

付 属 資 料

1. 要請書
2. 署名したM/M
3. 面談要旨
4. 収集資料リスト

SUMMARY SHEET FOR COOPERATION PROGRAM

□. BASIC INFORMATION

1. Classification

- a. new assignment
- b. extension
- c. substitution

2. Priority area

Economic and Industrial Growth

3. Development issues

- Make a Master Plan for Promoting the Mining Industry of Cambodia
- Implement a plan for developing mineral resources that will help the mining industry contribute to the economic development of Cambodia.
- Develop and arrange mining-related information
- Promote investment
- Contribute to local community development, infrastructure and poverty reduction by creating of employment.
- Develop capacity transferring technology.

4. Cooperation program

- Review of the Current Program
- Geological and Mineralogical Surveys
- Draft of Investment Promotion Study
- Formulation of Master Plan
- Establishment of a GIS database and website.

□. SUMMARY

1. Present conditions of the concerned sector and existing problems to be tackled (background & justification of the cooperation program)

For much of the 20th century, Cambodia was plagued by turmoil and conflict, which severely impeded the nation's development. Furthermore, until recently there had been little development assistance from advanced countries.

Cambodia has many known mineral resources, but they have remained undeveloped because of past periods of turmoil and conflict. Although the country's situation is stable now, it is very poor, and the Cambodian Government is keenly interested in promoting the mining industry as a core industry that will be able to stimulate economic development and provide a means for acquiring foreign currency, which will help to reduce poverty.

However, the Cambodian Government does not yet have a strategic development plan for promoting the mining industry, although a strategic development plan is urgently needed to help the industry deal with a variety of issues, including policy,

development strategy, the mining taxation system, the introduction of technology and knowledge, training of human resources, and construction of infrastructure, among others. Therefore, Cambodia will need to have a well defined, comprehensive vision for its mining industry.

2. Objectives of the cooperation program

a. Objectives of the cooperation program

- o Formulate a plan for promoting the metal mining industry that will help reduce poverty through the utilization of underground resources
- o Create a road map for the mining industry that will enable it to become a core industry in Cambodia, which has little experience with mining
- o Establish a technical and knowledge base covering the entire spectrum of the mining industry
- o Use this project to transfer technology for capacity development

b. Component projects to be proposed for the Japanese fiscal year 2008 and reasons why they are proposed to achieve the objectives of the cooperation program.

The Study for the Master Plan for Promoting the Mining Industry of Cambodia is proposed for the Japanese fiscal year 2008, meaning that the project can start early in January or February of 2009.

3. Expected outputs

- o Improved geological and mineralization maps (1:1,000,000 scale)
- o Mineralization maps of promising mineral potential areas
- o Geological maps of mineralization areas
- o Geochemical maps
- o GIS database of deposits and mineralization and website for investment promotion
- o Base maps compiled from baseline surveys for environmental management
- o Ore deposit/mineralization model
- o Strategic Development Plan, Action Plan

4. Desired project period (month, year)

Period: 3 years

From Month November Year 2008

To Month October Year 2011

5. Target area

The entire territory of Cambodia, with the exception of areas for which exploration licenses have already been issued for mineral concessions unless requested by the Ministry of Industry, Mines and Energy, and areas where land mines are a hazard.

6. Related cooperation program/project with other donors' assistance (if any)

(None)

□. Plan of operation (including on-going projects)

Japanese ODA Scheme	Project Title	Operational Year (Japanese Fiscal Year)				
		2008	2009	2010	2011	2012
Japanese ODA Development Study Program	Study for the Master Plan for Promoting the Mining Industry of Cambodia	—————				
Related Cooperation Program (with other donors including JBIC)						

APPLICATION FORM FOR JAPAN'S DEVELOPMENT STUDY PROGRAM

Date of entry: Month July year 2007

Applicant: The Government of Cambodia

021-2310E0030

021:カンボジア 鉱物資源マスタープラン調査

開発調査プロジェクト

1. Project digest

(1) Project Title: **Study for the Master Plan for Promoting the Mining Industry of Cambodia**

(2) Location (province/country name): The entire territory of Cambodia, with the exception of areas for which exploration licenses have already been issued for mineral concession unless requested by the Ministry of Industry, Mines and Energy, and areas where land mines are a hazard.

(city/ town/ village name): _____

from the metropolis : about _____ hours' ride/flight

(3) Implementing Agency

Name of the Agency: **General Department of Mineral Resources, Ministry of Industry, Mines and Energy**

Number of Staff of the Agency: 82
(on category basis)

Budget allocated to the Agency: _____

* Attach an organizational chart, and mark the department responsible for the study.

Appendix I- Organizational Chart of the General Department of Mineral Resources, Ministry of Industry, Mines and Energy

(4) Justification of the Project

For much of the 20th century, Cambodia was plagued by turmoil and conflict, which severely impeded the nation's development. At the same time, there had been little development assistance from advanced countries. However, by the end of the 20th century, Cambodia had finally started on the road to recovery in terms of economic conditions, human rights, education, health care, and other issues. With assistance from international organizations and advanced countries, this recovery has been continuing and expanding in the 21st century.

Cambodia has many known mineral resources. However, during the period of turmoil, almost no survey, exploration, or development work was conducted. That began to change in 2000, when the Cambodian government implemented a mining law and began to make mineral resources available to the private sector. Recently, metals such as copper, gold, and zinc have been targeted by foreign investors, who have begun exploration. For example, Japanese companies have started working with Western companies to explore for aluminum.

Cambodia is a poor country, and poverty reduction is a pressing issue there. The Cambodian government is keenly interested in promoting the mining industry as a core industry that will be able to stimulate economic development and provide a means for acquiring foreign currency, which in turn will help to reduce poverty.

The Cambodian government does not yet have a master plan for promoting the mining industry, which is urgently needed to help the industry deal with a variety of issues, including policy, development strategy, the mining taxation system, the introduction of technology and knowledge, training of human resources, construction of infrastructure, among others. Therefore, the Cambodian government will need to have a well-defined, comprehensive vision for its mining industry and wants to promote the mining industry based on a long-term plan.

4.1 Present conditions of the sector:

*Provide detailed information of the project regarding the items below.

1) General geology of Cambodia

The geology of Cambodia is composed primarily of pre-Cambrian massifs, Paleozoic to Cenozoic sedimentary rock, and intrusive rock. Between and surrounding the massifs are folded areas with faults. These geological units occur throughout the orogenic zones of Indochina.

2) Mineral potential

Mineralization has occurred in areas surrounding intrusive rock. Many minerals have already been discovered in Cambodia, such as zinc, chrome, antimony, iron, aluminum, molybdenum, manganese, tungsten, copper, and tin, among others. There are also valuable industrial minerals such as fluorite, graphite and clay, and construction materials. These minerals occur mainly in the northern and southern extremes of the country. Although Cambodia thus has much potential, almost no detailed surveys have been conducted in areas of mineralization.

3) Exploration and development

Despite the high potential, almost no exploration work has been carried out on mineral deposits due to Cambodia's long period of conflict and turmoil. Thus, almost the entire country is still at the grass roots stage. While there are about 50 registered concession areas in the country, there has so far been very little investment in exploration. Compared with neighboring Viet Nam, which has essentially the same geology, Cambodia has high mineral potential.

4) Environment

Except for quarries, there are no active mining operations in Cambodia. Therefore, there is no pollution from mines. However, some companies have started exploration work,

and in a few years Cambodia will have a working mine. To deal with the pollution which may result from future mining activities, the Cambodian government must prepare environmental laws and regulations.

4.2 Sectoral development policy of the national/ local government:

The Cambodian Government has not yet established a mineral policy because of the country's lack of mining history and experience. However, it is of the utmost importance to establish a mineral policy. In 2006, the government began its Third Five-Year Strategy of National Development of the Mineral Sector in an effort to improve geological and mineral information and promote the development of the mining industry in Cambodia. Below is an list of the 6 main goals of this strategy.

- 1) Strengthening the Enforcement of Laws and Agreements on Mineral Exploration and Exploitation;
- 2) Eliminating illegal mining, especially illegal gemstone and gold mining;
- 3) Evaluating Technical Reports on Mineral Exploration in Concession Areas;
- 4) Attracting Private Investment in the Mineral Sector;
- 5) Developing a Sustainable Socio-economic System; and
- 6) Developing Human Resources and Strengthening National Capacity.

4.3 Problems to be solved in the sector:

- o There is little experience with the mining industry, especially management in the mining sector;
- o There are few relevant government staff who have received technical or specialized training;
- o Nationwide, there is a severe lack of geologists, mining engineers, technical staff, etc.;
- o The educational system and the system for nurturing mine workers are unsatisfactory:
 - Geological maps and geological data are still lacking for most of the country;
 - There is a lack of know-how for promoting investment in the mining sector;
- o The Ministry of Industry, Mines and Energy has a web site, but it does not provide sufficient information to attract investment;
- o Laws and regulations governing the mining sector are not systematic or coordinated. There is a need to nurture experts who can develop information systems.

4.4 Outline of the project:

A. Review of the Current Conditions

- o Review and analysis of the existing geological and mineralogical data, evaluation of potential areas;
- o Baseline of the mining industry : Administration of the mining industry, mineral policy, mining law, mining-related tax system, environmental protection

- Economic and social environment : Defining the role of mining in society and the economy, infrastructure and local community development, education and training
 - Mining activities : Introduction of foreign investment, promotion of investment, procedures for investment, procedures for obtaining exploration and mining concessions
 - Linking the mining industry with national development and poverty reduction plans
- B. Geological and Mineralogical Surveys
- Arrangement of information on mineral resources
 - Remote sensing analysis
 - Geological and mineralogical site surveys of potential areas (about 10 sites) : Make geological and ore deposit/mineralization maps
 - Geophysical survey of potential areas
 - Geochemical surveys
 - Analyses of geology and mineralogy, “flesh out” information on mineralization
 - Development of mineralization and ore deposit models for potential areas
 - Baseline model survey
- C. Draft of Investment Promotion Policy
- Create materials such as pamphlets, books, etc., for investment promotion
 - Formulate methods for disclosing information on mineral resources, participate in international seminars
 - Make long-term plans for promoting investment
- D. Formulating the Master Plan
- Create draft of mineral policy document
 - Develop methods for institutional reform and capacity building
 - Formulate strategy and action plan
 - Formulate Master Plan
- E. Establishment of a GIS database and web site
- Arrangement of existing mineralogical and geological data, and new mineralogical and geological data obtained from this study.
 - Design of GIS database
 - Method of disclosing information
 - Web site for providing information
 - Web site design

F. Recommendations

- o Mine management, regulation of mining
- o Introduction of mining technology
- o Mining sector management
- o Environmental management
- o Capacity development

4.5 Purpose (short-term objective) of the project:

- o To formulate a plan for promoting the metal mining industry that will help reduce poverty through the utilization of underground resources
- o To create a road map for the mining industry that will enable it to become a core industry in Cambodia, which has little experience with mining
- o To establish a technical and knowledge base covering the entire spectrum of the mining industry
- o To use this study to transfer technology for capacity development

4.6 Goal (long-term objective) of the project:

- o The goal of this is to formulate and implement a Master Plan for the metal mining industry which would be linked with local community development, poverty reduction, creation of employment, and so on.

4.7 Prospective beneficiaries:

- o Prospective beneficiaries include domestic and foreign investors; workers involved with exploration, development and mining operations; local governments; related businesses (transport, energy, machinery, etc.), and local residents.

4.8 The Project's priority in National Development Plan/ Public Investment Program:

There is much potential for mineral resources in Cambodia, and many areas of mineralization are known to exist. However, while some exploration work is being carried out, almost no underground resources are currently being utilized. The mining industry can become a major contributor to the economy (macro-economy, local community development, creation of employment, etc.). For this reason, mining projects are being given top priority. Mining has already been making significant contributions to the economy in neighboring Viet Nam, and it has started to make a contribution to the economy in neighboring Lao PDR. Because Cambodia has essentially the same geological setting and mineralogy as these neighbors, it likely has much potential for mineral resources development.

(5) Desirable or Schedule time of the commencement of the Project:

Month November year 2008

This would be a three-year project, commencing in November 2008 and lasting through October 2011.

(6) Expected funding sources and/or assistance (including external origin) for the Project:

The Japanese government is being asked to support this study as a JICA Development Study. However, the Cambodian government should also provide some financial support, in the form of wages or salaries for Cambodian staff involved with this study. After the study has ended, the Cambodian government would like to receive support from JBIC and other international organizations in the form of an assistance loan.

(7) Other relevant Projects, if any.

No similar projects

(8) Any relevant information of the project from gender perspective

None

2. Terms of Reference of the proposed Study

*Please fill in (1) and (2) below, paying particular attention to the following items.

- In the case that a study was conducted in the same field in the past, describe the grounds for requesting this study, the present status of the previous project, and the situation regarding the technology transfer.
- Whether there are existing studies regarding this requested study or not.
- Coordination with other economic and technical cooperation from Japan

(1) Necessity/ Justification of the Study:

The Cambodian economy has long been stagnant due in large part to internal conflict. Recently, the country has been receiving much support for economic revitalization from Japan and other donor countries, and international organizations. However, it will have to become economically independent at some point in the future.

The Cambodian government would like to develop the country's economy by utilizing its mostly untapped resource potential. A master plan for promoting the mining industry would be essential for establishing a mining basement and promoting mining investment through the arrangement and disclosure of relevant information. Unfortunately, the government suffers from shortages of experts, technology, knowledge, and funding for formulating a Master Plan. The "Study for the Master Plan", undertaken with technical assistance from the Japanese government, would be instrumental for promoting the mining industry in Cambodia. It would also be important for establishing an industrial foundation for the Cambodian economy.

(2) Necessity/ Justification of the Japanese Technical Cooperation:

Japan has long been involved with the mining industry, and has accumulated a wealth of technologies, techniques, knowledge and know-how for exploration, underground mining, open-pit mining, and processing. In short, Japan has a "full set" of

technologies covering the entire spectrum of the mining industry, from exploration to smelting. Furthermore, it is a leader in modern operations management, environmental protection, and information technology (IT), and has a wealth of highly skilled workers and specialists in the mining sector.

In Cambodia, there are still very few operating mines, and none of them are metal mines. The country is lacking systematic knowledge and technology. Therefore, the "Study for the Master Plan" is essential as the first step for promoting the mining industry and for undertaking basic surveys for future mining projects. The Cambodian government is asking the Japanese government to help it implement this project by helping to provide systematic knowledge and technology.

(3) Objectives of the Study:

- * Describe the objectives of the study in detail. Also, indicate who will benefit from the study in as much detail as possible, including gender disaggregated data and describe the beneficial effect in terms of quantity. Enter in a concise manner the goal expected to be achieved in the future by conducting the study.
- * When the requested study is the only input scheme there is in the cooperation program, enter the same sentences given in the "Objective of the Cooperation Program" in the summary sheet. When more than one scheme is requested including this one, describe clearly the role of the requested study.
- o Develop ore and mineralization models for identifying promising areas.
- o Establish a GIS database and web site.
- o Carry out baseline surveys to create a base map for environmental management.
- o Write a draft mineral policy.
- o Make pamphlets and other materials for investment promotion.
- o Formulate a 10-year Master Plan for promoting the mining industry and a 5-year Action Plan.

(4) Area to be covered by the Study

- * Enter the name of the target area for the study and attach a rough map to the documents submitted. The attached map should be at a scale that clearly shows the project site. Mark the site in red.

The entire territory of Cambodia, with the exception of areas for which exploration licenses have already been issued for mineral concession unless requested by the Ministry of Industry, Mines and Energy, and areas where land mines are a hazard.

(5) Scope of the Study

- *Enter in a concise manner using an itemized statement.

A. Thorough understanding of current conditions

- o Review and analysis of existing documents and data, evaluate potential
- o Basement of the mining industry, socio-economic environment, role of the mining industry in society and the economy
- o Mining activity

- B. Site geological and mineralogical surveys
 - o Remote sensing analysis
 - o Geological and mineralogical surveys
 - o Geochemical surveys
 - o Establishment of ore and mineralogical models
 - o Baseline surveys
- C. Establishment of GIS database and web site
- D. Investment promotion
- E. Formulation of Master Plan (analysis of current conditions and projections for the future)
- F. Sponsorship of domestic seminars
Participation in international seminars in Canada, Tokyo, and elsewhere

(6) Study Schedule

* Enter the time/period of the study

Period: 3 years

	Year 1	Year 2	Year 3
A. Analysis and understanding of current conditions	—————		
B. Site geological and mineralogical surveys	—————	—————	
C. Establishment of GIS database and web site	—————	—————	—————
D. Investment promotion	—————		—————
E. Formulation of Master Plan		—————	—————
F. Seminars	H	H	H H H

(7) Expected Major Outputs of the Study:

- o Improved geological and mineralization maps (1:1,000,000 scale)
- o Mineralization maps of promising mineral potential areas
- o Geological maps of mineralization areas
- o Geochemical maps

- GIS database of deposits and mineralization and web site for investment promotion
- Base map derived compiled from baseline surveys for environmental management
- Ore deposit/mineralization model
- Master Plan, Action Plan
- Recommendations for the mining industry and environmental protection

(8) Possibility to be implemented/ Expected funding resources:

JICA

(9) Environmental and Social Considerations:

* Please fill in the attached screening format

(10) Request of the Study to other donor agency, if any.

* Please pay particular attention to the following items:

- Whether you have requested the same study to other donors or not.
- Whether any other donor has already started a similar study in the target area or not.
- Presence/absence of cooperation results or plans by third-countries or international agencies for similar projects.
- In the case that a study was conducted in the same field in the past, describe the grounds for requesting this study, the present status of the previous project, and the situation regarding the technology transfer.
- Whether there are existing studies regarding this requested study or not. (Enter the time/period, content and concerned agencies of the existing studies.)

None

(11) Other relevant information:

* Enter relevant information other than that described above, if any

N/A

3. Facilities and Information for the Study

(1) Assignment of counterpart personnel of the implementing agency for the Study: (number, academic background, etc.

Geologist (2), GIS (2), Mineral Policy/ Mining Law (1)

(2) Available data, information, documents, maps, etc. related to the Study: (please attach the list)

- Appendix II – A brief report on general geology of Cambodia, attached with a Geological map in scale 1:1,000,000, covering the entire country
- Appendix III – A brief report on metallic mineral resources in Cambodia, attached with a Mineral Resources map in scale of 1:1,000,000
- Appendix IV – Mineral Concession map in scale of 1:1,000,000

(3) Information on the security conditions in the Study Area

No security problems

4. Global Issues (Environment, Gender, Poverty, etc.)

- (1) Environment components (such as pollution control, water supply, sewage, environmental management, forestry, biodiversity) of the Project, if any.

Sustainable economic development, environmental protection, local/regional economic development, poverty reduction, and creation of employment.

- (2) Anticipated Environmental Impacts (both natural and social) by the Project, if any.

None

However, the potential environmental impacts of future mining activities will be examined using the baseline survey.

- (3) Women as main beneficiaries or not

As a result of this study, it is expected that many employment opportunities will be created for women

- (4) Project components which require special consideration for women (such as gender difference, women specific role, women's participation), if any

N/A

- (5) Anticipated impacts on women caused by the Project, if any

N/A

- (6) Poverty alleviation components of the Projects, if any

Reduce poverty in rural areas and alleviate income disparities with urban areas.

- (7) Any Constraints against the low - income people caused by the Project

N/A

5. Undertaking of (the recipient country)

- (1) In order to facilitate the smooth conduct of the Study, the Government of (the recipient country) shall take necessary measures:

- 1) To secure the safety of the Team,
- 2) To permit the members of the Team to enter, leave and sojourn in (the recipient country) for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;
- 3) To exempt the members of the Team from taxes, duties and any other charges on equipment, machinery and other material brought into (the recipient country) for the implementation of the Study;
- 4) To exempt the members of the Team from income tax and charges of any kind

imposed on or in connection with any emoluments or allowances paid to the members of the team for their services in connection with the implementation of the Study;

- 5) To provide necessary facilities to the Team for the remittance as well as utilization of the funds introduced into (the recipient country) from Japan in connection with the implementation of the Study;
- (2) The Government of (the recipient country) shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the team.
- (3) (The implementing Agency) shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
- (4) (The implementing agency) shall, at its own expense, provide the Team with the following, in cooperation with other organizations concerned:
 - 1) Security-related information on as well as measures to ensure the safety of the Team;
 - 2) Information on as well as support in obtaining medical service;
 - 3) Available data and information related to the Study;
 - 4) Counterpart personnel;
 - 5) Suitable office space with necessary office equipment and furniture;
 - 6) Credentials or identification cards; and
 - 7) Vehicles with drivers.
- (5) (The implementing Agency) will, as the executing agency of the project, take responsibilities that may arise from the products of the Study.

*In the case that Detail Design Study is requested.

The Government of (the recipient country) assures that the matters referred to in this form will be ensured for the smooth conduct of the Development Study by the Japanese Study Team.

Signed:  **VICTOR JONA**

Title: Deputy Director General

On behalf of the Government of Cambodia / NIME'S Focal

Date: Aug. 15, 2007 Point

Screening Format

Question 1 Outline of the project

1-1 Does the project come under following sectors?

Yes No

If yes, please mark corresponding items.

- Mining development
- Industrial development*
- Thermal power (including geothermal power)
- Hydropower, dams and reservoirs
- River/erosion control
- Power transmission and distribution lines
- Roads, railways and bridges*
- Airports
- Ports and harbors
- Water supply, sewage and waste treatment
- Waste management and disposal
- Agriculture involving large-scale land-clearing or irrigation
- Forestry
- Fishery
- Tourism

*Note: Ripple effects

1-2 Does the project include the following items?

Yes No

If yes, please mark following items.

- Involuntary resettlement (scale: households persons)
- Groundwater pumping (scale: m³/year)
- Land reclamation, land development and land-clearing (scale: hectors)
- Logging (scale: hectors)

1-3 Did the proponent consider alternatives before request?

Yes: Please describe outline of the alternatives

()

No

1-4 Did the proponent have meetings with the related stakeholders before request?

Yes No

If yes, please mark the corresponding stakeholders.

- Administrative body
- Local residents
- NGO
- Others: Japanese investors and other investors

Question 2

Is the project a new one or an on-going one? In the case of an on-going one, have you received strong complaints etc. from local residents?

- New On-going (there are complaints) On-going (there are no complaints)
- Others

Question 3 Name of the law or guidelines:

Is Environmental Impact Assessment (EIA) including Initial Environmental Examination (IEE) required for the project according to a law or guidelines in the host country?

- Yes No

If yes, please mark the corresponding items.

- Required only IEE (Implemented, on going, planning)
- Required both IEE and EIA (Implemented, on going, planning)
- Required only EIA (Implemented, on going, planning)
- Others:

Question 4

In case of that EIA was taken steps, was EIA approved by relevant laws in the host country? If yes, please mark date of approval and the competent authority.

<input type="checkbox"/> Approved: without a supplementary condition	<input type="checkbox"/> Approved: with a supplementary condition	<input type="checkbox"/> Under appraisal
----------------------------------------------------------------------	-------------------------------------------------------------------	------------------------------------------

(Date of approval: Competent authority:)

- Not yet started an appraisal process
- Others: ()

Question 5

If a certificate regarding the environment and society other than EIA is required, please indicate the title of certificate.

- Already certified Required a certificate but not yet done
- Title of the certificate :()
- Not required
- Others

Question 6

Are following areas located inside or around the project site?

- Yes
- No
- Not identified

If yes, please mark corresponding items.

- National parks, protected areas designated by the government (coast line, wetlands, reserved area for ethnic or indigenous people, cultural heritage) and areas being considered for national parks or protected areas
- Virgin forests, tropical forests
- Ecological important habitat areas (coral reef, mangrove wetland, tidal flats)
- Habitat of valuable species protected by domestic laws or international treaties
- Likely salts cumulus or soil erosion areas on a massive scale
- Remarkable desertification trend areas
- Archaeological, historical or cultural valuable areas
- Living areas of ethnic, indigenous people or nomads who have a traditional lifestyle, or special socially valuable area

Question 7

Does the project have adverse impacts on the environment and local communities?

- Yes
- No
- Not identified

Reason:

Question 8

Please mark related environmental and social impacts, and describe their outlines.

- | | |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Air pollution | <input type="checkbox"/> Social institutions such as social infrastructure and local decision-making institutions |
| <input type="checkbox"/> Water pollution | <input type="checkbox"/> Existing social infrastructures and services |
| <input type="checkbox"/> Soil pollution | <input type="checkbox"/> The poor, indigenous or ethnic people |
| <input type="checkbox"/> Waste | <input type="checkbox"/> Maldistribution of benefit and damage |
| <input type="checkbox"/> Noise and vibration | <input type="checkbox"/> Local conflict of interests |
| <input type="checkbox"/> Ground subsidence | <input type="checkbox"/> Gender |
| <input type="checkbox"/> Offensive odors | <input type="checkbox"/> Children's rights |
| <input type="checkbox"/> Geographical features | <input type="checkbox"/> Cultural heritage |
| <input type="checkbox"/> Bottom sediment | <input type="checkbox"/> Infectious diseases such as HIV/AIDS etc. |
| <input type="checkbox"/> Biota and ecosystem | <input type="checkbox"/> Others () |
| <input type="checkbox"/> Water usage | |
| <input type="checkbox"/> Accidents | |
| <input type="checkbox"/> Global warming | |
| <input type="checkbox"/> Involuntary resettlement | |

- Local economy such as employment and livelihood etc.
- Land use and utilization of local resources

Outline of related impacts:

Note: The purpose of this project is merely to formulate a Master Plan, so there will be no damage as a result. The Master Plan will be used to assess damage that might result from future mining activities.

Question 9

Information disclosure and meetings with stakeholders

9-1 If the environmental and social considerations are required, does the proponent agree on information disclosure and meetings with stakeholders in accordance with JICA Guidelines for Environmental and Social Considerations?

- Yes No

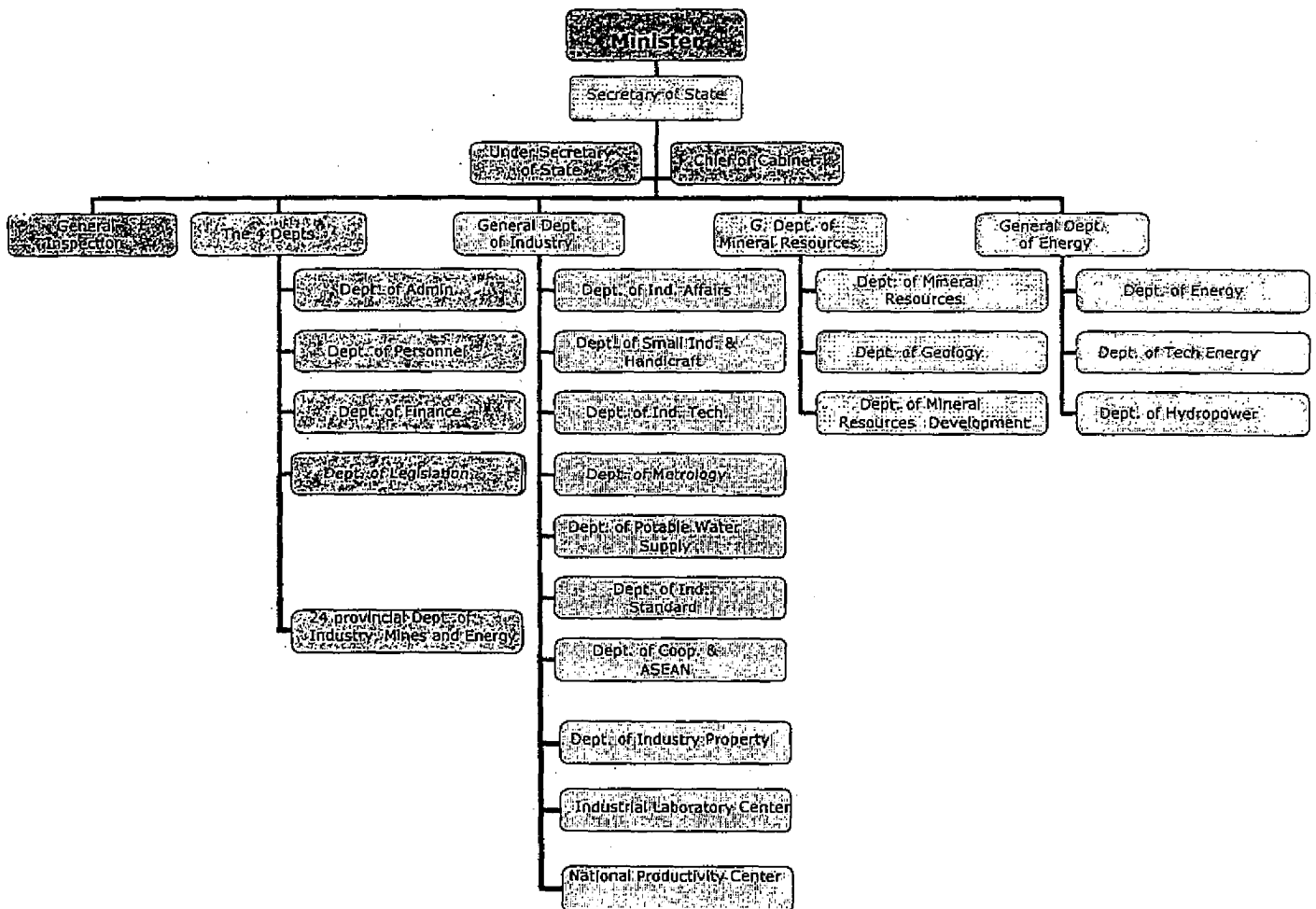
9-2 If no, please describe reasons below.

APPENDIX – I

THE ORGANIZATIONAL CHART OF THE MINISTRY OF INDUSTRY, MINES AND ENERGY (MIME) OF CAMBODIA

The Ministry of Industry, Mines and Energy governs three General Departments, one Inspection General, 4 Central Departments in the Ministry and 24 provincial departments under Sub-Decree No 35 ANK/BK, dated 26 April 1999.

The organizational chart of MIME is shown below:



The functions of the General Department of Mineral Resources are as follow:

- Conduct and manage geology and mineral development;
- Disseminate and enhance geological and mineral information;
- Encourage the exploration for, potential evaluation and exploitation of mineral resources, gravel, sand and construction materials; and
- Conduct and enhance geological survey.

The General Department of Mineral Resources managed three departments:

1. Department of Mineral Resources;
2. Department of Geology; and
3. Department of Mineral Resources Development.

1.- Department of Mineral Resources – manages five offices:

1. Office of Metallic Minerals;
2. Office of Non-Metallic Minerals
3. Office of Gemstone and Coal;
4. Office of Construction Materials; and
5. Office of Mining Inspection

The Department of Mineral Resources is responsible for

- Set up methodologies and measures to manage the exploration for, evaluation, mining, processing, extraction, marketing of mineral resources, gravel, sand, and construction materials for both techniques, economy, labor safety and environment in the effective way for techniques, economy, labor safety and environment;
- Implement laws, sub-decrees, orders and regulations related to the exploration for and exploitation of mineral resources, gravel, sand, and construction materials throughout the country;
- Explore for and evaluate mineral resources, gravel, sand and construction materials to calculate their quantify and quality;
- Study and comment on investment projects of exploration for and exploitation of mineral resources, gravel, sand and construction materials;
- Manage, control and monitor the implementation of laws, sub-decree, orders, regulations and mineral agreements.

2.- Department of Geology – manages four offices:

1. Office of Geological Survey;
2. Office of Mapping;
3. Office of Environmental Geology; and
4. Laboratory

The Department of Geology is responsible for

- Implement laws, sub-decrees, regulations related to geological survey;
- Conduct the study of geology, geo-physic and geo-chemistry;
- Evaluate mineral resources and mapping;
- Collect, manage, use, exchange and sell geological data and information except data and information related to petroleum and gas;

- Analyze geological data in areas of Cambodia and areas of mineral potential for the benefits of geological or tourism and urbanization and construction fields;
- Disseminate and enhance geological survey and mapping related to geology and mineral resources;
- Collect information of geology to be applied in urbanization and environmental and natural hazard protection.

3.- Department of Mineral Resources Development – manages three offices:

1. Office of Mineral Resources Development;
2. Office of Cooperation; and
3. Office of Data Management.

The Department of Mineral Resources Development is responsible for

- Formulate national policies to develop geology and mineral resources in Cambodia;
- Draft laws, sub-decree, orders, regulations and mineral investment agreements related to geological survey, exploration for and exploitation of mineral resources, gravel, sand, and construction materials.
- Set up projects and cooperate with ministries concerned and international community to collect and analyze data of mineral resources, gravel, sand and construction materials both inside and outside the country, and set up a data center of mineral resources, gravel, sand, and construction materials.
- Cooperate with concerned departments to organize training courses for human resources development for skills of geology and mining.

APPENDIX II

A BRIEF REPORT ON GENERAL GEOLOGY OF CAMBODIA

Cambodia is geologically composed of three different structures: the Triassic and Liassic "Ancient Gulf" covering a large area in the East, the Jurassic-Cretaceous continental sandstone forming important highlands in the West and, between them, the Quaternary basin which occupy the whole central plain of the country.

Geological studies show series of sedimentary formation extending from Precambrian at the bottom through to Cretaceous at the top; the whole are affected by successive tectonic and volcanic activities.

A - Stratigraphy

A.1 - Precambrian (PR)

Precambrian rocks are composed of high grade metamorphic and form basement complex in northeastern and northwestern Cambodia. In northeasternmost of Ratanakiri Province, outcrops of high grade metamorphic rock which are the prolongation of the Kontum Massif and called as "Bokham series ", consist of gneisses, micashists, peroxenite and amphibolite . In northwestern Cambodia, the Pailin crystalline assigned as Precambrian by its similarity to the series of Bokham, has a comparatively small exposure and is composed of granitic and dioritic gneisses, amplibolites and basic gneisses which grade into gabbroic rocks. Leucocratic orthogneiss that form the core of Preah massif in southwestern Cambodia is also ascribed to be of Precambrian age by its position comparing to the overlying Cambrian quartzites.

A.2 - Cambrian - Silurian

The only one fossil proving the existence of the Cambrian in Cambodia is a Cambrian trilobite found in the sandy shale by F. Bonelli in northern Cambodia. Several small outcrops of metamorphic rocks in the Kratie-Snoul- Memot area which were ascribed by some authors as Cambrian, are, in most case, Triassic microbreccias metamorphosed by subjacent granitic intrusion.

A.3 - Devonian-Carboniferous

The Devonian-Carboniferous constitutes the lower part of the non metamorphosed sedimentary formation of Cambodia which unconformably rests on the Cambrian- Silurian and comprises shale, sandstone with beds of jaspers and radiolarite and, in small amount, marl, conglomerate and limestone. The series itself are unconformably overlaid by Permian limestone (south of Poi Pet), and in some places, by Triassic sandstone as the case of southeastern foothill of Tadeth massif. These rocks form small isolated hills in southern Cambodia (Phnom Chettares, Phnom Logneang, Chrouh Pok, Tapok Tang Dong...) or

occupy a large extension beneath the surface and covered by thin Quaternary alluvial deposit (Peam Prou depression, south of Kchol massif, Phnom Malay and Stung Treng areas. Some fossils of *Endothyra* sp., *Monogenerina* sp. et *Geinitzina* sp. of Devonian and Upper Carboniferous ages were found in the limestone beds intercalated in the Devonian-Carboniferous series in Battambang area by J. Gubler. The thickness of the series, in several places, can exceed 3,000 meters.

A.4 - Upper Carboniferous- Permian

Upper Carboniferous-Permian of Cambodia consists of 2 types of sedimentary facies: epicontinental clastic and epicontinental biogenic facies.

- o The epicontinental clastic facies comprising sandstone, shale with intercalation of limestone is restricted to the eastern Cambodia. The age of the series is dated by means of intercalated Permian fossiliferous limestone.
- o On the contrary, the Permian of northern, western and southern Cambodia is entirely characterized by rich fossiliferous limestone of white to grey color outcropping as isolated hills rising from the surrounding plain. The series rest unconformably on the Devonian-Carboniferous or older substratum, but in some places, the Permian is absent as the Triassic formation can be seen in direct contact with the Devonian Carboniferous. The study on fauna gives the age of this limestone from Middle to Upper Permian.

A.5 - Triassic

In Cambodia, two facies of Triassic can be distinguished. The marine triassic is common in eastern Cambodia (Kratie, Stung Treng, Ratanakiri) and consists of sandy shales, calcareous sandstone, marl. The subcontinental facies occurs in many places in central (Rovieng, Srang and west of Kratie) and western Cambodia (the Tadeth massif). The sequence consists of sandstone, microbreccia with intercalation of shale and marl. These beds are mostly of continental or paralic origin. The thickness is up to 1000 meters at the massif of Tadeth in the west of Cambodia.

A.6 - Lower-Middle Jurassic

The Lower-Middle Jurassic is represented by the "Red Terrain" which is well developed (up to 2000m thick) in eastern Cambodia where it covers a large area of Ratanakiri, Mondulokiri, Kratie, Stung Treng and Preah Vihear provinces. The series become thinner westward (few hundred meters at Rovieng), then completely disappear before appearing again in the riverbed of Stung Sangke as well as in the northern foothill of the Cardamom. The sequence consists of continental clastic rocks including red colored sandstone, siltstone and claystone with intercalation of beds of conglomerate, greenish sandstone, limestone and calcareous sandstone of nearshore or lagunal origin.

In western Cambodia, the Lower-Middle Jurassic formation is linked up to the series of overlying Upper sandstone with slightly discordance. In many places between Rovieng and

Sisophon, it was found at the bottom of the Upper sandstone, in form of fine grained sandstone which was used as building materials for many antic temples of Angkor.

A.7 - Upper Jurassic -Cretaceous

The Upper Jurassic -Cretaceous forms subhorizontal highlands and mesas in western (Phnom Kravanh), northern Cambodia (Phnom Dangrek) and central Cambodia (Phnom Kulen, Phnom Tbeng, Phnom Santuk.....). The formation of this age is characterized by two types of section: the sedimentary and volcano-sedimentary types. The sedimentary type consists of sandstone, siltstone and conglomerates of continental origin with the thickness exceeding 2,000 meters. The upper part of the series was dated by palynology to Lower Cretaceous.

The Upper Jurassic -Cretaceous volcano -sedimentary section are restrictively found in eastern Cambodia (Stung Treng, Kratie and Ratanakiri) and comprises basal conglomerates, red coloured sandstones grading up to andesites, tuffs with some dacites. The thickness of the series in the nearby Vietnamese side can reach up to 800 meters.

A.8 - Neogene- Pleistocene

These sediments generally form terrains and plains in the level of 25-150 meters above sea level. The upper level of the series is locally strongly laterized. Their age is confirmed as greater than 650 000 years by the fact that the younger basalt of this age overlies the deposits. In Pailin the Old alluvium is interstratified by Neogene-Quaternary basalts. This places the older Alluvium in the Lower Quaternary and possible Upper Pliocene, i.e., 1.5- 2 My.

The Neogene- Early Pleistocene formation is seen in large basin in eastern Cambodia and consists of claystones and siltstone.

The Neogene- Pleistocene formation can be also found filling the grabens of the Mekong valley and TonleSap region. In Phnom Penh, the supposed upper Neogene formation is found lying under 25 - 30 meters thick Quaternary alluvium.

Another unit of the Neogene Quaternary period is the Plio-Pleistocene basalt which forms plateaus in Ratanakiri, Mondulakiri, Kampong Cham, and rather smaller flow, in Preah Vihear, Pailin, Pursat and Koh Kong provinces. These rocks consist of basalt, alkaline basalt and high alumina basalt with stratigraphic thicknesses of the order of 100 to 140 meters. The age of these basalts varies from 1.77 to 2.6 My. Some small basaltic outcrops in western Cambodia (Pailin, Samlot, Chamnong, Chhnuon) are the host rock-source of high quality corundum: ruby and sapphire, while the large basaltic plateau in Ratanakiri is the source of an important zircon deposit.

A.9 - Quaternary

Quaternary deposits are widespread in Cambodia, especially in the broad central plains of the Mekong and Tonle Sap River systems and generally occupying levels from 0 to 40 m

above sea level. The Lower Quaternary consists of sands, silts and claystones of both fluvial and marine origin.

The Middle Quaternary of the plains comprises red sandy sediments occupying terraces above 15 meters. The Middle-Upper Quaternary is widespread in the north, southeastern and northwest sectors of Cambodia and composed of grits, pebbles, sands and clays outcropping on higher relief levels on the outer parts of the central plains. This unit is about 200 meters thick in the Battambang area.

The Holocene is represented on the coastal and central plains and in small upland valleys by recent deposits of lacustrine, fluvial, paralic and shallow sea origin. The sediment comprises gray silts, sands and clay containing organic remains. The thickness is quite thin as we can see the outcrop of older formation (granite, rhyolite, Triassic sandstone, Devonian Carboniferous schist and jaspers) appearing on the surface.

Finally, the eluvial sand which covers some parts of old and recent alluvium nearby the sandstone and granitic massifs (Koulen, Dangrek, Kravanh, Kchol) belong to the most recent formation.

B - Igneous Activities

B.1 - Intrusive rocks

According to geochronologic dating, 4 principal phases of granitization can be distinguished:

- Pre Hercynian or early-middle Paleozoic granitic rocks found in three areas: the Preah massif, approximately 40km north of Kampot, the diorite of Pailin and that of Bokham.
- Hercynian or Permo-Triassic intrusion comprised the granite of Bokham (227My) and many smaller batholiths in the northeast of Cambodia. Gabbroic and dioritic intrusions of Stung Treng and Ratanakiri also belong to this phase.
- Late Triassic-Liassic diorite-granodiorite phase which is the most important phase and responsible for the occurrence of the Kchol Khnong Ay and Phnom Lung granite and their annexes and granodiorite of northern and eastern Cambodia (Klek Klak, Snuol, Kdol, O Chhung..). The radiometric dating of these rocks ranging from 64 to 172 My.
- Cretaceous- Paleogene intrusive suite comprises the high alumina granite of Ba Phnom, the Granite of Phnom Bayang and intermediate rock from gabbro to diorite of Bammak type.

B.2 - Volcanic rocks

Volcanic rocks found in Cambodia are rhyolite - dacite association, andesite and basalts.

Rhyolites are of different age ranging from Cambrian-Silurian to Cretaceous. Cambrian-Silurian rhyolites is found at the massif of Preah at the lower part of quartzite. Ante- Permian rhyolite is widespread in Kampot province of southern Cambodia (Tani, Kep) and some coastal islands. Permian- Triassic phase is proved by the presence of rhyolite pebbles in the basal conglomerates of the Jurassic Red Terrain.

Andesitic volcanism is mainly Permian as in Preah Vihear highland and secondary Jurassic Cretaceous (volcano-sedimentary complex) as seen in Kratie and Stung Treng.

The last unit is Neogene and Quaternary basalt which form large plateaus in eastern and central Cambodia

C - Tectonic History of Cambodia

Cambodia has been affected by 4 main tectonic phases:

- The Caledonian orogenesis (or Pre Hercynian) strongly metamorphosed the Precambrian and Cambrian-Silurian formation of Pailin and Bokham,
- Indosinian orogeny can be divided into 4 small phases, the first phase that folded the series of Devonian-Carboniferous, the second resulting the unconformity between Permian and Triassic, the third phase which culminated in middle Triassic time strongly folded the series of Triassic, and the last phase that caused the immersion of western part of Cambodia.
- Tertiary and Quaternary orogenesis began in middle Cretaceous and finished in early Quaternary. It probably resulted the subsidence of the central basin actually occupied by the Great Lake Tonle Sap and caused the basaltic extrusion which form important plateaus in east and south central part of Cambodia.
- Neotectonic movement can be clearly observed at the western coast of Cambodia, where it causes the formation of submerged valleys and plain.

D - Metallogenic Evolution in Cambodia

In Cambodia, four major metallogenic epochs can be identified.

D.1 - Devonian -Carboniferous and Hercynian

Mineral deposits that can be joined to this epoch are iron deposits of Anlong Chey, Kompong Putrea, Tapok TangDong and that of Phnom Rumdey, Jaspers and phtanite of Tram Khna that can be used as silica source and small vein gold deposits, which is associated with the granite of Bokham and constitute the provenance of some local alluvial deposits of gold. Chromite and zinc bearing stibnite deposits occurring in gabbroic veins also belong the this metallogenic epoch.

D.2 - Carboniferous- Permian epoch

Known deposits and occurrences associated with this epoch include pure limestone of Battambang and Kampot, bauxite of Battambang and lignite of Kampot interstratified in the limestone and the dolomite of Chvang.

D.3 - Late Jurassic- Cretaceous

Mineralisation activity of this period is most frequently the result of thermal reactions and hydrothermal activity accompanying granitic and granodioritic intrusive penetrating Meozoic sedimentary formations. Principal occurrences related to this epoch include gold (Phnom Lung, Phnom Chi, Phnom Thmar Meas, Memot, O Chhung, Memang...), iron that is resulted by contact metamorphism with these intrusions (Phnom Deck, Stung Treng), manganese of Chhep, the occurrences of tin, tungsten, lead, zinc, copper and those of molybdenite and fluorite reported in quartz veins in the granites of Ba Phnom and Baset, amethyst and colorless quartz of Phnom Chi and Kon Mum, lignite and jet interstratified in the Upper sandstone, coal of Voen Nhung and Talat and finally kaolin deposits coming from the weathering of Kchol type granites in Kampong Chhnang and refractory clay of Phnom Krom.

D.4 - Cenozoic epoch

Mineral concentrations of this epoch are principally related to weathering accumulation(placers) and include the corundum (ruby and sapphire) and zircon deposits as well as important lateritic bauxite , all derivating from the weathering of basaltic plateaus, gold placer at Bokham, cassiterite placer of Knong Ay, Kampot and Battambang karstic cavity filling phosphorite, clay for cement at Kampot, lateritic manganese crust of Chhep, peat deposit of Chantrea and silica sand forming along the coast of Cambodia.

APPENDIX III

A BRIEF REPORT ON METALLIC MINERAL RESOURCES IN CAMBODIA

Type of Minerals	Locality	Brief Notes	Remark
1. ANTIMONY	Sre Peang (D-002, UNIFC = 334), Pursat province	The only occurrence of antimony is located 3 km SSW of the village of Sre Peang. Location: 103° 15' E, 12° 2' N. The mineralization is zinc-bearing stibnite which occurs in disseminated form in lumps of quartz vein material. The quartz veins apparently traverse an amphibolite-biotite granite in the area.	Under Exploration License
2. CHROMIUM	Sre Peang (D-001, UNIFC = 334), Pursat province	A chromite occurrence is found 2km South South West (SSW) of the Sre Peang village, Pursat province. Location: 103° 14' E, 12° 22' N. In this area, residual blocks and fragments of chromite are found over an area of some 10 km ² . The chromite is apparently the residue of the weathering of post-Jurassic gabbro outcrops of basic irrepitive plugs and stocks which intrude the Devonian-Lower Carboniferous sandstone and schists that form the bedrock of the broad valley of the upper Pursat River in this district.	Under Exploration License
3. IRON ORE	1- Phnom Prean (D-019, UNIFC = 334), Battambang province	Phnom Prean deposit is located in the Samlot district, about 54km southwest of Battambang town. Approximate location: 102° 52' E, 12° 46' N. The deposit is set in Lower Permian grey to gray-white brecciated limestone, schists and calcareous breccias, occurring in two areas of the mountain, referred to as Phnom Poil and Phnom Prean.	Under Exploration License
	2 - Tani (D-025, UNIFC = 334), Kampot province	The Kampot group of iron ore showings is located near the village of Tani, 35 km SSW of the Takeo provincial center, South of the town of Angkor Chey. Location: 104° 40' E, 10° 44' N. The mineralization consists of a large number of veinlets and fracture filling of magnetite and hematite in metasediments of Devonian-Carboniferous age.	Under Exploraion License
	3 - Chhep-1 (D-027, UNIFC = 334), Preah Vihear province	There are two showings. One is between Sniet and the Chhep-Rovieng road, and the other along the trail from Chang-Ha to Chrach. Location: 105° 23' E, 13° 33' N. As well, hematite blocks near Phnom Chirait on the trail from Chhep to Chrach are reported in the Devonian-Carboniferous sandstone and grit rocks.	Under Exploraion License

3. IRON ORE

- | | | |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <p>4 - <i>Chhep-2</i>
(D-028, UNIFC = 334),
<i>Preah Vihear</i>
<i>province</i></p> | <p>This hematite occurrence is situated 5 km north-northwest of the Chhep town in Preah Vihear province. Location: 105° 22' E, 13° 47' N. The mineralization occurs in the form of lumps of massive hematite over an area of about 3 km by 2 km on the surface of a much-folded subvertical schisto-sandstone series of Devonian to Lower-Carboniferous age.</p> | <p><i>Under
Exploration
License</i></p> |
| <p>5 - <i>Phnom Prolean</i>
(D-029, UNIFC = 334),
<i>Rovieng district,</i>
<i>Preah Vihear</i>
<i>province</i></p> | <p>This magnetite occurrence is situated about 8.5 km Southwest of Rovieng, about 0.7 km from the Prolean Mountain. Location: 105° 03'E, 13° 19'N. Blocks of magnetite of approximately 1m thickness are in a larger area of fragments of magnetite, hematite, limonite (2Fe₂O₃, 3H₂O), a common secondary mineral of iron, and ferruginous rock fragments. This magnetite is probably of skarn origin.</p> | |
| <p>6 - <i>Koh Keo</i>
(D-030, UNIFC = 334),
<i>Rovieng district,</i>
<i>Preah Vihear</i>
<i>province</i></p> | <p>The Koh Keo magnetite occurrence is situated about 16.5 km north-north-east (NNE) of Rovieng, on a track accessible in good weather conditions. Location: 105° 11' E, 13° 28' N. An excavation at the site shows magnetite, skarn rock and epidotized quartz-bearing metasediments. A 3m thickness of magnetite striking N 60E is observed, rich in the central core and becoming leaner toward the margins where it becomes a granular magnetite dispersed in a skarn rock.</p> | <p><i>Under
Exploration
License</i></p> |
| <p>7 - <i>Authmor Sreal</i>
(D-031, UNIFC = 334),
<i>Rovieng district,</i>
<i>Preah Vihear</i>
<i>province</i></p> | <p>Occurrences of magnetite are located 6 km West of Rovieng district, Preah Vihear province with approximate location: 105° 03' E, 13° 23' N. Quartz diorite porphyry, and rhyolites are noted in the vicinity. The interest ore minerals are magnetite, specularite and massive hematite. The deposit is of apparent skarn origin.</p> | <p><i>Under
Exploration
License</i></p> |
| <p>8 - <i>Phnom Kbol</i>
(D-032, UNIFC = 334),
<i>Rovieng district,</i>
<i>Preah Vihear</i>
<i>province</i></p> | <p>This magnetite occurs on the Phnom Kbol area, Rovieng district, North of the Stung Sen river. Location: approximately 105° 14' E, 13° 35' N. The country rocks as gray-brown Lower Permian schists, sandstone, white-gray limestone and various calcareous and sandy schists of apparent Triassic age.</p> | <p><i>Under
Exploration
License</i></p> |
| <p>9 - <i>Phnom Deck-1</i>
(D-033, UNIFC = 333),
<i>Preah Vihear</i>
<i>province</i></p> | <p>Phnom Deck-1 deposit is situated in the north centre of the country, at 105° 03' E, 13°14' N, 15 km southwest of Rovieng town and 74 km north of Kompong Thom. The primary deposits at Phnom Deck are contact-metasomatic replacements in metamorphosed Triassic sandstone and marls near the margin of a vast post-Triassic granodiorite botholith having a diameter of some 30 km.</p> | <p><i>Under
Exploration
License</i></p> |

3. IRON ORE	<p>10 - Phnom Deck- 2 (D-034, UNIFC = 334), Preah Vihear province</p>	<p>This deposit is apparently a related zone of the same deposit. Location: 105° 03' E, 13° 19' N. This location is approximately 10 km NW of the above site. At least four occurrences were found in the area surrounding the Phnom Deck massif: Phnom Deck, Phnom Thmak, Katkeo and Popun. All these occurrences are apparently comprised of magnetite and hematite in a quartzose gangue associated with the contact zones of the granodiorite irruptive rocks.</p>	<p><i>Under Exploration License</i></p>
	<p>11- Phnom Rumdek (D-020, UNIFC = 334), Oddor Meanchey province</p>	<p>This occurrence is located 20km east-south-east (ESE) of Sam Rong in Oddor Meanchey province. Approximate location: 103° 50' E, 14° 05' N. The ore is in the form of massive alluvial hematite derived from the weathering of iron-rich shales of Devonian-Carboniferous age.</p>	<p><i>Under Exploration License</i></p>
	<p>12 - Phnom Kbal Stung (D-021, UNIFC = 334), Siem Reap province</p>	<p>This occurrence is located on the upper Stung Chikreng river, approximately 55km east-north-east (ENE) of the Siem Reap town. Location: 104° 19' E, 13° 35' N. The prospect consists of strongly folded magnetite-bearing Cambro-Silurian quartzites which form inselbergs mostly surrounded by rhyolites and andesites.</p>	
	<p>13- Phnom Pours (D-116, UNIFC = 334), Oddor Meanchey province</p>	<p>This deposit is located in the northeast of Siem Reap, where iron is observed as magnetite and limonite in a series of quartzites and tuffs of probable Devonian-Carboniferous age in the Phnom Pours range. The best mineralized zone is to be in the banded quartzites at Phnom Chamkouy, where the iron-bearing quartzites achieve an apparent thickness of 20-30m.</p>	<p><i>Under Exploration License</i></p>
	<p>14 - Stung Treng (D-022, UNIFC = 334), Stung Treng province</p>	<p>Surface showings located about 10km southwest of the Stung Treng town in the Stung Treng province. Location: 105° 54' E, 13° 31' N. The mineralization occurs in the form of lumps of massive hematite for a length of about 4 km on the surface of a concordant and folded subvertical series of sandstone, schists and phthanites of Devonian to Lower-Carboniferous age.</p>	<p><i>Under Exploration License</i></p>
	<p>15 - Anlong Chey (D-023, UNIFC = 334), Stung Treng province</p>	<p>This occurrence is located 38km west-northwest of the Stung Treng town in the Stung Treng province. Location: 105°40'E, 13°38'N. The mineralization occurs in the form of lumps of massive hematite for a length of 3km on the surface of a much-folded subvertical schisto-sandstone series of Devonian to Lower-Carboniferous age.</p>	<p><i>Under Exploration License</i></p>

3. IRON ORE	16- Sam Ang (D-024, UNIFC = 334), Stung Treng province	The magnetite occurrence is situated 6 km South of Sam Ang on the Chrang-Thalibarivat road. Location: 105° 53' E, 13° 38' N. There is a bed of magnetite in a series of Paleozoic quartzites and cherts. A possible affinity with banded ironstone type of deposit has been suggested.	<i>Under Exploration License</i>
	17- Chrang (D-026, UNIFC = 334), Stung Treng province	Surface debris of iron ore, as magnetite is situated 3 km East of Chrang in an area of weathered mica schist. Location: 105° 49' E, 13° 43' N. There is no more geological information on this area.	<i>Under Exploration License</i>
4. MANGANESE	1 - Chhiep-1 (D-035, UNIFC = 333), Preah Vihear province	This occurrence is situated about 6 km West of the Chhiep town, southwest of the village of Phum Troun. Location: 105° 21' E, 13° 46' N. The prospect consists of manganese laterite containing a layer of psilomelane and pyrolusite usually less than 1m, but locally up to 1.8 m thick, admixed with iron minerals.	<i>Under Exploration License</i>
	3 - Chhiep-2 (D-036, UNIFC = 334), Preah Vihear province	Psilomelane and pyrolusite occurrences have been found at a point 7km ENE of Chhiep, along the road from Chhiep to Phum Chang Ha. Location: 105° 28' E, 13° 47' N. The size, thickness, quality and setting are the same as described for the Chhiep-1 occurrence above.	<i>Under Exploration License.</i>
	3 - Chhiep-3 (D-037, UNIFC = 334), Preah Vihear province	A possible similar showing is reported to occur at a locality 9 km West of Chhiep but no details are available.	<i>Under Exploration License</i>
5. MOLYBDENUM	1 - Phnom Basset (D-038, UNIFC = 334), Kandal province	Phnom Basset deposit is located about 20 km northwest of Phnom Penh. Location: 104° 45' E, 11° 41' N. Two small inselbergs of monzonitic granite of Lower Jurassic age, fine-grained and locally porphyritic in texture, rise from the Mekong central plain. The monzonite carries molybdenite in quartz veins and also weakly disseminated in the ground mass.	Prohibited areas
	2 - Phnom Thong (D-039, UNIFC = 334), Preah Vihear province	The occurrences are reported at the location 35km south of the Tbeng Meanchey town. Location: 105° 00' E, 13° 20' N. These occurrences are located in the Phnom Deck district, approximately 12km WSW of the Rovieng town. Molybdenite mineralization occurs in disseminated form in a network of small discontinuous quartz veins within a monzonite granite of probable Jurassic-Cretaceous age which intrudes Lower Jurassic (Lias) sandstone breccias.	<i>Under Exploration License</i>
	3 - Phnom Den (D-040, UNIFC = 334), Takeo province	The site is about 45 km South of the Takeo town. Location: 104° 53' E, 10° 36' N. The molybdenite occurs as coatings and seams in a network of quartz veins, often long but discontinuous in character, accompanied by lesser chalcopyrite (CuFeS ₂) and pyrite	<i>Under Exploration License</i>

(FeS₂).

6. TUNGSTEN	<p><i>Knong Ay</i> (D-005, UNIFC = 334), <i>Kampong Speu</i> province</p>	<p>Tungsten mineralization is rare and very limited scale. The only occurrence so far examined has been in the Knong Ay district. Location: 104° 06'E, 11° 35'N. In this area, the traces of wolframite accompany the cassiterite. The mineral occurrence is of no economic interest.</p>	<p><i>Under</i> <i>Exploraion</i> <i>License</i></p>
7. BASE METALS	<p>1 - <i>Battambang</i> <i>deposits</i> (D-052, UNIFC = 333), <i>Battambang</i> province</p>	<p>Thin beds of siliceous bauxite are interbedded within the Permian limestone found in the Battambang - Sisophon areas. The most intensively studied area is about 20 km West of the Battambang town, at the Phnom Sampeou and Phnom Thmei. Location: 103° 02'E, 13° 04'N.</p>	<p><i>Under</i> <i>Exploraion</i> <i>License</i></p>
1. BAUXITE	<p>2 - <i>Haut Chhlong</i> <i>Plateau deposits</i> (D-053, UNIFC = 334), <i>Mondulkiri</i> province</p>	<p>Bauxitic laterites have been found in the Haut Chhlong Plateau in Mondulkiri province. This plateau, which extends into Vietnam, is composed of a great thickness of basaltic lavas and volcanic ash, which are probably mainly of Pleistocene age although the oldest flows may be Pliocene or Miocene. In Cambodia only the Haut Chhlong Plateau was studied at approximately 107° 12'E, 12° 23'N.</p>	<p><i>Under</i> <i>Exploration</i> <i>License</i></p>
2. COPPER	<p>1 - <i>Kroch Chhma</i> (D-047, UNIFC = 334), <i>Kratie</i> province</p>	<p>A group of chalcopyrite-bearing showing is reported in this area, 28km west of Kratie town. Location: 105° 46'E, 12° 31'N. The mineralization occurs in metamorphosed Triassic rocks in the vicinity of biotite granite stocks and intrusive dioritic sills and plugs. Chalcopyrite is also observed within the intrusive units.</p>	<p><i>Under</i> <i>Exploraion</i> <i>License</i></p>
	<p>2 - <i>Phnom</i> <i>Sekahom</i> (D-042, UNIFC = 334), <i>Preah Vihear</i> province</p>	<p>The occurrence is situated in the Roven-Chhep district, Preah Vihear province. Location: 105° 22'E, 13° 44'N. The occurrence apparently consists of minor showings of malachite in epidote-bearing hornfels and skarn rocks within and adjacent to intrusive granitic rock. Country rocks consist of metamorphosed Triassic schist-sandstone sequences with marble intercalations.</p>	<p><i>Under</i> <i>Exploraion</i> <i>License</i></p>
	<p>3 - <i>Phnom Pel</i> (D-046, UNIFC = 334), <i>Preah</i> <i>Vihear</i> province</p>	<p>Surface showing located 33km SSW of the town of Tbeng Meanchey. Location: 104° 42'E, 13° 26'N. Rhyolitic breccias of presumed Cretaceous age outcrop along the South margin of the Permian andesitic complex which outcrops in this area. Malachite and azurite have crystallized in vugs and fractures in the rhyolite breccias.</p>	<p><i>Under</i> <i>Exploraion</i> <i>License</i></p>

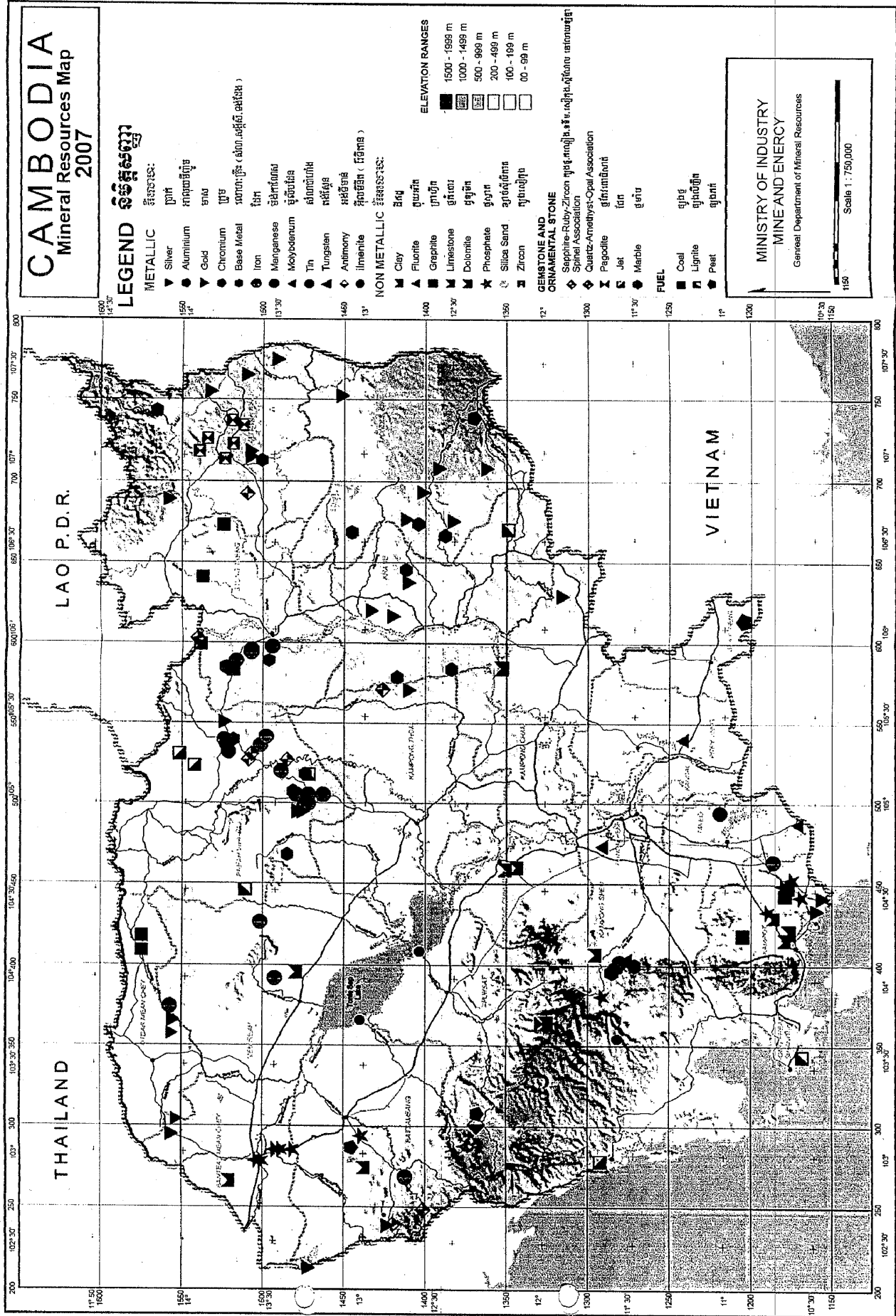
2. COPPER	4 - <i>Phnom Ke (D-050, UNIFC = 334), Preah Vihear province</i>	The occurrence is situated in the Rovieng-Chhep district, Preah Vihear province. Location: 105° 10' E, 13° 20' N. The occurrence apparently consists of minor showings of malachite in epidote-bearing hornfels and skarn rocks within and adjacent to intrusive granitic rock. Country rocks consist of metamorphosed Triassic schist-sandstone sequences with marble intercalations.	<i>Under Exploraion License</i>
	5 - <i>Lomphat (D-048, UNIFC = 334), Rattanakiri province</i>	The occurrence is located 7km northeast of Lomphat town, along the O Cheng to Lomphat trail. Location: 106° 58' E, 13° 34' N. Sparse mineralizations of chalcopyrite and malachite are observed in the contact aureole of a small gabbro intrusive body which intrudes a calcareous sandstone sequence of Lower Jurassic age. No economic interest.	<i>Under Exploraion License</i>
	6 - <i>Phnom Chamkar Keu (D-045, UNIFC = 334), Stung Treng province</i>	The occurrence is located 19km south-west (SW) of Phum Thalibarivat, Stung Treng province. Location: 105° 49' E, 13° 32' N. The occurrence apparently consists of minor showings of malachite in epidote-bearing hornfels and skarn rocks within and adjacent to intrusive granitic rock. Country rocks consist of metamorphosed Triassic schist-sandstone sequences with marble intercalations.	<i>Under Exploraion License</i>
3. COPPER-LEAD- ZINC	1 - <i>Sam Rong occurrences (D-003, UNIFC = 334), Kampong Speu province</i>	A vein type lead-zinc mineralization is seen near Sam Rong, 110km west-north-west of Phnom Penh, in the Western part of Kampong Speu province. Location: 103° 55' E, 11° 50' N. The occurrences are located in a group of hills and situated southwest of Kchol massif, among which are the Phnom Thmar Prak, Phnom Preah, Tang Vill, Ran Kol and Tambangyak.	<i>Under Exploraion License</i>
	2 - <i>Knong Ay (D-049, UNIFC = 334), western Kampong Speu province</i>	Chalcopyrite occurrences were found in two locations in and near the Knong Ay Jurassic-Cretaceous granitic massif of central-western Cambodia. Location: 104° 05' E, 11° 30' N. At Daun Penh, Chalcopyrite accompanied by blende and galena occurs in a vein system. To the west of Kdam Ngoeut, disseminated crystals and clots of chalcopyrite are observed in a diorite dyke.	<i>Under Exploraion License</i>
	4 - <i>Phum Pring (D-044, UNIFC = 334), Preah Vihear province</i>	The occurrence is located approximately 7 km WNW of Rovieng town, Preah Vihear province. Location: 105° 04' E, 13° 24' N. It remnants of hornfelses divided from sandstone sedimentary rocks are observed within the mass of the Phnom Deck granitic massif. The margins of the metasediments carry traces of pyrite, sphalerite and galena. The occurrence is no apparent economic interest.	<i>Under Exploraion License</i>

3. COPPER-LEAD-ZINC	5 - Ban Chai (D-041, UNIFC = 334), Rattanakiri province	Copper mineral (plus galena) indications are reported in quartz veins in the southern periphery of a Paleozoic granitic massif, situated in Ban Chai area, located in Tonle San valley, Rattanakiri province. Location: 107° 15'E, 14° 09'N.	<i>Under Exploration License</i>
8. TIN	1 - Knong Ay occurrences (D-004, UNIFC = 334), Kampong Speu province	The tin mineralization occurs at the Knong Ay district, Kampong Speu province. Location: 104° 07'E, 11° 33'N. Cassiterite occurs disseminated in the veins of aplite and above all of greisen, in tiny grains ranging from 0.12 to 0.5mm diameter. Some of the quartz veins contain a little galena (PbS), sphalerite (ZnS), chalcopyrite (CuFeS ₂), barite (BaSO ₄) and fluorite (CaF ₂). There also occurrences of scheelite (CaWO ₄) and wolframite (Fe,Mn)WO ₄ associated with the cassiterite.	<i>Under Exploration License</i>
	2 - Angkor Borey (D-051, UNIFC = 334), Takeo province	Tin deposit is found in Angkor Borei district, 20km south-southeast of Takeo town. The area is characterized by small granitic intrusions probably of Jurassic Cretaceous age, which raise at approximately 40m above surrounding flooded plain. The intrusions are covered by thick eluvium and alluvium, in which crystals of cassiterite of 0.1mm – 1cm are found.	<i>Under Exploration License</i>
9. GOLD	Phnom Thmar Meas occurrence (D-059, UNIFC = 334). Battambang province	Phnom Thmar Meas is located near the Thai frontier in westernmost Cambodia, approximately 90 km west-northwest of Battambang. Location: 102° 21'E, 13° 18'N. The occurrence consists of gold-bearing quartz veins in faulted and deformed Permian limestone.	<i>Under Exploration License</i>
	Rumchek (Memut) deposit (D-055, UNIFC = 333) Kampong Cham province	The deposit is located 8 km North of the village of Memut, at Chom Ta Mao. Location: 106° 11'E, 11° 54'N. The deposit is described as "lateritic placer". Gold occurs in colluvial material above the eroded primary vein system in a soil-zone some 3-4 m thick, within which values up to 11gm per ton were found, with an average yield of 2.72gm per ton.	<i>Under Exploration License</i>
	1 - Phnom Chi - South deposit (D-057, UNIFC = 334) Kampong Thom province	The deposit is located at Phnom Chi - South in eastern Kompong Thom province, near the border of Kratie province. Approximate location: 105° 39'E, 12° 45'N. The showing is apparently consisted of fracture-filling quartz veins in a sheared Triassic hornfelsic country rock (probably Triassic). This system is related to intrusions of granitic rocks (monzonites, diorites) in the vicinity.	<i>Under Exploration License</i>
	2 - Krava deposit (D-111, UNIFC = 334) Kampong Thom province	The deposit is located in Krava district, Kompong Thom province. Location approximately: 105° 16'E, 12° 28'N.	

9. GOLD

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| <p>1 - <i>Memung deposit</i> (D-056, UNIFC = 334)
<i>Mondulkiri province</i></p> | <p>Its location is 106° 55'E, 12° 35'N, in Keo Seima district. The primary deposit is a gold-bearing quartz of 0.6 m wide, also mineralized with arsenopyrite (FeAsS), pyrite (FeS₂), chalcopyrite (CuFeS₂) and galena (PbS). The vein(s) traverse a Triassic age shale sandstone series. Microscopic studies show that the gold particles vary in size from 0.05 mm to 5 mm and are associated with arsenopyrite. The deposit was studied by the Department of Geology and Mines of Cambodia in 1991.</p> | <p><i>Under Exploration License</i></p> |
| <p>2 - <i>PuChu Leu deposit</i> (D-109, UNIFC = 334)
<i>Mondulkiri province</i></p> | <p>The deposit located in Keo Seima, Mondulkiri province.</p> | <p><i>Under Exploration License</i></p> |
| <p>1 - <i>Phnom Deck alluvial deposit</i> (D-062, UNIFC = 334) <i>Preah Vihear province</i></p> | <p>This deposit was in fairly continuous production for a period after 1956 into the 1960s. The deposit is a lateritic placer of presumed eluvial-colluvial (as well as alluvial) origin located near the village of Phnom Deck in the Rovieng district. Location 105° 01'E, 13° 19'N.</p> | <p><i>Under Exploration License</i></p> |
| <p>2 - <i>Rom Dey vein deposit</i> (D-063, UNIFC = 333) <i>Preah Vihear province</i></p> | <p>The Rom Dey vein deposit, Rovieng district, is located 8 km WNW of the village of Phnom Deck. Location approximately: 104° 59'E, 13° 21'N. Numerous quartz veins and veinlets are noted in this district in which granites and granodiorite intrusions have metamorphosed the Triassic sedimentary rocks to hornfelses.</p> | <p><i>Under Exploration License</i></p> |
| <p>3 - <i>Phnom Lung deposit</i> (D-064, UNIFC = 334) <i>Preah Vihear province</i></p> | <p>The deposit is located 14 km west of the village of Phnom Deck. The showing is situated at the eastern foot of the hill known as Phnom Lung, 6 km west of the Rovieng district. Location: 104° 57'E, 13° 22'N. The primary deposit is gold-bearing quartz vein 3-90 cm wide containing in addition a little pyrite (FeS₂), chalcopyrite (CuFeS₂) and mispickel (FeAsS).</p> | <p><i>Under Exploraion License</i></p> |
| <p>1 - <i>Bo Kham deposit</i> (D-060, UNIFC = 334) <i>Rattankiri province</i></p> | <p>At <i>Bo Kham</i> (107° 21'E, 13° 51'N) there are auriferous gravels and also gold-bearing quartz veins related to diorite intrusions. In northeastern districts, an occurrence, about 20 km northwest of Voerun Sai, Rattanakiri province, is reported to be small gold placers derived from hornblende-bearing granites and from quartz-diorites rich in pyrite. Location: 106° 45'E, 14° 05'N.</p> | <p><i>Under Exploraion License</i></p> |
| <p>2. <i>Oyadav deposits</i> (D-061, UNIFC = 334) <i>Rattanakiri province</i></p> | <p>The deposits were found in Oyadav district, near the Cambodian-Vietnamese border. Intense mining activities in this area have been reported since 1994. Gold is exploited from quartz veins in the dept varying from 15 to 30 m.</p> | <p><i>Under Exploraion License</i></p> |

9. GOLD	3 - Banlung deposit (D-110, UNIFC = 334) Rattankiri province	The deposit is located in Banlung district, Rattanakiri province.	Under Exploration License
	4 - O Kanchanh deposit (D-132, UNIFC = 334) Rattanakiri province	This colluvial type deposit is located 14km south of the Banlung town, on the national road No 13 Banlung-Lumphat. Gold bearing quartz veins are extracted from shafts and trenches of 0.5 to 2m depth, the crushed and panned in the streams nearby. The gold grain size varies from microscopic to 0.5 mm.	Under Exploration License
	Phum Kampin occurrence (D-133, UNIFC = 334) Stung Treng province	Some gold placers that are the weathering product of amphibolic granite and diorite rich in pyrite (FeS ₂), are formed in a small river 20 km from Voeun Sai. Primitive panning done by local people was reported in 1954.	Under Exploration License



Mineral Concession Map of Cambodia

APPENDIX - IV

