such EOS program data.

## **2. Turkey institutions that participate; Remote Sensing Center (RSC) division of MTA**

### **2.1. Remote sensing activities in MTA**

Remote sensing activities in MTA started with the interpretation of 1:1,000,000 scaled Landsat MSS analogous images as a Remote Sensing Unit in 1975.

In 1982, a single user digital image analysis system was set up under a United Nation Development Project. However, this system was not upgraded for a long time and remote sensing studies could not be developed enough in MTA.

In 1994, Remote Sensing Unit was re-organized as Remote Sensing Center (RSC) and a multi-user digital image analysis and geographic information system was established. A new laboratory was donated with new hardware and software at that time. Today, there are 5 workstations (hp-ux) (4 of them old models), 3 personal computers (two of them old models), 2 plotters, 2 printers (old models) and 2 scanners at work. Erdas Imagine 8.3 and Arc/Info 7.1.2 software are being used for the purpose of image analysis and GIS respectively. There is a coordinator of RSC as manager and there are three units in RSC of MTA, called Laboratory, Image Analysis and Geographic Information System Units.

### **2.2. The Projects Completed**

RSC of MTA mainly focused on three types of projects:

#### **2.2.1. Exploration Projects**

RSC of MTA has been carried out some exploration studies to give support to the other branches of MTA.

Since 1995, RSC of MTA has contributed to 27 metallic mineral exploration projects i.e. iron, lead, zinc, copper, gold, chromium, etc., 5 industrial raw material exploration projects i.e. clay, sulphur, marble, kaolin etc., 17 energy raw material exploration projects i.e. lignite, geothermal energy. In the most of these studies, lineaments and partly hydrothermal alteration areas were extracted from satellite data.

#### **2.2.2. Environmental Projects**

RSC of MTA contributed to some environmental projects, using remote sensing and geographic information techniques. RSC of MTA has also carried out some different kinds of short duration remote sensing and GIS projects to the other government and private sectors.

#### **2.2.3. The Projects Planned**

RSC of MTA has prepared two projects to conduct in 2000 by its own researchers in the northwestern part of Turkey:

1. The studying of Kocaeli earthquake that occurred in northwestern part of North Anatolian.

2. Hydrothermal alteration mapping project in semi-covered areas using remote sensing techniques in the northwestern part of Turkey (in Biga Peninsula).
3. In 2000, RSC of MTA will also contribute to the projects proposed by the other departments of MTA about the subjects in mineral, energy raw material explorations and environmental studies.

### 3. Relevance of the project

RSC of MTA was in good condition when it was re-organized in 1994. Remote sensing techniques and integrated technologies, GIS and computer technology has been growing up rapidly since the beginning of 1990s. However, our hardware and software capacities could not be improve sufficiently. So, RSC of MTA needs to improve its hardware and software capacities. Another need is to get new improved satellite data such as ASTER products.

On the other hand, the researchers of the center need to learn remote sensing advanced technologies, digital analysis and GIS subjects. It is also necessary for MTA's technical staff to learn new exploration methods and to apply these new technologies in the exploration and environment projects. Using spectrometer in the field that a new one improved more in MMAJ will be especially useful to determine the alteration minerals which can lead to explore new mineral deposits.

In Turkey, there are not common studies in environmental impacts of open cast or underground mining activities by using GIS and satellite data. Passive and active satellite remote sensing is a useful tool for determination and observation of degradation changes, and improvement of open cast mining areas. It will be also useful to investigate environmental impacts of open cast mining activities by using ASTER and ancillary data in Turkey. Besides, in areas subjected to underground mining activities (such as Zonguldak area in the north west of Turkey), it will be appropriate to use radar data and SAR interferograms for determining deformation areas and velocity of deformation in the course of time.

It is well known that Japan is well qualified in these subjects as we referred above. We also know this fact from our close co-operation with Japan until now. Therefore, due to all these reasons mentioned above, MTA requests a new technical co-operation from The Japanese Government to transfer all these high-technology and its application to Turkey by this projects.

### 4. Objective of the Center

MTA requested to the Department of Mines to submit a promotion and technical assistance program aiming to establish a digital processing division in MTA to the Japanese government through JICA. Multi-spectral images obtained from satellites will be processed in the above-mentioned proposed division. Such technology is rapidly developing and improving in its spatial and spectral resolutions recently, and is utilizing for evaluation of resources potential and environmental monitoring around the world.

MTA intends to perform the co-operation program with JICA as the implementation function during the period from 2000 to 2004 in order to achieve the technical advancement. For this objective, JICA will provide adequate investigation, operation facilities and those equipment, and specialists for the equipment and software to assist to the RSC's staff. JICA will dispatch training specialists for the MTA staff, and manage demonstration projects for mineral exploration and environmental control survey programs. In addition, JICA will arrange some training programs for Turkish specialists in Japan.

The final objectives of the Center's functions are as follows.

1. Utilization of the newest remote-sensing technique to know characteristics of mineral exploration, environmental impacts and controls earth materials.
2. Establishment of various remote sensing related databases such as GIS and spectral data.
3. Training and technical transfer to MTA specialists in the fields of geo-science and earth environment.
4. Application for MTA's domestic and abroad exploration activities.
5. Implementation of seminars and special training courses (such as The JICA-MTA Third Countries Training Project conducted recent years in MTA) for technical staffs in the surrounding countries, and technical co-operation programs.

## 5. Organization and administration of the Center

### 5.1 Organization

The Center will have an administration and will be located in the RSC division of the Geological Research Department of MTA.

### 5.2 Roles in the Center establishment

#### 5.2.1 Direction

The Center establishment will be co-directed by the RSC of the Geological Research Department and JICA.

#### 5.2.2 Administration Committee of the Center

The Administration Committee of the Center will be formed by the head of the Geological Department and RSC managers of MTA. This management committee shall hold meetings at least once every two months.

#### 5.2.3 Japanese-Turkish coordination committee

Independently from the organization of the Center for the good operation of the Project, the Japanese-Turkey Coordination Committee will be formed, which must meet once a year to coordinate the participation of Turkish and Japanese in the Project. This committee will be directed by the Deputy General Director of MTA and one from the Japanese part.

## 6. Budget

### 6.1 Contribution of MTA

MTA will contribute the budget for remodeling of the physical space of MTA for JICA equipment, offices of the experts of the Japanese part and equipment maintenance.

### 6.2 Contribution of JICA

JICA will contribute the budget for all the hardware and software of remote sensing and computer network related equipment, which will be newly introduced for this project. JICA will also contribute for technical experts dispatch from Japan.

## **7. Infrastructure**

The infrastructure that will be used to establish the Center will be that which exists in the RSC of MTA. The equipment donated by JICA will be located in the basement of the RSC, that has an area of 8x22 (176) square meters.

Before using the place it requires repair, painting, lighting, etc. which will be contributed by MTA.

The offices for the Japanese experts of short and long duration will be located in RSC.

## **8. Project Activities**

### **8.1 Teaching**

The laboratories of the Center will be used for teaching in pre and post grade of the geology career. Here will also be a post-degree course for professionals of MTA other enterprises requiring it. The JICA-MTA Third Countries Training Project can also be conducted in this Center

### **8.2 Research**

The researchers of the RSC of MTA shall use the laboratories of the Center.

## **9. Request for Japanese co-operation**

### **9.1 Experts**

#### **9.1.1 Long term experts**

Five long duration experts with following roles are requested.

- Project leader, for the general management of the experts' activities
- Image/GIS digital processing expert
- Computer network expert
- Mining geology expert
- Project coordinator

#### **9.1.2 Short term experts**

It is convenient to have Japanese experts of short duration to help to complement the work of the long duration experts in specific matters.

### **9.2 Equipment**

The requirement of equipment was prepared by MTA.

With the creation of the Center for Digital Processing of Images and Characterization of Geologic Material, it is planned to strengthen geological teaching and investigation in these topics.

The request of equipment is emphasized of:

- a) Implementing a new line of geologic-mining research in the field of Digital Processing of Image and Characterization of Geologic Materials (rocks and minerals).
- b) Implement a post-graduate teaching center and for training of professional geologists of MTA.

#### 9.2.1 Content of the Equipment Requested

- All the hardware related to the remote sensing and GIS methods and computer network such as workstations and PCs, tape readers, CD-RW and DVD devices, color printers and plotters, digitizers, scanners, data storage devices and network devices.
- All the software related to the remote sensing and GIS methods and computer networks.
- Some equipment for the field survey to apply the remote sensing and GIS methods such like 4-wheel drive vehicle, spectroradiometer, GPS equipment and digital cameras.

### 10. Turkish persons from MTA who will participate in the Center

#### 10.1. Managers and Researchers

**Ergün AKAY,**

Head of Remote Sensing Center, Geological Engineer.

**A. Ünal AKMAN PhD,**

GIS Manager and Researcher, Geological Engineer.

**Temel TOPÇU,**

Image Analysis Manager and Researcher, Geological Engineer.

**M. Ender TEKİRLİ,**

Laboratory Manager, Geological Engineer.

**Kenan TÜFEKÇİ PhD,**

Researcher, Geomorphologist.

**Şener TEOMAN MSc,**

Researcher, Geological Engineer.

**Mehmet ŞEN,**

Researcher, Geological Engineer.

**Önder KAYADİBİ MSc,**

Researcher, Geological Engineer.

**M. Kerem AVCI MSc,**

Researcher, Geological Engineer.



## SUMMARY OF TOR (Terms of Reference)

<b>Category</b>	Project-Type Technical Cooperation (X) Aftercare ( ) Dispatch of Experts' Team ( ) Joint Study Project ( )
<b>Project Title</b>	CENTER FOR DIGITAL PROCESSING OF IMAGES CHARACTERIZATION OF GEOLOGICAL MATERIALS
<b>Executing Agency</b>	<b>Name:</b> General Directorate of Mineral Research and Exploration (MTA) <b>Location:</b> Balgat-ANKARA <b>Distance from</b> <b>main city:</b> 6 km
<b>Upper Organization</b>	State Ministry Responsible for Mining
<b>Outline of activities of Executing Agency (Status, authority, contents of activities, budget, etc.)</b>	MTA is a state organization founded by the special law in 1935. According to its foundation law MTA has a judicial personality, it is directed according to the rules of law and trade procedures.
<b>Background of project</b>	Since 1935, MTA carried out many geological exploration programs within Turkey and many multinational programs with foreign countries. However, for the application of some projects, there is a need for new techniques. That's why, MTA requests to carry out a technical cooperation project on Remote Sensing with JICA.
<b>Objectives and brief information on project (as detailed as possible)</b>	The objectives of this projects; a) New techniques on digital image processing, b) New techniques on remote sensing analysis, c) New techniques on GIS about mineral exploration and environmental investigation, d) Re-organized Remote Sensing Center of MTA (RSC of MTA).
<b>Number of the proposed Japanese experts and their fields</b>	a) Image/GIS digital processing expert (1) b) Computer network expert (1) c) Mining geology expert (1)
<b>Number of counter-part trainees and their fields</b>	a) Image/GIS digital processing (7) b) Computer network (1) c) Mining geology (2) d) Environmental investigations (2)

<p><b>Main items of necessary equipments and their amount</b></p>	<p><b>Hardware</b>  EWS-Unix-4  Desktop PC-Windows-10  Scanner-A3-2  Digitizer - AO-2  Plotter-AO-2  Printer-ink Jetcolor-1</p> <p><b>Software</b>  Image processing-EWS-1  GIS-EWS Module-EWS-1  Spectrometer-windows-2  GPS-5  PC module,1,2,3 -2</p>
<p><b>Present situation of facilities of the project</b></p>	<p>Infrastructure exists in RSC of MTA, that has an area of 8x22 (176) square meters. In this area, there are five workstations, two PCs, two plotters, two scanners, two table digitizers, two digital image libraries, one tape unit and twelve tables for technical staff.</p>
<p><b>Names and positions of counter-part organization</b></p>	<p>General Directorate of Mineral Research and Exploration (MTA) – State Company-Exploration, Evaluation. Metal Mining Agency of Japan (MMAJ)</p>
<p><b>Present situation of budget allocation for counter-part organization</b></p>	<p>MTA will contribute the budget for remodelling of physical space of MTA for JICA equipment offices of the experts of the Japanese part and equipment maintenance.</p>
<p><b>Relationship concerned with Japanese cooperation</b></p>	<p>MTA-NED (Nikko Exploration and Development)-ERSDAC (Earth Remote Sensing Data Center) Joint Remote Sensing Project is being carried out.</p>
<p><b>Cooperation with other countries or other organizations</b></p>	<p>-</p>
<p><b>Priority among possible candidate project for FY 1999</b></p>	<p>MTA gives the priority to the project "Center for Digital Processing of Images and Characterization of Geological Materials" among possible candidate projects for FY 1999.</p>