

**Kingdom of Cambodia**  
**General Department of Mineral Resources (GDMR)**  
**Ministry of Mines and Energy (MME)**

**The Project on Capacity Development  
for Mining Administration  
in The Kingdom of Cambodia  
Final Report**

**March 2017**

**Japan International Cooperation Agency (JICA)**

**Mutual Corporations with a Joint Venture**

- **Nittetsu Mining Consultants Co., Ltd.**
- **Nittetsu Mining Co., Ltd.**
- **Sumiko Resources Exploration & Development Co., Ltd.**

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5. Minutes of the Joint Coordination Committee (JCC) for The Project on Capacity Development for Mining Administration in The Kingdom of Cambodia (20 February, 2017)
6. Certificate of Handover

### ➤ Technical transferring items

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2. The drafting of Mine Safety Regulation Phase 1 (No. 1, No. 2, No. 3)
3. The drafting of Mine Safety Regulation Phase 2
4. Drafting Regulation on Procedures and Items of in Mine Safety Law and its Regulations
5. Drafting of Manual for Mine Safety Inspection rule
6. Comparison list of Mining Law among Japan, Cambodia and other countries (Khmer)
7. Manual on Measurement and Evaluation of dust Concentration at Mines
8. Manual on Risk Management for Mine Safety
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11. Designing a Policy for an Annual Inspection Plan at Mines
12. Support for Establishment of Supervised Governmental Structures that are Suitable for the Enforcement of Mine Safety Law and its Regulations
13. Management and Sharing of Mine Safety Information such as Inspection Results of Mines between GDMR and Provincial DMEs
14. Special Inspection Report using mine safety inspection manuals at open-pit mines
15. Promotion of Enlightening Campaign for Mine Safety in Japan
16. Guidebook on Mine Safety in Cambodian version
17. Database Operational Manual
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# **1. Project Description**

## **1.1 Background**

The Royal Government of Cambodia is intending to promote the mineral resources sector to stimulate the economic growth and contribute to the reduction of the poverty in the country.

Currently, there are more than 140 Mineral Exploration licenses, around 10 Mining licenses, and about 300 Construction Material licenses.

In a few years, some of these companies, who have Mineral Exploration licenses, will apply for mining licenses.

GDMR will absolutely need the effective management of mining operations to these companies' activities.

In order to prevent accidents and health hazards caused by mining activities, the completion of law on mine safety and health is the main objective of GDMR/MME in the next few years.

In addition, there are also mine pollution problems caused by the small-scale mining in some places in Cambodia.

Therefore, GDMR needs to strengthen its human resources and increase capacity to manage safe mining operation and environmental safeguard effectively.

## **1.2 Outline of the Project**

### **(1) Title of the Project**

Project on Capacity Development for Mining Administration

### **(2) Project Purpose and Overall Goal**

Project purpose

“To enhance the capacity of mine safety at GDMR”

Overall Goal

“Mine development is safely carried out in Cambodia

### **(3) Goal and Outputs**

- To formulate the draft law of mine safety and strengthen the enforcement system of the law
- To establish a database for mining management
- To enhance the capacity of human resources of GDMR to maintain mine safety practices sustainably

### **(4) Activities**

<Formulation of the draft of mine safety law>

- Formulate the working team for drafting mine safety law
- Draft the mine safety law (including the items of submission of mine operation plan and waste water quality standard, etc.)

<Establishment of enforcing system of mine safety law>

- Prepare the annual inspection plan according to the drafted law (including the items of inspections)
- Define the responsibilities of safety staff at GDMR and DME (responsibilities, reporting process, etc.)
- GDMR assigns the staff responsible for mine safety at GDMR and define the responsibilities of each staff about safety work
- Prepare the format of inspection report on mine safety

<Strengthening of enforcing the mine safety law (strengthening of capacity of inspections)>

- Carry out OJT on practice of inspection targeting the staff at GDMR and DME
- Prepare the annual inspection plan for next year based on inspection results

<To establish a database for mining management>

- Formulate the working team for building a database
- Review the mine information that GDMR holds
- Define the detailed items of cadastral information, information relating to mines and relating to mineral resources to be input into the database
- Define management system of database (GDMR assigns staff in charge of database and frequency of update, etc.)
- Input the cadastral information into the database
- Input the information relating to mines (such as mine site, deposit-type-size-volume, operation information, production data, mine-safety information, mine-environmental information, etc.)
- Input the information relating to mineral resources (such as geology, RS analysis information, exploration information, ore volume, etc.)
- Define the data items necessary to enforce the mine safety law and input those data into the database
- Prepare a manual of operation and maintenance of database
- Update the database according to the manual

<Short-term Training Program>

- Select the candidates from GDMR staff to participate in the short-term training program in Japan

- Participate in the short-term training program in Japan
- Organize the sharing workshop and give feedback about the results of the training program to other staff of GDMR

< Long-term Training Program >

- Select the candidates from GDMR staff to participate in the master degree course of mine in Japan
- Participate in the master degree course at the graduate school in Japan including the internship program at Japanese private companies
- Organize the sharing workshop and give feedback about the results of the master degree course to other staff of GDMR

(5) Project Site

Project activity was mainly implemented in MME. However, the part of the Project activities was carried out in Mine site.

(6) Counterpart

MME Ministry of Mines and Energy

GDMR General Department of Mineral Resources

### 1.3 Experts

Short Term Experts (STEs)

Family Name	Given Name	Sex	Role
Kashima	Sakae	M	General Manager / Mine Safety System
Sueoka	Shinya	M	Vice-General Manager / Mine Safety System
Aoki	Atsushi	M	Mine Safety Law
Takahata	Hiroyuki	M	Mine Safety Law
Onuma	Takumi	M	Database Manager
Ninomiya	Atsushi	M	Database of Geology & Mineral Resources
Suzuki	Ioki	M	Database of Tenement, Mine & Mine Safety
Hara	Masahiko	M	Database of Server



The Project on Capacity Development for Mining Administration in Cambodia, which was covered by this work, and the separately signed agreement on the Dispatch of a Long-term Expert for Technical Guidance on Mine Safety Operations (for two years from January 2015) was implemented based on the Record of Discussion (“RD”) agreed upon between MME and JICA in August 2014. As a long-term expert provided routine technical guidance to the Project Counterparts (“CPs”) at GDMR, JICA Short-term Experts (“STEs”) worked closely with him in the execution of the work and ensure that his input and this work were coordinated for effective and efficient project implementation.

Long Term Expert

Mr. Akira Shichinohe

## **2. Activity**

### **2.1 Formulation of the draft of mine safety law and strengthen the enforcement system of the law**

#### **2.1.1 Actual results of Mine Safety Team**

2.1.1.1 The First visit (from January 11 to January 24, 2015 (2 weeks))

(1) JICA short-term experts (STEs): S. Kashima, S. Sueoka and A. Aoki

(2) Outline of actual results:

- Presentation for the outline of the Project on Capacity Development for Mining Administration: 1 time
- Conference and an understanding on Work Plan for the Project: 2 times
- Making the draft of Annual Plan for Joint Coordinating Committee: 1 time
- Holding and attendance on Joint Coordinating Committee: 1 time
- Collecting data and information of relating mine safety: 1 time

2.1.1.2 The Second visit (from March 23 to April 10, 2015 (3 weeks))

(1) JICA short-term experts (STEs): S. Kashima and A. Aoki

(2) Outline of actual results:

- Number of times of lectures: 8 times
- On-site inspections at mines: 1 times (2 mines)
- Others: 1 time (arrangement of schedule)

(3) The points of lectures:

STEs conducted lectures about following items to WT members based on the prepared documents that translated into not only Khmer language but also English.

1) Lectures regarding “Drafting Mine Safety Law in Kingdom of Cambodia”

STEs gave the technical guidance to WT members about the drafting Mine Safety Law in Kingdom of Cambodia that was composed from article 1 to article 40 including interpretation of provisions and technical terms, and took Q&A through lectures for 6 times.

table 2.1.1 Composition of drafting Mine Safety Law in the Kingdom of Cambodia

Chapter I General Provisions	§ 1 Purpose of the Law    § 2~3 Definition § 4 Validity
Chapter II Safety	§ 5 Duties and obligations of the concessionaires § 6 Obligations of mineworkers § 7 Education on mine safety § 8 Restrictions regarding machinery and equipment § 9 Permission regarding facility plans § 10 Dumps and tunnels (galleries) § 11~12 Safety rules § 13 Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor § 14~15 Duties of the safety supervisor, technical safety managers and technical safety staffs § 16~17 Safety committee § 18 A survey of mine safety conditions § 19 Safety for contractual work § 20 Permission for special mineral operation plan § 21 Mine pollution prevention measures § 22 Reserve fund system § 23~28 Administrative measures to be supervised § 29 Mine safety reports § 30 Mine safety diagrams § 31 Commission to ministerial ordinance § 32 Use of land in emergencies
Chapter III Supervision Authorities	§ 33 Supervision § 34 Mine safety inspectors § 35~36 Jurisdiction of mine safety inspectors § 37 Reports by a mineworker to supervision authorities § 38~39 Mine safety advisory committee § 40 Mine safety training units
Chapter IV Penal Provisions	(Omission)

- 2) Lectures regarding comparison and differences concerning mining-related Laws between Cambodia, Japan and other countries

STEs gave the technical guidance to WT members about the legal content differences, problems using comparison tables of the present mining-related Laws between Cambodia, Japan, Viet Nam, Laos and Myanmar, and took Q&A through lectures for 2 times.

- (4) On-site inspection at mines

STEs conducted on-site inspections on mineral working fields at open-pit quarry mine (the concessionaire is Hav Un quarry & crushing Ltd.) and open-pit lime stone mine (the concessionaire is Kampot Cement Co., Ltd.) in Kampot province with the JICA's long term expert and six (6) of WT members, and took consideration about mine safety problems both of mines based on the results of the inspection for 1 times (2 mines).

- (5) Activities of the WT members of mine safety

Six (6) staffs of GDMR selected as the WT members of the Project, and attended the lectures and on-site inspections at mines.

- (6) Pending matters

- 1) Necessity for review and modification of existing mining-related Law

In existing "Law on Management and Exploitation of Mineral Resources", the matters concerning "protection of environment", "ensuring the occupational health and safety of workers", "protection of the public safety in and around mining sites", "education, training, and employment of Cambodians" and "controlling the implementation of regulations on health and safety of workers and people and environmental protection" concerning mine safety are overlapped with provisions of the drafting Mine Safety Law that was conducted technical transfer to WT members and MME/GDMR by STEs.

The composition of existing Law should be reviewed and modified, and overlapped provisions should be transferred to Mine Safety Law.

- 2) Necessity for preparing regulations or ministerial ordinances of existing Law

The regulations or ministerial ordinances of existing Law should be established at an early age because procedures and items of mentioned based on the provisions of existing Law are not sufficient for concessionaires to draft and submit documents for mineral-related operations.

#### 2.1.1.3 The Third visit (from June 8 to July 2, 2015 (4 weeks))

- (1) JICA short-term experts (STEs): S. Kashima and A. Aoki
- (2) Outline of actual results:

- Number of times of lectures: 12 times
- Others: 2 times

(arrangement of schedule: 1 time and a brief presentation: 1 time)

(3) The points of lectures:

- 1) STEs prepared the documents regarding drafting Mine Safety Regulations (phase 1) that translated into not only Khmer language but also English.
- 2) STEs gave the technical guidance to WT members about the drafting Mine Safety Regulations (phase 1) that was composed from article 1 to article 110 including interpretation of provisions and technical terms, and took Q&A through lectures for 12 times.

(4) Activities of the WT

Six (6) staffs of GDMR, and three (3) staffs of Legal Department by turns attended the lectures as the WT member this time.

2.1.1.4 The Forth visit (from August 17 to September 11, 2015 (4weeks))

(1) JICA short-term experts (STEs): S. Kashima and A. Aoki

(2) outline of actual results:

- Number of times of lectures: 15 times
- Others: 2 times

(arrangement of schedule: 1 time and a brief presentation: 1 time)

(3) The points of lectures:

- 1) STEs prepared the documents regarding drafting Mine Safety Regulations (phase 1) that translated into not only Khmer language but also English.
- 2) STEs gave the technical guidance to WT members about the drafting Mine Safety Regulations (phase 1) that was composed from article 111 to article 243 including interpretation of provisions and technical terms, and took Q&A through lectures for 15 times.

(4) Activities of the WT

Seven (7) staffs of GDMR and 1 staff of Legal Department by turns attended the lectures as the WT member this time.

(5) Proposal matters

STEs made suggestion on necessity of advanced coordination between the administrative ministries of supervisory guidance about mine pollution prevention at mines.

The Chapter on “prevention of mine pollution” for mine smoke, dust, mine water or wastewater, noise, vibration and so on shall be provided in drafting Mine Safety

Regulation that concessionaires and mineworkers at mines must take compliance matters for mine pollution prevention. However, Ministry of Environment in Cambodia has already taken administrations on supervisory guidance for public pollution prevention to domestic factories and business owners in accordance with the provisions of the Law on Environmental Protection and Natural Resource Management and relevant regulations.

The coordination on supervisory guidance of mine pollution prevention and environmental conservation at operating mines shall be considered in necessary condition between Ministry of Mines and Energy(MME)/ General Department of Mineral Resources(GDMR) and Ministry of Environment to take clearance of the duplicated administrations before enforcement of Mine Safety Law and its regulations, in advance.

(6) Agreement with the issues and proposals in the progress of the Project

In the progress of the Project, Parties between MME/GDMR and STEs of JICA had a meeting about the issues and proposals on September 3rd that have taken place as follows.

1) Necessity for massive lectures and documents in comparison with the plan

The translated documents concerning technical term of the mining and mine safety in Khmer and English are not understandable to the WT who do not have much experience in underground mining that cause the process of lectures takes more time than an original plan.

2) Progress in the capacity of the WT members and GDMR staffs

It needs to have more practical use of regulations, implementation formats such as manuals and field practices to make Mine Safety Law for applicable use in Cambodia and also to enhance the capacity of WT members and GDMR staffs.

3) Use of drawings and videos

Beside the verbal explanation regarding underground mining in the Safety Law and its Regulations, it also needs drawings and videos to illustrate and show to the WT members.

Both parties have agreed with following solution concerning issues, and exchanged the “Minutes of Meeting” on the same day.

“Increase of dispatch times of JICA short-term experts, and transferring applicable and particular regulations based on the Law and manuals for inspection in addition should be requested to JICA Head Office to implement the project successfully in the term of contract.”

2.1.1.5 The Fifth visit (from November 30 to December 25, 2015 (4 weeks))

(1) JICA short-term experts (STEs): S. Kashima and A. Aoki

(2) Actual schedule and substance:

- Number of times of lectures including an indoor exercise: 12 times
- Holding a Workshop: 1 time
- Holding the Joint Coordinating Committee (2nd times) meeting: 1 time
- Others: 2 times (arrangement of schedule: 1 time, and a brief presentation: 1time)

(3) The points of lectures and an indoor exercise:

- 1) STEs prepared the documents regarding drafting Mine Safety Regulations (phase 1 and phase 2) and Mine Safety Inspection Rule that translated into not only Khmer language but also English.
- 2) STEs gave the technical guidance to WT members about the drafting Mine Safety Regulations (phase 1) that was composed from article 244 to article 282 including interpretation of provisions and technical terms, and took Q&A through lectures for 5 times.
- 3) STEs gave the technical guidance to WT members about the drafting Mine Safety Regulations (phase 2) that was composed from article 2 to article 274-6 including interpretation of provisions and technical terms, and took Q&A through lectures for 4 times.

Table 2.1.2 Composition of drafting Mine Safety Regulations

drafting Mine Safety Regulations	Phase 1	Phase 2
Chapter I General provisions		
Section 1 General rules	3	1
Chapter II Safety		
Section 1 General rules	2	
Section 2 Training on mine safety	2	
Section 3 Caution items regarding machinery, equipment and so on	4	2
Section 4 Permission regarding facility plans	2	
Section 5 Safety rules	2	
Section 6 Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor	19	
Section 7 Safety committee	5	
Section 8 The survey of mine safety conditions	3	
Section 9 Safety for contractual work	1	
Section 10 Permission for special mineral operation plan	5	

Section 11 Mine pollution measures and reserve fund system	4	
Section 12 Mine safety reports	3	
Section 13 Mine safety diagrams	1	
Chapter III Rescue activities and mechanisms at the time of mine disaster		
Section 1 General rules	1	
Section 2 Rescue activities at the time of mine disasters	2	
Section 3 Rescue mechanisms	4	
Chapter IV Roof fall and collapse		
Section 1 General rules	3	
Section 2 Working places in underground mining	6	
Section 3 Working places in open-pit mining	9	
Chapter V Explosives and blasting work		
Section 1 General rules	1	
Section 2 Handling explosives	13	
Section 3 Blasting work	15	3
Chapter VI Vehicle type mine machines and automobiles		
Section 1 General rules	2	
Section 2 Capability standard of vehicle type mine machines and automobiles	2	
Section 3 Inspections	4	
Section 4 Prevention of danger caused by operation	3	
Section 5 Mine roads and tunnels (galleries)	3	
Chapter VII Haulage by a belt conveyor, hoisting device and locomotive		
Section 1 General rules	5	
Section 2 General safety equipment	7	
Section 3 Transportation of personnel	5	
Section 4 Haulage by a locomotive	6	
Chapter VIII Mine fires and spontaneous combustion		
Section 1 General rules	1	
Section 2 Prevention of mine fires in underground mine	7	
Section 3 Handling fire on surface	3	
Section 4 Spontaneous combustion	3	
Section 5 Centralized monitoring	-	4



Chapter IX Measures to approaching to old pit		
Section 1 General rules	1	
Section 2 Measures in approaching to old pit	2	
Chapter X Prevention of mine pollution		
Section 1 General rules	2	
Section 2 Prevention of mine pollution caused by mine smoke	3	
Section 3 Prevention of mine pollution caused by dust	4	
Section 4 Prevention of mine pollution caused by mine water or wastewater	5	
Section 5 Prevention of mine pollution caused by dioxin-kinds	3	
Section 6 Prevention of mine pollution caused by poisonous or deleterious substances	3	
Section 7 Prevention of mine pollution caused by noise	3	
Section 8 Prevention of mine pollution caused by vibration	3	
Section 9 Prevention of mine pollution caused by land excavation	2	
Section 10 Prevention of mine pollution caused by mining wastes	6	
Section 11 Prevention of mine pollution caused by accumulations of waste stones and slag, and sedimentation of tailings	7	
Chapter XI Electrical equipment		
Section 1 General rules	6	
Section 2 The grounding (Earth)	4	
Section 3 Protection of excess current	1	
Section 4 Electrical motors and attachments	2	
Section 5 Underground wiring	9	
Section 6 Underground lightning equipment	1	
Section 7 Overhead type electric railway	-	5
Chapter XII Underground passage, working places and management of scattered dust		
Section 1 General rules	1	
Section 2 Underground passage	7	
Section 3 Working places and management of scattered dust	9	
Chapter XIII Ventilation and mine gas		
Section 1 General rules	1	
Section 2 Underground mine air	5	
Section 3 Ventilation facilities	7	

Section 4 Measurement of ventilation quantity	3	
Section 5 Underground gas	5	1
Section 5-2 Prevention of danger caused by gas outburst	-	7
Section 5-3 Prevention of danger caused by static electricity	-	1
Section 6 Restrictions for use of open fire	2	
Chapter XIII-2 Explosive coal dust		
Section 1 General rules	-	1
Section 2 Treatment of explosive coal dust	-	3
Section3 Barrier shelves for prevention of explosion extension	-	3
Chapter XIV Surface passage, working places and management of scattered dust		
Section 1 General rules	1	
Section 2 Management of scattered dust	5	
Section 3 Surface passage and working places	4	
Section 4 Preservation of safety equipment and wearing protective equipment	5	
Chapter XV Management of poisonous and deleterious substances		
Section 1 General rules	1	
Section 2 Management of poisonous and deleterious substances	6	
Chapter XVI Use of land in emergencies		
Section 1 General rules	1	
The sum total of provisions	291	31

(notice)

- 1) The Regulation (phase 1) will be enforced as same time as the enforcement of Mine Safety Law.
- 2) The Regulation (phase 2) will be enforced within five (5) years after enforcement of the Law.

4) STEs gave the technical guidance to WT members about drafting Mine Safety Inspection Rule that was composed from article 1 to article 9 including interpretation of provisions and administrations on supervisory guidance, and took Q&A through lectures for 2 times, and also gave the technical guidance to the members about issuance of “the improvement instruction for mine safety” and issuance of “the orders for warning and directing” that are both provided in the Rule through an indoor exercise for 1 time.

(4) Preparation and holding a Joint Workshop

- 1) STEs and WT members prepared and printed materials on a Joint Workshop for 2 times.

- 2) STEs, WT members and concerned staffs of GDMR held a Joint Workshop on Dec. 14th, and a STE gave a lecture titled “Outline of drafting Mine Safety Law and its Regulations” for 1 time.
- (5) Preparation and holding the Joint Coordinating Committee (the 2nd times) meeting
  - 1) STEs and WT members prepared and printed materials on the Joint Coordinating Committee (the 2nd times) meeting for 2 times.
  - 2) STEs, WT members and concerned staffs of GDMR held on the Joint Coordinating Committee (the 2nd times) meeting on Dec. 21st for 1 time.
  - 3) A STE explained “Actual results on the Project in 2015 and technical transfer plan for establishment of an enforcement system of Mine Safety Law in next phase” in the Joint Coordinating Committee (the 2nd times) meeting.
- (6) Activities of the WT members of mine safety
 

Seven (7) of WT members actively participated lectures, a Joint Workshop and JCC (the 2nd times) meeting.
- (7) Measures against the issues and proposals in the progress of the Project
 

In the progress of the Project, Parties between MME/GDMR and STEs of JICA had a meeting about issues and proposals on September 3<sup>rd</sup>, and both parties agreed and exchanged the “Minutes of Meeting” on the same day.

Later, STEs had considered and revised the schedule of the original Work Plan for adopting such MME/GDMR’s proposals, the extension of term of the Project was clearly identified because of increasing dispatch times of STEs and transferring applicable and particular regulations based on the Law and manuals for inspection in addition.

STEs presented and explained following items to GDMR on December 18th, and both parties exchanged the “Minutes of Meeting” under the agreement on December 25th in 2015.
- 1) Contents of additional regulation and manual and enhancement of the capacity of the WT/GDMR staffs that were requested by MME/GDMR.
 

MME/GDMR requested for practical use of a regulation such as procedures and items of mentioned regarding Mine Safety Law, and a manual such as an environmental preservation in addition were useful and effective for enforcement of the Law and its regulations.

In case the technical transfer of such additional regulation and manual to the WT/GDMR staffs who didn’t have much experience in underground mining was conducted, using the audio/visual equipment and lecturing the technical terms with lucid explanation should help the enhancement of the capacity of them.

## 2) Increase of dispatch times of STEs and extension of term of the Project

The STEs considered and revised the schedule of the original Work Plan for adopting such MME/GDMR's proposals, and planned that the "Regulation on Procedure and Items of Mentioned provided by Mine Safety Law" and the "Manual on Measurement and Evaluation of Dust Concentration" would be additional items of technical transfer for practical use to the WT/GDMR staffs.

As a result, the STEs should have to visit GDMR four (4) weeks each of two (2) times of increase than original Work Plan, and the term of the Project should be extended for two (2) months until the end of February in 2017.

## 3) Desire for JICA Head Office

After agreement and exchange the "Minutes of Meeting" between both Parties, STEs should desire and approve the aforementioned facts for JICA Head Office to complete the Project successfully.



### 2.1.1.6 The Sixth visit (from February 29 to March 18, 2016 (3 weeks))

(1) JICA short-term experts (STEs): S. Kashima and A. Aoki

(2) The outline of actual results:

- The number of times of lectures: 7 times
- The number of times of indoor exercises: 4 times
- Others: 2 times

(arrangement of date for lectures and indoor exercises: 1 time, and a brief presentation: 1 time)

(3) The points of lectures and indoor exercises

STEs conducted lectures and indoor exercises about following items to WT members based on the prepared documents of the Manuals that translated into not only Khmer language but also English.

1) Lectures and indoor exercises regarding the Manual on measurement and evaluation of dust concentration at mines

STEs gave the technical guidance to WT members about the Manual on measurement and evaluation of dust concentration at mines that was composed of the purpose of measurement of dust concentration, measurement design at unit working places, measurement methods, and evaluation of the measurement results and so on, and took Q&A through lectures for 4 times.

STEs also gave the technical guidance to WT members about measurement design (determination of measurement points at the working place) through indoor exercises for 2 times.



Indoor exercise on measurement and evaluation of dust concentration



Lecture at the meeting room

2) Lectures and indoor exercises regarding the Manual on risk management for mine safety

STEs gave the technical guidance to WT members about the Manual on risk management for mine safety that was composed of the application of “Risk Management System” to the survey of mine safety conditions, preparation of risk evaluation level & rank charts based on the risk evaluation standard chart and so on, and took Q&A through lectures for 3 times.

STEs also gave the technical guidance to WT members about the survey of mine safety conditions using three cases studies like an underground working place, a tailings dam and a processing plant at a mine how to make the risk evaluation standard chart, risk evaluation level & rank charts, and identifying of risks, analysis of risks, evaluation of risks and countermeasures for risks using the above-mentioned charts, and took Q & A through indoor exercises for 2 times.

(4) Activities on WT members of mine safety

Number of WT members increased from 8 to 10 staffs of the GDMR and Legal Department this time, but their attendances to lectures and indoor exercises were

sluggish because of incredibly busy for their own job.

STEs demanded an improvement in working conditions of WT members for attendances to lectures and indoor exercises of this project to the executives of MME/GDMR at a meeting of brief presentation.

#### 2.1.1.7 Conducting short term training in Japan in 2016

Six (6) trainees of GDMR staffs were chosen and the short term training for mine inspections and lectures concerning mine safety and preservation of environment were conducted for 2 weeks in Japan.

Table 2.1.3 The schedule and contents of short term training in Japan in 2016

Date		Time	Content	Lecture/Instructor	Affiliation	Method of Transportation	Accommodation
8-May	Sun	7:40	Arrive to Tokyo, move to TIC			JICA Bus	JICA TIC
9-May	Mon	10:30 ~ 12:00 14:30 ~ 15:30	Courtesy call and Meeting Briefing by JICA TIC		JICA Head Office	JICA Bus	JICA TIC
10-May	Tue	9:00 ~ 16:00	Practical Example for Mine Safety in Japan	Mr. Kawahara	Nittetu Mining Co., Ltd		JICA TIC
11-May	Wed	9:00 ~ 16:00	Respiratory Protection Equipment for Mine	Mr. Imagawa	Shigematsu Works Co., Ltd		JICA TIC
12-May	Thu	9:00 ~ 16:00	Problem of Mine Pollution and Protection of Mine Pollution	Mr. Hatsuya	Japan Oil, Gas and Metals National Corporation		JICA TIC
13-May	Fry	9:00 ~ 16:00	Regulatory administration of mine safety in Japan	Mr. Miyase Mr. Hirata	Kanto Tohoku Industrial Safety and Inspection Department		JICA TIC
14-May	Sat		Assemble data				JICA TIC
15-May	Sun	15:00 ~ 16:00 16:00 ~ 17:18	Move to Tokyo station Move to Koriyama by Shinkansen	Mr. Kashima Mr. Sueoka		JICA Bus JR East	Hotel in Koriyama City
16-May	Mon	9:00 ~ 12:00	Visit to Ohtakine Underground Limestone Mine	Mr. Tanabe	Bihoku Hunka Co., Ltd	Minibus	Hotel in Utsunomiya City
17-May	Tue	9:00 ~ 13:30	Visit to Tailing Dam and Mine water Treatment Facility	Mr. Yamazaki	Furukawa Co., Ltd Asho Works	Minibus	Hotel in Sano City
18-May	Wed	9:00 ~ 13:00	Visit to Opencut Limestone Mine Return to TIC	Mr. Matsumoto	Nittetsu Mining Co., Ltd Hanetsuru Mine	Minibus	JICA TIC
19-May	Thu		Assemble data and Prepare the Presentation				JICA TIC
20-May	Fry	13:00 ~ 16:00 16:30 ~ 18:30	Presentation of Short term Training Farewell Party	Each Members			JICA TIC
21-May	Sat	21:40	TIC to Narita Airport Departure from Narita Airport			JICA Bus MH 071	

JICA TIC JICA Tokyo International Center 49-5 Nishihara 2-choume, Shibuya-ku, Tokyo 151-0066, Japan Tel: +81-3-3485-7635  
JICA Training Coordinator Mr. Kouta Fukuhara

#### 2.1.1.8 The Seventh visit (from June 20 to July 15, 2016 (4 weeks))

(1) JICA short-term experts (STEs): S. Kashima S. Sueoka and A. Aoki

(2) The outline of actual results:

- The number of times of lectures: 9 times
- The number of times of indoor exercises: 2 times
- OJT on handling the equipment for inspection
- Others: 2 times (arrangement of date for lectures and indoor exercises: 1 time, and a brief presentation: 1 time)

(3) The points of lectures, indoor exercises and OJT

STEs conducted lectures following items to WT members based on the prepared documents of the Manual that translated into not only Khmer language but also English, and lectured and conducted indoor exercises based on the instructions that translated into English.

1) Lectures on Mine Safety Inspection Manual (vol. 1: prevention of mine disaster)

STEs gave the technical guidance to WT members about the mine safety inspection manual (vol. 1: prevention of mine disaster that was composed preparation prior to conducting a general inspection (prevention of mine disaster), conducting a general inspection regarding hearing, confirmation and guidance to the safety supervisor at a mine, main items for a general inspection regarding mine facilities and working places, and drafting and reporting of a general inspection (prevention of mine disaster) using the form and so on, and took Q&A through lectures for 9 times.

2) OJT on handling the equipment for inspection

a) STEs gave the technical guidance to WT members about handling all equipment for inspection that were supplied by JICA as required equipment from MME/GDMR for implementation of the project, and took Q&A through lectures for 2 times.

STEs also gave the technical guidance to WT members about putting together the equipment following the instructions and checking starting devices of the equipment through indoor exercises for 2 times.

b) STEs conducted OJT on handling the equipment for inspection concerning measurement of water quality, dust concentration and noise levels, and confirmation of measurement points using GPS that were all supplied equipment with JICA's long term expert at a quarry mine (the concessionaire is Thy Loo Construction) at Kampong Chhnang province for 1 time (1 quarry mine).



Measurement exercise of water quality



Measurement exercise of vibration and noise level at the border of the mine

(4) Activities on WT members of mine safety

Some numbers of WT members of GDMR and Legal Department were replaced, and

eight (8) of WT members were finally maintained this time, and attendances to lectures, indoor exercises and OJT were good conditions and they were attentively engaged in the study of lectures, indoor exercises and OJT.

(5) Relevant matters

STEs requested WT members for preparation of lists and outline of licensed mines in Cambodia according to the format because the data of the mines would be used for a general inspection based on the “designing a policy for an annual inspection plan” until next visit.

2.1.1.9 The Eight visit (from August 22 to September 9, 2016 (3 weeks))

(1) JICA short-term experts (STEs): S. Kashima and A. Aoki

(2) The outline of actual results:

- The number of times of lectures: 8 times
- The number of times of indoor exercises: 1 time
- Consideration and guidance about contents of a draft of Mine Safety Law prepared by GDMR: 4 times
- Others: 2 times (arrangement of date for lectures, indoor exercises and OJT: 1 time, and a brief presentation: 1time)

(3) The points of lectures and indoor exercises

STEs conducted lectures and indoor exercises about following items to WT members based on the prepared documents of the Manual that translated into not only Khmer language but also English.

1) Lectures on Mine Safety Inspection Manual (vol. 2: prevention of mine pollution)

STEs gave the technical guidance to WT members about the mine safety inspection manual (vol. 2: prevention of mine pollution that was composed of preparation prior to conducting a general inspection (prevention of mine pollution), conducting a general inspection regarding hearing, confirmation and guidance to the safety supervisor at a mine, main items for a general inspection regarding mine facilities and working places, and drafting and reporting of a general inspection (prevention of mine pollution) using the form concerning a waste stone dump, a slag dump and a tailings dam, of mine water and wastewater, and of noise and vibration and so on, and took Q&A through lectures for 7 times.

STEs also gave the technical guidance to WT members about compiling data, and the measurement methods of noise levels and vibration levels using a noise level meter and a vibration level meter that were supplied to MME/GDMR by JICA through an indoor exercise for 1 time.



- 2) Lectures and collaboration work with WT members regarding the “Designing a Policy for an Annual Inspection Plan at Mines”
  - a) STEs gave the technical guidance about the designing a policy for an annual inspection plan on mines that was composed of factors on classification of mines and decision of frequency for a general inspection at mines, and took Q&A through a lecture for 1 time.
  - b) STEs collaborated work with WT members on classification of mines for a general inspection that WT members collected information and data of licensed mines in Cambodia and made a draft of an annual inspection plan using “Designing a Policy for an Annual Inspection Plan at Mines”.
- (4) Support and guidance on constitution of drafting Mine Safety Law prepared by GDMR
 

STEs gave support and technical guidance on constitution of drafting Mine Safety Law prepared by GDMR, and took Q&A about interpretation of provisions, and made amendments of provisions of the drafting Law for 4 times .
- (5) Activities on WT members of mine safety
 

Some numbers of WT members of GDMR and Legal Department were replaced, and ten (10) of WT members were maintained this time, and attendances to lectures and an indoor exercise were generally good conditions
- (6) Relevant matters
 

STEs requested WT members to choose suitable mines for OJT on a general inspection (prevention of mine disaster and of mine pollution) until next visit based on the results of classification of mines and an annual inspection plan for a general inspection above.

#### 2.1.1.10 The Ninth visit (from October 10 to November 4, 2016 (4 weeks))

- (1) JICA short-term experts (STEs): S. Kashima and A. Aoki
- (2) The outline of actual results:
  - The number of times of lectures: 4 times
  - The number of times of an indoor exercise: 1 time
  - OJT on a general inspection using mine safety inspection manuals at open-pit mines: 2 times (2 mines) (measurement of noise levels, vibration levels and scattered dust concentration, and survey of safety conditions using risk management manual)
  - Preparation, making a report and announcement of OJT on a general inspection: 2 times
  - OJT on a special inspection (survey of mine disaster caused by rock collapse): 1 time (1 mine)

- Preparation, consideration of causes and countermeasures against the mine disaster, making reports and announcements of OJT on a special inspection: 3 times
- Others: 3 times (arrangement of date for lectures and indoor exercises: 1 time, arrangement for OJT and Workshop: 1time, and a brief presentation: 1time)

(3) The points of lectures

STEs conducted lectures and indoor exercises about following items to WT members based on the prepared documents of the Manual that translated into not only Khmer language but also English.

1) Lectures regarding the Manual on mine safety inspection (vol. 2: prevention of mine pollution)

STEs gave the technical guidance to WT members about the mine safety inspection manual (vol. 2: prevention of mine pollution that was composed of preparation prior to conducting a general inspection (prevention of mine pollution), conducting a general inspection regarding hearing, confirmation and guidance to the safety supervisor at a mine, main items for a general inspection regarding mine facilities and working places, and drafting and reporting of a general inspection (prevention of mine pollution) using the form concerning mine smoke (soot) and dust, mining wastes, poisonous and deleterious substances, dioxin-kinds, and land excavation, and took Q&A through lectures for 4 times.

(4) Preparation, conducting, making reports and announcements of OJT on a general inspection (prevention of mine disaster and of mine pollution) using mine safety inspection manuals at Open-pit mines

- 1) Some of WT members reported general conditions of targeted mines to other WT members and STEs as for providing primary information, and STEs and WT members checked carrying equipment before conducting the OJT for 1 time.
- 2) STEs gave the technical guidance to WT members about the analysis & evaluation method of risk management on the results of the survey of mine safety conditions using risk management manual for mine safety, and making a report about measurements of noise levels, vibration levels and environmental dust concentration using mine safety inspection manuals by reviewing through a lecture and an indoor exercise for 1 time.
- 3) STEs conducted OJT on a general inspection (prevention of mine disaster and of mine pollution) concerning measurement of dust concentration, noise levels and vibration levels at boundary of two (2) mines and conducting the survey of mine safety conditions with the JICA's long term expert, seven (7) staffs of WT members and two (2) staffs of PDME at an open-pit lime stone mine (the concessionaire is Cambodia

Cement Chakrey Ting Factory Co., Ltd.) and an open-pit quarry mine (the concessionaire is Hok Chenda Construction) in Kampot Province for 2 times (2 mines).

- 4) WT members made reports of OJT on a general inspection (prevention of mine disaster and of mine pollution) and had announcements of the contents, STEs advised on WT members' announcements instead for 1 time.



Measurement of environmental dust concentration at near the Limestone mine



Measurement of vibration levels by blasting at the entrance of the quarry

- (5) Preparation, conducting, making reports and announcements of OJT on a special inspection (the survey of mine disaster caused by rock collapse) using mine safety inspection manuals at an open-pit mine, and consideration of causes and countermeasures against the mine disaster (An additional item)
  - 1) GDMR requested STEs to give the technical guidance about the survey of mine disaster that was caused by rock collapse at a quarry mine to WT members, and STEs conducted the survey of mine disaster by added as "OJT on a special inspection"
  - 2) One of WT members reported general conditions of targeted quarry mine to other WT members and STEs as for providing primary information before execution of OJT on a special inspection (the survey of mine disaster caused by rock collapse), and STEs and WT members checked carrying equipment before conducting the OJT for 1 time.
  - 3) STEs conducted OJT on a special inspection (the survey of mine disaster caused by rock collapse) with the JICA's long term expert, seven (7) of WT members and one (1) staff of provincial DME at an open-pit quarry mine (the concessionaire is Lim Heng) in Banteay Meanchey province for 1 time (1 mine)
  - 4) STEs and WT members took consideration of causes and countermeasures against the mine disaster for 1 time.
  - 5) WT members made reports of OJT on a special inspection (the survey of mine disaster caused by rock collapse) and had announcements of the contents, STEs advised on WT

members' announcements instead for 1 time.



The excavator crushed under the rock collapse



Condition of the remained high-wall  
There are a lot of joints and cracks

(6) Activities on WT members of mine safety

Two (2) WT members were decreased and eight (8) of them were maintained this time, and attendances to lectures, an indoor exercise were generally good conditions, and they were engaged attentively in the OJT on a general inspection (prevention of mine disaster and of mine pollution) and the OJT on a special inspection (the survey of mine disaster caused by rock collapse).

(7) Relevant matters

- 1) STEs requested WT members to prepare documents of general workload in the present five (5) Departments of GDMR for the sake of considering suitable authorized government body at the time of enforcement of Mine Safety Law until next visit.
- 2) STEs requested WT members to make a draft of announcement in the Second workshop until next visit.

2.1.1.11 The Tenth visit (from November 28 to December 23, 2016 (4 weeks))

(1) JICA short-term experts (STEs): S. Kashima and A. Aoki

(2) The outline of actual results:

- The number of times of lectures: 5 times
- Consideration and collaboration work on “Support for establishment of supervised governmental structures that are suitable for the enforcement of Mine Safety Law and its regulations”: 3 times
- OJT on a general inspection using mine safety inspection manuals at underground mines: 2 times (1 mine and two (2) of illegal mining places)  
(measurement of underground dust concentration, the survey of safety conditions and wastewater samplings)
- Preparation, an indoor exercise, making reports and announcements of OJT on a

general inspection: 3 times

- Collaboration work on editing the “Guidebook on Mine Safety” with Cambodian version: 3 times (An additional item)
- Support and guidance for drafting presentation manuscripts on the “Joint Workshop between MME/GDMR and JICA”: 2 times
- Others: 3 times: (arrangement of date for lectures and OJT: 1 time, arrangement for Workshop: 1time, and a brief presentation: 1time)

(3) The points of lectures, consideration and collaboration work

STEs conducted lectures, consideration and collaboration work and indoor exercises about following items to WT members based on the prepared documents that translated into not only Khmer language but also English.

1) Lectures regarding “Promotion of enlightening campaigns for mine safety”

STEs gave the technical guidance to WT members about the “Promotion of enlightening campaigns for mine safety” that was composed of safety promotion activities at mines in Japan such as producing videos and guide books on mine safety, making better use of education materials, introducing mine safety educational activities by home page, and continuous development of enlightening campaigns for mine safety by setting up “National mine safety week” and so on, and took Q&A through a lecture for 1 time.

STEs also introduced some videos on mine safety and “Mine Safety Guidebook” for the purpose of the “Promotion of enlightening campaigns for mine safety”

2) Lectures regarding “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”

STEs gave the technical guidance to WT members about the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” that was composed of following articles and items, and took Q&A through a lecture for 1 time.

- a) Items, period and contents of training to mineworkers who engage in the hazardous works
- b) Standards of the inspection and official tests for particularly dangerous machinery, equipment, explosives, and other materials using at mines
- c) The fixed form of notification of safety rules to administration authority
- d) The contents of specifications that are established in the safety rules
- e) A model case of “Safety Rules at ABE mine”

3) Lectures, consideration and collaboration work regarding “Support for establishment of supervised governmental structures that are suitable for the enforcement of Mine

Safety Law and its regulations”

- a) WT members reported current administrative duties of GDMR.
  - b) STEs gave the technical guidance to WT members about required workload and staffs involved in enforcement of Mine Safety Law and its regulations, and took Q&A through lectures for 3 times.
  - c) STEs collaborated work with WT members to classify the duties into the suitable Department(s) of GDMR and to consider required workload and staffs for the establishment of supervised governmental structures of future GDMR for 3 times.
- (4) Preparation, conducting, making reports and announcements of OJT on a general inspection (prevention of mine disaster and of mine pollution) using mine safety inspection manuals at underground mines
- 1) One of WT members made documents and reported general conditions of targeted mine to other WT members and STEs as for providing primary information, and STEs and WT members checked carrying equipment before conducting the OJT for 1 time. WT members asked for an on-site inspection of illegal mining places around the targeted mine to STEs.  
After confirmation of safety for conducting an on-site inspection of illegal mining places, STEs decided to conduct the on-site inspection like as OJT on a general inspection at illegal mining places, too.
  - 2) STEs gave the technical guidance to WT members about taking notes, main items and technical know-how of a general inspection in case of an underground mining through a lecture, and measurements of underground dust concentration by reviewing through an indoor exercise for 1 time.
  - 3) STEs conducted OJT on a general inspection (prevention of mine disaster and of mine pollution) concerning the survey of safety conditions and measurement of underground dust concentration in the tunnels, and conducted the survey of safety conditions at processing plant and a tailings dump at metallic mine (the concessionaire is Phu Yang Co., Ltd.) with the JICA’s long term expert, five (5) of WT members and three (3) staffs of provincial DME in Battambang province for 1 time (1mine).  
STEs and WT members also conducted an on-site inspection as OJT on a general inspection at two of illegal mining places, and processing plants including heap leaching using cyanide, and had water samplings at a wastewater pond near processing plants for 1 time (2 of illegal mining places).
  - 4) WT members made reports of OJT on a general inspection (prevention of mine disaster and of mine pollution) and had announcements of the contents, STEs advised on WT members’ announcements instead for 2 times.



XJ1 Pit Mouth in Phu Yang Mine



Water sampling from the pond of illegal mine

(5) Collaboration work on editing the “Guidebook on Mine Safety” with Cambodian version  
(An additional item)

- 1) STEs made suggestions about editing a guidebook on mine safety in Cambodian version for practical use of education material to mineworkers and effectiveness on safety promotion activities at mines, WT members agreed about editing work.
- 2) STEs collaborated work with JICA long-term expert and WT members to select illustrations and edit, and WT members also translated into Khmer language of a rough draft for 3 times.

(6) Support and advice about making presentation manuscripts on the “Joint Workshop between MME/GDMR and JICA”

- 1) WT members prepared presentation manuscripts on the Joint Workshop.
- 2) STEs advised the contents of the manuscripts that WT members made for 2 times.

(7) Activities on WT members of mine safety

Eight (8) of WT members were maintained this time, and attendances to lectures and OJT were generally good conditions, and they engaged attentively in editing the “Guidebook on Mine Safety” and preparation of presentation manuscripts on the Joint Workshop.

STEs estimated that WT members were well understanding of OJT on a general inspection (prevention of mine disaster and of mine pollution) and learned the skills of preparing, conducting, making reports and announcing of the OJT this time than before.

(8) Proposal matters

- 1) STEs considered that the most concessionaires and mineworkers at mines and quarries were lack of understanding on “Safety” and “Preservation of Environment” because a lot of dangerous or unsafe acts were found around mineral working fields and mine facilities during conducting OJTs with WT members.

In order to improve the issues above, the promotion of following voluntary safety

activities taken the lead by GDMR is a top priority to uplift mine safety awareness of the concessionaires and mineworkers at mines and quarries.

- a) To supervise and guide the establishment of the own “Safety Rules” by the concessionaires at mines and quarries that employ a certain scale number of mineworkers, and promotion of voluntary safety activities in accordance with their own Rules
- b) To hand out the “Guidebook on Mine Safety” edited by WT/GDMR and JICA experts to the mines and quarries of the whole country, and to conduct seminars on training methods about “Mine Safety” to the concessionaires or the chief of mines and quarries using the guidebook and safety videos.

And, to instruct the concessionaires to carry out the safety training for their mineworkers with making better use of the guidebook for heightening awareness of security.

- 2) It is important that the local inhabitants who operate illegal mining and collecting (smelting) gold ores as for method of amalgam using the mercury or of heap leaching using cyanide should be understood to cause not only hazardousness to the human body but also occurrence of serious environmental pollution problems around areas, and as soon as possible to consider the measures against using toxic substances. The measures on the transition to a legitimate mining, prohibition of using mercury, proper technical guidance for heap leaching with cyanide by dispatched processing specialty and conducting general inspections regularly by the administration authority are comprehensive solution.

#### (9) Particular matters

At a meeting of the brief presentation, Mr. Tina Dith, the Secretary of State of Mines and Energy (MME), and the Project Director of the JCC explained that a drafting Mine Safety Law was coordinated formation and articles in the Ministry, and a draft of the Law was going to be reported to the Minister until February 2017.

#### 2.1.1.12 The Eleventh visit (from January 30 to February 24, 2017 (4 weeks))

(1) JICA short-term experts (STEs): S. Kashima, H. Takahata and A. Aoki

(2) The activities:

- Lectures regarding “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” and “Management and sharing of mine safety information such as inspection results (reports) of mines between GDMR and PDMEs”: 4 times
- Collaboration work on editing the “Guidebook on Mine Safety”: (An additional item):



3 times

- Support and guidance about making presentation manuscripts on the “Joint Workshop between MME/GDMR and JICA”: 3 times
- Proposal and consideration on “Establishment of supervised governmental structures involved in the enforcement of Mine Safety Law and its regulations”: 1 time
- Support and guidance about drafting Mine Safety Law prepared by GDMR: 1 time
- Holding the Joint Workshop (the 2nd times) between MME/GDMR and JICA: 1 time
- Holding the Joint Coordinating Committee (the 3rd times): 1 time
- Others: 4 times (arrangement of date for lectures: 1 time, preparing workshop and JCC: 3 times)

(3) The points of lectures, consideration, collaboration work, support and guidance

STEs conducted lectures, consideration, collaboration work, support and guidance about following items to WT members based on the prepared documents that translated into not only Khmer language but also English.

1) Lectures regarding “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”

STEs gave the technical guidance to WT members about the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” that was composed of from article 1 to article 28 including following items, and took Q&A through lectures for 3 times.

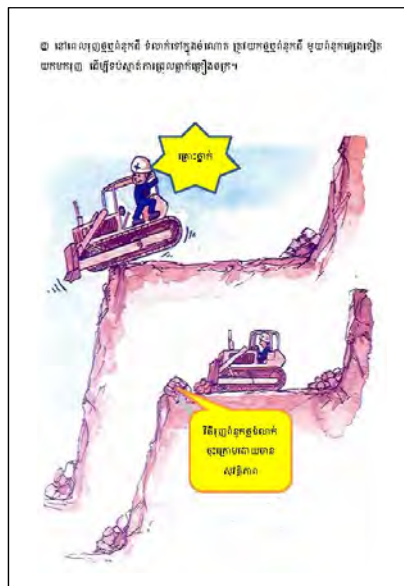
- a) The items mentioned on the “Facility Plan” that a concessionaire drafts and submits for permission when mine buildings, structures or other facilities shall be established or modified for use in mineral-related operations complying with the form.
- b) Items mentioned on the “Appointments” that a concessionaire drafts and submits for notification when the safety supervisor and its representative are appointed at a mine complying with the form.
- c) Items mentioned on the “Contractual Work Plan” that a concessionaire drafts and submits for notification when the concessionaire makes a deal with a contractor other than a mineworker to be engaged at working places of a mine complying with the form.
- d) Items mentioned on the “Mine Pollution Prevention Measures” that the concessionaire drafts and submits for notification with regard to prevention of mine pollution from mine facilities such as a waste stone dump, a slags dump, and a tailings dam, and tunnels (a level, an inclined shaft and a vertical shaft) for when mines are closed in the future complying with the form.

- e) Items mentioned on the “Monthly Safety Report” that a concessionaire drafts and submits for notification regarding safety conditions of mineral working fields and occurrence of mine disasters and accidents at a mine every end of month complying with the form.
  - f) Items mentioned on the “Mine Safety Diagram” that the concessionaire draws-up and submits for notification regarding present conditions of mineral-related operations as of every end of December complying with the form, and so on.
- 2) Collaboration work on editing the “Guidebook on Mine Safety” in Cambodian version (An additional item)

STEs collaborated work with JICA long-term expert and WT members on editing the “Guidebook on Mine Safety” in Cambodian version for 3 times.



Front cover of “Guidebook on Mine Safety”



Sample page of “Guidebook on Mine safety”

- 3) Support and guidance to WT members about presentation manuscripts of the “Joint Workshop (the 2nd time) between MME/GDMR and JICA”
- STEs gave the technical guidance to WT members about contents presentation manuscripts of the Joint Workshop for 3 times.
- 4) Proposal and consideration on “Establishment of supervised governmental structures involved in the enforcement of Mine Safety Law and its regulations”
- a) STEs prepared a proposal on the establishment of supervised governmental structures of future GDMR based on consideration and collaboration work with WT members former time.
  - b) STEs held a meeting with executives of MME/GDMR about consideration of supervised governmental organization of future GDMR involved in the

enforcement of Mine Safety Law and its regulations based on the proposal above for 1 time.

- 5) A lecture regarding “Management and sharing of mine safety information such as inspection results (reports) of mines (quarries) between GDMR and provincial DMEs”
  - a) STEs prepared documents concerning management and sharing of mine safety information such as inspection results (reports) of mines (quarries) between GDMR and provincial DMEs based on the results of a conference with data base team.
  - b) STEs gave a technical guidance to WT members about considering how to effective and efficient methods concerning management and sharing of mine safety information between GDMR and provincial DMEs through a lecture, and took Q & A for 1 time.
- 6) Support and guidance about drafting Mine Safety Law prepared by GDMR  
STEs gave support and guidance about drafting Mine Safety Law prepared by GDMR for 1 time.
- 7) Holding the Joint Workshop (the 2nd time) between MME/GDMR and JICA  
STEs made arrangements with MME/GDMR for holding the Joint Workshop (the 2nd time) for 1 time.
- 8) Holding the Joint Coordination Committee (the 3rd time)  
STEs made arrangements with MME/GDMR for holding the Joint Coordination Committee (the 3rd time) for 1 time.

### **2.1.2 Outcome**

- (1) Formulation of drafting Mine Safety Law and applicable regulations
  - 1) Drafting Mine Safety Law
    - a) Technology transfers about formulation of “drafting Mine Safety Law” composed of 40 provisions that were conducted through lectures during the 2nd visit.
    - b) Support and guidance on drafting Mine Safety Law prepared by GDMR that were conducted during the 8th visit and 11th visit.
  - 2) Drafting Mine Safety Regulation (phase 1)  
Technology transfers about formulation of “drafting Mine Safety Regulation (phase 1)” composed of 291 provisions that were conducted through lectures during the 3rd, 4th and 5th visit.
  - 3) Drafting Mine Safety Regulation (phase 2)  
Technology transfers about formulation of “drafting Mine Safety Regulation (phase 2)” composed of 31 provisions that was conducted through lectures during the 5th visit.

4) Drafting Regulation on Procedures and Items of in Mine Safety Law and its Regulations

Technology transfers about formulation of “drafting Regulation on Procedures and Items of Mine Safety Law and its Regulations” composed of 28 provisions that were conducted through lectures during the 10th and 11th visit.

5) Drafting Mine Safety Inspection Rule

Technology transfers about formulation of “drafting Mine Safety Inspection Rule” composed of 9 provisions that were conducted through lectures and indoor exercises during the 5th visit.

(2) Establishment of enforcing system of the Law and applicable regulations

1) Manual on Measurement and Evaluation of dust Concentration at Mines

Technology transfers about the “Manual on Measurement and Evaluation of Dust Concentration at Mines” that were conducted through lectures and indoor exercises during the 6th visit.

2) Manual on Risk Management for Mine Safety

Technology transfers about the “Manual on Risk Management for Mine Safety” that were conducted through lectures and indoor exercises during the 6th visit.

3) Manual on Mine Safety Inspection (Vol. 1 prevention of mine disaster)

Technology transfers about the “Mine Safety Inspection Manual (Vol. 1: prevention of mine disaster)” that were conducted through lectures and indoor exercises during the 7th visit.

4) Manual on Mine Safety Inspection (Vol. 2 prevention of mine pollution)

Technology transfers about the “Mine Safety Inspection Manual (Vol. 2: prevention of mine pollution)” that were conducted through lectures and indoor exercises during the 8th and 9th visit.

5) Designing a Policy for an Annual Inspection Plan at Mines

Technology transfers about “Designing a Policy for an Annual Inspection Plan at Mines” that were conducted through lectures, and collaboration work with WT members during the 8th visit.

6) Support for Establishment of Supervised Governmental Structures involved in the Enforcement of Mine Safety Law and its Regulations

Technology transfers about “Support for Establishment of Supervised Governmental Structures involved in the Enforcement of Mine Safety Law and its Regulations” that were conducted through lectures, collaboration work with WT members and consideration during the 10th and 11th visit.

7) Management and Sharing of Mine Safety Information such as Inspection Results of

## Mines between GDMR and PDMEs

Technology transfers about “Management and Sharing of Mine Safety Information such as Inspection Results (Reports) of Mines between GDMR and PDMEs” were conducted through a lecture during the 11th visit.

### (3) Strengthening of capacity of inspections

#### 1) OJT on handling the equipment for inspection at open-pit mine

OJT on handling the equipment for inspection at an open-pit mine was conducted after explaining the instructions and checking starting devices of all equipment that were supplied by JICA through lectures and indoor exercises during the 7th visit.

#### 2) OJT on a general inspection using mine safety inspection manuals at open-pit mines

OJT on a general inspection using mine safety inspection manuals at open-pit mines were prepared, conducted, made reports and announced the results of the measurement of noise levels, vibration levels, scattered dust concentration, and survey of safety conditions by WT members, and staffs of PDME participated the OJT during the 9th visit.

#### 3) OJT on a general inspection using mine safety inspection manuals at underground mines

OJT on a general inspection using mine safety inspection manuals at underground mines were prepared, conducted, made reports and announced the results of the measurement of underground dust concentration in the tunnels, and the survey of safety conditions by WT members, and staffs of PDME participated the OJT during the 10th visit.

#### 4) OJT on a special inspection (survey of mine disaster caused by rock collapse) using mine safety inspection manuals at open-pit mines (An additional item)

OJT on a special inspection (the survey of mine disaster caused by rock collapse) using mine safety inspection manuals at an open-pit mine was prepared, conducted, considered causes and countermeasures against the disaster, made reports and announced the results of the survey by WT members, and staffs of PDME participated the OJT during the 9th visit.

### (4) Promotion of enlightening campaigns for mine safety

#### 1) Joint Workshop between MME/GDMR and JICA

Two times of the “Joint Workshop between MME/GDMR and JICA” were held. At first time (14<sup>th</sup> Dec. 2015), a STE gave a lecture titled “Outline of drafting Mine Safety Law and its Regulations”, and for Second time (21<sup>st</sup> Feb. 2017) STEs supported and advised about making presentation manuscripts to WT members during the 10th and 11th visit.

2) Promotion of Enlightening Campaign for Mine Safety in Japan

Introduction of “Promotion of Enlightening Campaigns for Mine Safety in Japan” was conducted during the 10th visit.

3) Editing Guidebook on Mine Safety in Cambodian version (An additional item)

Collaboration work with JICA long-term expert and WT members on editing the “Guidebook on Mine Safety” in Cambodian version for practical use of education material to mineworkers and effectiveness on safety promotion activities at mines were conducted during the 10th and 11th visit.

## **2.2 Database development for mining management**

### **2.2.1. Visits of Database Team**

(1) First visit

Schedule: 11 Jan 2015 to 24 Jan 2015 (14 days)

JICA experts: Onuma and Suzuki

(2) Second visit

Schedule: 8 Mar 2015 to 21 Mar 2015 (14 days)

JICA experts: Onuma

Schedule: 8 Mar 2015 to 11 Apr 2015 (35 days)

JICA experts: Suzuki

(3) Third visit

Schedule: 17 May 2015 to 4 Jun 2015 (49 days)

JICA experts: Ninomiya

(4) Fourth visit

Schedule: 25 Oct 2015 to 19 Dec 2015 (56 days)

JICA experts: Suzuki and Ninomiya

Schedule: 6 Dec 2015 to 19 Dec 2015 (14 days)

JICA experts: Onuma

(5) Fifth visit

Schedule: 31 Oct 2016 to 12 Nov 2016 (13 days)

JICA experts: Onuma, Ninomiya

Schedule: 31 Oct 2016 to 9 Nov 2016 (10 days)

JICA experts: Hara

(6) Sixth visit (Final visit)

Schedule: 12 Feb 2017 to 25 Feb 2017 (14 days)

JICA experts: Onuma, Suzuki

### 2.2.2. Activities of Database Team

(1) Formulate the Working Team for building database

For building database, Working Team (WT) with collaboration of JICA Short-term Experts (STEs) was formulated. The members are selected from all five departments, by one or two members per department, which enables to cover all kind of data to be stored in database such as cadastral information, mine information, mineral resource information. Team leader is Mr. Sieng Sotham, Director of Department of Geology. List of members is shown in Table 2.2.1 at starting time, and Table 2.2.2 at final time. Some members are changed due to study abroad in university's higher course in Japan or Australia.

Table 2.2.1 List of working team member for database (at starting time)

Department (Dept.)	Name	Reason of replacement
Director of Dept. of Geology	Sieng Sotham (Leader)	
Dept. of Geology	Rathborith	Master course of Waseda Univ, Japan
Dept. of Mineral Resources Development and Promotion	Ol Ratana	
Dept. of Mineral Exploration Management	Ou Chak Ny Pharorth	
Dept. of Construction Material	Mak So Chetra	
Dept. of Mining	Loeung Vanmonyrak Kong Sitha	Study in Australia Mine Safety Law Team

Table 2.2.2 List of Working team member for database (at final time)

Department (Dept.)	Name
Director of Dept. of Geology	Sieng Sotham (Leader)
Dept. of Geology	Yang Virinrath
Dept. of Mineral Resources Development and Promotion	OI Ratana
Dept. of Mineral Exploration Management	Ou Chak
	NY Pharorth
Dept. of Construction Material	Mak So Chettra
	Seng Darathin
Dept. of Mining	Uy Rith
	Ou Narath

(2) Review the mine information that GDMR holds

Working Team reviewed existing information held by GDMR and each department, and the stored format (e.g., paper document or digital).

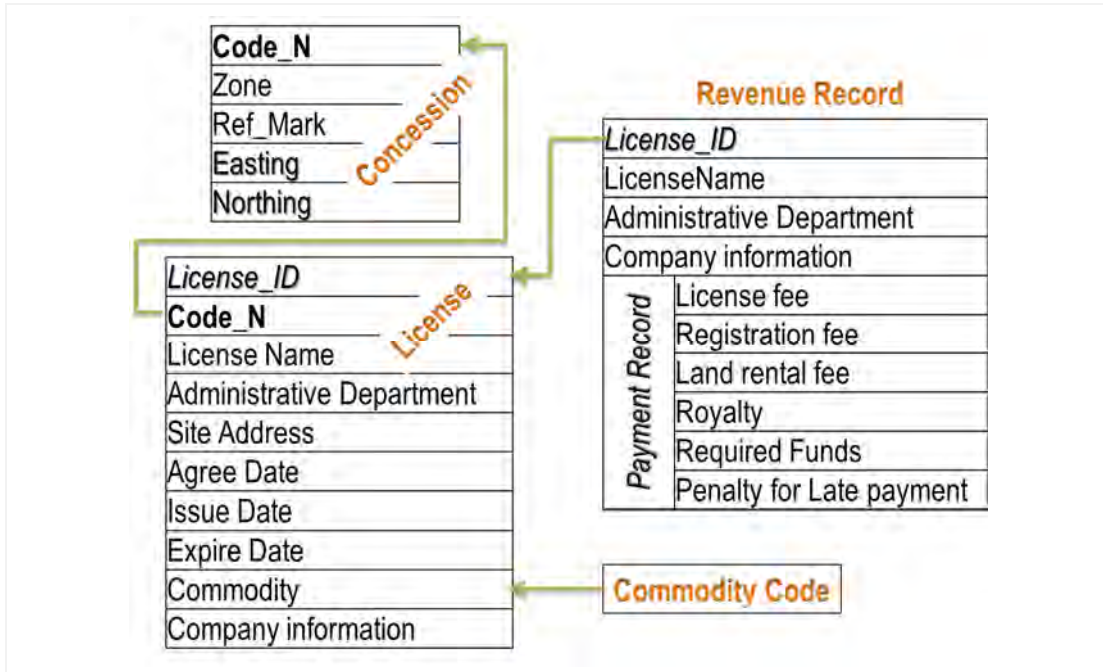
(3) Clarification of information necessary for database

Working Team selected the following items to be input for database through team meeting.

- 1) Cadastral information (Concession, X, Y coordinates, License period, validity, owner company), Mine operation data held by Dept. Mining,
- 2) Revenue data
- 3) Mineral resource data and geology data
- 4) Basic Country information (as national basemap, Elevation contour, River, Administrative boundary, Road, Port and airport, Protect area, Satellite images, Aerial photos, UXO and Mine distribution,...)
- 5) Common data over department: Commodity code, Manuals for database
- 6) Mine safety inspection data/reports



Table 2.2.3 Input items and relationship between data tables



In Table 2.2.3, arrow shows a key item to join between tables. Joining enables us to look revenue data relevant to the concession, directly from concession map. Working team defined key items to join two tables. It requires to consist of unique value to join.

- 1) License Number/Name: This original number/name is described on license certificate in Khmer language. It consists of both issuer's name/sector and serial number which is reset year by year. Therefore, duplicate license name appears sometimes even in the same department. Impossible to use this License Number as key item to join.
- 2) Code number: This has been used within individual department in charge of managing license activity. It consists of two letters to distinguish department, and a serial number to start from beginning without reset over year. This is unique value in GDMR.
- 3) License ID: This is installed first time during this project to building database. For database, Department of Promotion assigns this License ID to ALL license revenue data, then distributes License ID to the relevant department. Working team has learned that Department of Promotion has been keeping entirely whole license data, while individual department responsible for mining activity has not all of data.

Conclusion for database establishment as follows:

- 1) Code number (Code\_N) should be input to both Concession data and License data, to join on GIS software (ArcMap), by individual department.
- 2) License ID should be input in Revenue data at first by Department of Promotion. Then distributed to each department. License data which License ID is added, are joined with

Revenue data on GIS software (ArcMap).

Commodity described in License is classified by construction materials, mining, exploration. When input license data, commodity code must be used, as listed in Table 2.2.4.

Table 2.2.4 Commodity code

Group	Code	Commodity	Group	Code	Commodity
11	11	Sand for construction	21	21	Metalic material
	111	River sand		211	Iron
	112	Inland sand mining		212	Gold
	113	Sea sand mining		213	Copper
12	12	Sand for filling materials	22	22	Industrial mineral
	121	River sand		221	Limestone
	122	Sea sand mining		222	White sand
13	13	Gravel		223	Phosphate
	14	14		Crushed stone mining	224
15		15	Dimension stone mining	23	23
	151	Sandstone	231		Corundum
	152	Laterite	24	24	Fuel minerals
	153	Granite		241	Coal
	154	Stone Calcite	99	99	ASM
	155	Diorite		991	Gem
	156	Andesite		992	Gold
	157	Marble		993	Crush stone
16	16	Ornamental stone	994	Gravel	
	161	Pagodite	995	Sand	
	162	Chalcedony	996	Soil	
17	17	Soil	2#: group for Mining & Exploration 99: group for Municipal/Small scale mining		
18	18	Red soil (Laterite)			

1#: group for Construction Material

#### (4) Establishment of a database management system

Database must be stored in Server computer, updated by responsible officers and accessible by users within GDMR through LAN. Server has been installed since late 2016 in the Server room of GDMR office but LAN has not yet at the time of final visit in Feb 2017. The reconstruction inside GDMR office might affect Server and network setting delayed.

Setting of Server and first storage of database in Server were conducted in Nov 2016 through OJT by JICA experts. Last update of database in Server was conducted during

the last visit in Feb 2017, by JICA experts (Onuma, Suzuki), and database working team member (leader Sotham, a member of Department of Promotion).

IT sector stands outside GDMR but under MME. The issue to build management system on database is outstanding. Collaborating work is desired among Server administrators and Database managing officers and possibly network managers.

JICA experts presented an example model for management and update of database, and described in Manual on database management (see Apx).

A proposed structure for database management:

- 1) Establishment of IT/database section, with the top responsibility by General Director of GDMR
- 2) The 2<sup>nd</sup> responsibility by individual director in charge of data of individual department and update work by appointed officers.

There are two opportunities of update required for database: One is time to change license condition such as issue cancel, relinquish, extension, probably weekly or monthly. The other is annually. GDMR is expected to decide the frequency and procedure to update.

This project covers the establishment of database. In future further issues will be considered like how allowed users access and utilize database

#### (5) Data input and correction through the OJT

Selected data described in License certificate have been input by hand by each department member of working team.

There are four templates of Excel file for input.

- 1) Concession: To input X, Y coordinates of concession vertex. Then to create from X, Y to point shapefile, using ArcGIS tools. Then to convert map projection from Indian1960 to WGS1984, using ArcGIS tools. Then to make polygon shapefile from point shapefile by correct order of RefMark, using ArcMap ETGeoWizard add-in.
- 2) License: To input such as date of agree, issue, expire of license, owner company information. It is joined into concession on map by Code number.
- 3) Revenue: To input revenue record per license. The License ID is assigned to every record at the same time. Revenue data are joined into concession map through License ID of license which is in advance joined with concession.
- 4) Mines: To input operation data, such as mining site, employee, production as GDMR get information.

There are varieties in concession shape. Firstly, each type is individually made into

individual shapefile, then finally all types in department are merged into one concession shapefile.

- 1) Concession coordinates given by UTM Indian1960 datum: Most and previous licenses use this. Projection conversion to WGS1984 is required
- 2) Concession coordinates given by UTM WGS1984 datum: Recent licenses use this.
- 3) Multiple zones or several separated concessions of a single license: To input zone name in Concession datasheet.
- 4) Line concession: Like concession along river, only two points on line are given as concession coordinates. Firstly, to make line shapefile, then make polygon shapefile through appropriate width (buffer) given to line

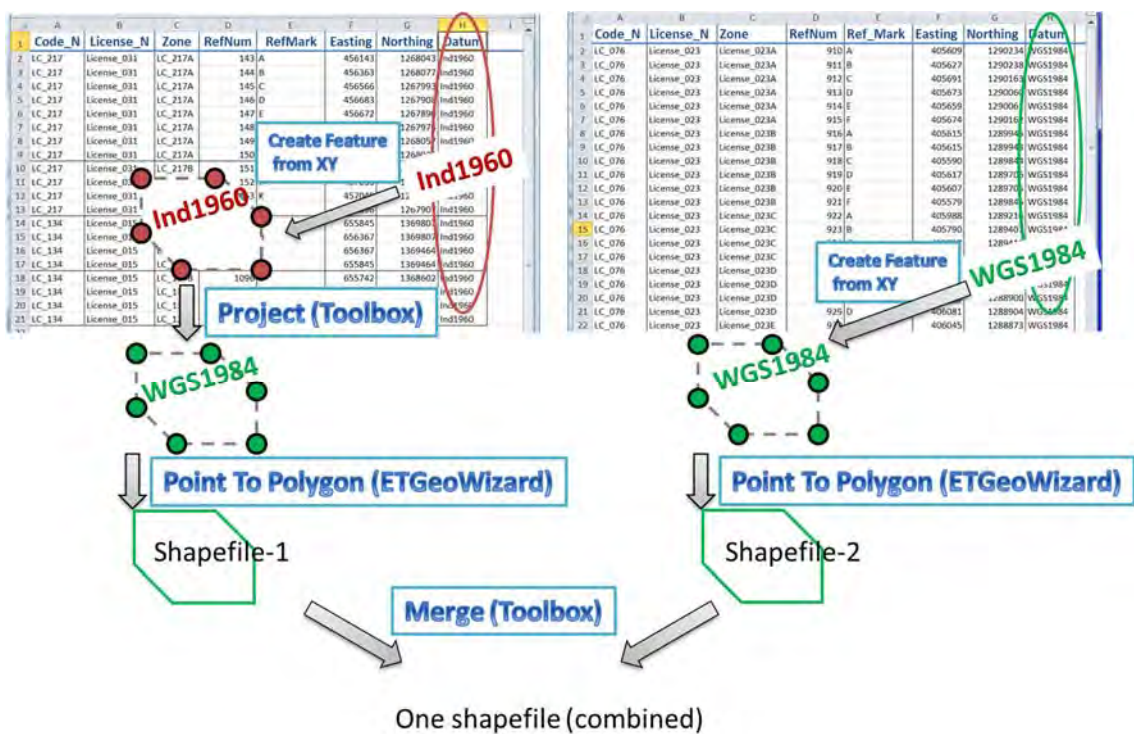


Figure 2.2.1 Workflow from input in Excel to creation of GIS file

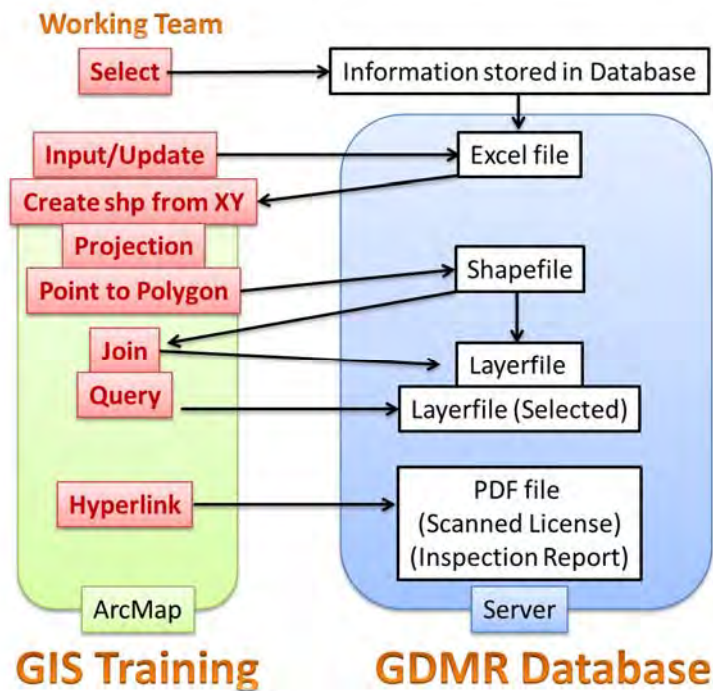


Figure 2.2.2 Workflow in establishment of GIS database

(6) Database utilization in enforcement of the mine safety law

In this project, one mine safety inspection was done with JICA mine safety working team. The report has been stored as PDF in new folder of “Inspection” of this database, where users can access from map, through hyperlink of ArcMap software by one click on the location point of inspection. These inspection data are expected to be stored in database and shared with officers of GDMR and possibly municipal officers.

(7) Creation of database manuals

Two manuals are created, distributed within database working team, and stored in database. One for management how to maintain database. The other is for operation how to create database (See Annex).

(8) Revision of database manuals

Regarding database management such as maintenance and update, the qualified personnel or system after terminate of database OJT is still under establishment. Current manual describes an example of proposed management.

It is expected to update to actual management system established by GDMR.

In operational manual, there are some updates as follows;

- Inspection Folder was prepared, where inspection report was stored.
- In geological map, legend and symbology are updated.
- In National\_data, River.shp is corrected fitting to WGS1984.
- In Template\_Concession.xls, new fields are added.
  - Zone field for Multiple zones of single license.
- Datum field for different datum of XY coordinates, Recent concessions are given on WGS1984, rather than Indian1960.
- In Dept\_Construction, Line concession is added, and merged.
- Commodity code is updated, with 2 additional commodities.
- Template\_License.xls, the 2<sup>nd</sup> commodity is added as a commodity2 field. Construction licenses can permit up to two commodities.
- License data and Concession data are joined by Code\_N.
- Revenue data and License data are joined by License\_ID.

Above are described in the first page of operational manual as Significant changes.

Additional revenue table has been designed for new revenue regulation since July 2016. Additional format for input is designed and provided to the responsible member from Department of Promotion. The project period is over before inputting and integrating to database. It is expected to do integration to database by themselves of GDMR.

#### (9) Update database through OJT and manuals

Using manuals, especially operational one, guiding procedures to create database, JICA experts provide OJT, software demonstration, presentation, and trouble-shooting, as well as proposal on management as an example.

The following updates were achieved during final visit.

##### [1] Geological Survey Map Legend Updated

Legend and symbology for the geological map was added.

##### [2] License Data Added

The license data were added and updated. When a change occurs in operation site, existing license data are updated. Input work is done by responsible team member of Department of Mineral Resources Development & Promotion.

#### (10) Additional Support relevant to Database Work

[1] Support for Server Setup (Nov 2016)

Server Setting and database folder

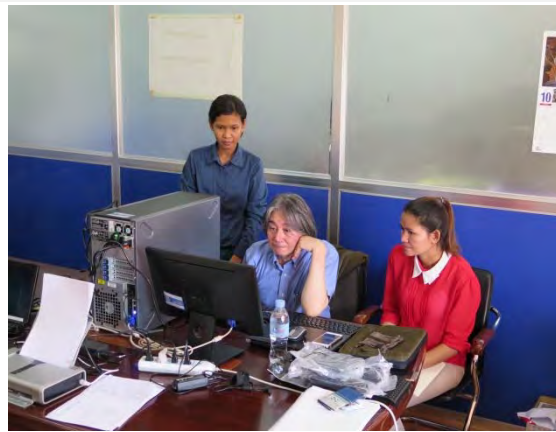
Item	Description
Server Name	DATABASE
C Drive	OS/Windows Server 2012 R2
D Drive	Top folder: Shares Lower folder: GDMR DATABASE : Back up
User Names (initial setup)	Administrator
	License Managers
	Srey mao
IP Address	192.168.10.10, 255.255.255.0, 192.168.10.1

Server user account

- The server was set up with the objective of facilitating operation as a “File server”.
- Accessing system to the server was set up so that the “database” can be accessed via a switching hub from client PCs with a wired LAN connection.
- Besides “Administrator”, two other accounts (“Srey mao” and “License Managers”) were registered as server clients.
- The access permission for the Administrator and “Srey mao” was set as “full control (read, write and save possible)”. Permission for “License Managers”, was set as “Read only”.
- After “Sign in” to the server using the respective account and password, the database which is stored in the “GDMR DATABASE” folder under “Shares” folder of D drive can be accessible.
- Only account of “Srey mao” is allowed to update the database.



Hardware items purchased by GDMR  
Server, Monitor, Keyboard, UPS



Instruction about how to Sign In to Server,  
by JICA experts



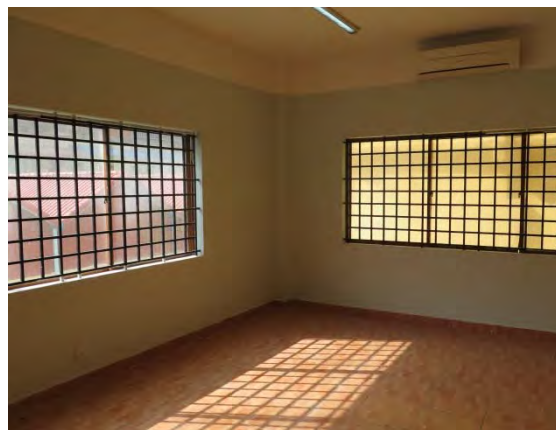
Instruction about role and utilization of  
Server  
to GDMR officer (Ms. Srey Mao)



Review on Server setting by IT technical  
staff of GDMR



Under reformation of GDMR office  
Server room designed at Right, overside



Server room,  
Not yet ready at Nov 2016.



## Server Security

The Windows firewall has been set with this server, but this has been done with the assumption that anti-virus software has been installed on the client PCs that access the server. In addition, security management is essential in the same way as client PC.

### [2] Server Database Updating Work (Feb 2017)

During the final visit, it was found that the server has been kept the last database, but the LAN cable has not been built. The server administrator and database manager to maintain and update have not been assigned yet either.

Therefore, the final updating work was performed by a JICA experts on February 24, 2017, accompanied with Director Sotham, the database team leader. The GDMR side needs to assign a server administrator and a database manager as early as possible, and create a personal system to maintain database.

### (11) Answer to Additional Requests relevant to Database Utilization

[1] Regarding the revenue, which was newly introduced from July 2016, a request to add to the database was brought by database working team. New format on Excel sheet was prepared by JICA experts and provided to the responsible member of Department of Mineral Resources Development & Promotion. Since the request occurred during the final visit, there was not enough time for input work. Further works of input, data check, integration to database by joining to license data are desired by GDMR themselves.

### [2] Requests/Responses Concerning Various Database Utilization Methods

A request for instruction was brought by GDMR side about how to get statistical data concerning the concessions of their interested topics, during the final visit. JICA experts made quick lectures and demonstrations, all available days until leaving day.

### **2.2.3. Database working team meeting**

Objectives of the meeting are as follows:

- Discussion and solution about database issue
- Lecture, software demonstration, troubleshooting by JICA experts
- Proposal from JICA expert on database construction
- Meeting with general director or directors

#### (1) First visit of Database Team

##### No.1 DBT Meeting

Date: 13 Jan 2015 (Tue) 9:00 – 11:10

Venue: JICA expert office, 4th Floor, GDMR

Participants: Ou Chak, Ratana, Pharorth, ONUMA, SUZUKI

Topics for discussion:

- Confirmation for contact information of database working team member

#### No. 2 DBWT Meeting

Date: 16 Jan 2015 (Fri) 9:00 – 10:00

Venue: Office of Sokhom 3rd floor GDMR

Participants: Sokhom, ONUMA, SUZUKI

Topics for discussion:

- Revenue information managed by Dept. Promotion
- Confirmation of coordination system

#### No. 3 DBWT Meeting

Date: 19 Jan 2015 (Mon) 9:00 – 11:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Ou Chak, Ratana, Pharorth, ONUMA, SUZUKI

Topics for discussion:

- Confirmation of GDMR data

#### No. 4 DBWT Meeting

Date: 20 Jan 2015 (Tue) 10:00 – 10:50

Venue: JICA expert office, 4th Floor, GDMR

Participants: Chettra, ONUMA, SUZUKI

Topics for discussion:

- License information managed by Dept. Construction

#### No. 5 DBWT Meeting

Date: 22 Jan 2015 (Thu) 10:00 – 10:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Vanmonyarak, ONUMA, SUZUKI

Topics for discussion:

- Concession information managed by Dept. Mining and revenue information managed by Dept. Promotion

(2) Second visit of Database Team

No. 1 DBWT general assembly

Date : 10 Mar 2015 (Tue) 9:00~12:00

Venue: GDMR meeting room 6th floor GDMR

Participants: Sotham, Chak, Pharorth, Ratana, Chetra, Vanmonyarak, Sitha, ONUMA,  
SUZUKI, Shichinohe

Topics for discussion:

- Schedule and work
- Confirmation for member's experiences on ArcMap software

No. 2 DBWT general assembly

Date : 11 Mar 2015 (Wed) 9:00~12:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Chak, Pharorth, Ratana, Chetra, ONUMA, SUZUKI, Shichinohe

Topics for discussion:

- Confirmation for GDMR data and their responsibility
- Commodity code

No. 3 DBWT general assembly

Date : 12 Mar 2015 (Thu) 14:30~16:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Borith, Chak, Pharorth, Ratana, Chetra, ONUMA, SUZUKI,  
Shichinohe

Topics for discussion:

- Template for excel data sheet

No. 4 DBWT Meeting

Date : 13 Mar 2015 (Fri) 10:10~10:30

Venue: Office of Sotham 2nd floor GDMR

Participants: Sotham, ONUMA

Topics for discussion:

- Long term training program

No.5 DBWT Meeting

Date : 13 Mar 2015 (Fri) 14:40~15:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sokhom, ONUMA, SUZUKI

Topics for discussion:

- Request for collaboration on publication of GDMR license information in future

No. 6 DBWT general assembly

Date : 17 Mar 2015 (Tue) 14:30~16:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Borith, Chak, Pharorth, Ratana, Chetra, Rith, ONUMA, SUZUKI, Shichinohe

Topics for discussion:

- Request from team member on item for data sheet
- Demonstration to show excel data on ArcMap

No. 7 DBWT Meeting

Date : 18 Jan 2015 (Wed) 8:30~11:00

Venue: GDMR meeting room 6th floor GDMR

Participants: Sotham, Borith, Chak, Pharorth, Ratana, Chetra, ONUMA, SUZUKI

Topics for discussion:

- Lecture on operating software Excel and ArcMap
- This processing will be described in the manual

No. 8 DBWT Meeting

Date : 20 Mar 2015 (Fri) 9:30~10:00

Venue: Office of Sotham 2nd floor

Participants: Sotham, ONUMA, SUZUKI

Topics for discussion:

- Confirmation for GDMR data which will be available for the database
- Some data is constructed on TNTmips

No. 9 DBWT Meeting

Date : 27 Mar 2015 (Fri) 9:00~11:00

Venue: GDMR meeting room 4th floor GDMR

Participants: Chak, Pharorth, Ratana, Chetra, SUZUKI

Topics for discussion:

- Lecture on operating software Excel and ArcMap
- This processing will be described in the manual

No.10 DBWT Meeting

Date : 31 Mar 2015 (Tue) 9:00~11:10

Venue: Dept. Geology 2nd GDMR

Participants: Borith, Chak, Pharorth, Ratana, Chettra, SUZUKI

Topics for discussion:

- Lecture on operating software Excel and ArcMap
- This processing will be described in the manual

No. 11 DBWT Meeting

Date : 6 Apr 2015 (Mon) 10:50~11:10

Venue: Office of Sotham 2nd GDMR

Participants: Sotham, SUZUKI

Topics for discussion:

- Providing data format conversion from TNTmips to ArcMap

No. 12 DBWT Meeting

Date : 8 Apr 2015 (Wed) 14:30~16:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Borith, Chak, Pharorth, Ratana, Chettra, Sarith, SUZUKI

Topics for discussion:

- Lecture on operating software Excel and ArcMap
- This processing will be described in the manual

No. 13 DBWT Meeting

Date : 10 Apr 2015 (Fri) 9:20~9:40

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, SUZUKI

Topics for discussion:

- Data format conversion from TNTmips to ArcMap
- Confirmation of data in ASEAN DB with AIST

<<Remark on the Purchase of Server by GDMR>>

Information on installation plan of Server was brought by H.E. Dith Tina, H.E. Meng Saktheara, Director Sokhom, at general project meeting held on 9<sup>th</sup> Apr and afterward private meeting.

(3) Third visit of Database Team

No. 1 DBWT Meeting

Date : 20 May 2015 (Wed) 14:30~15:30

Venue: Office of Sotham 2nd floor GDMR

Participants: Sotham, NINOMIYA

Topics for discussion:

- Confirmation of schedule and work with DBWT leader

No. 2 DBWT general assembly

Date : 22 May 2015 (Fri) 9:00~10:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Rathborith, Ou Chak, Ol Ratana, Chettra, NINOMIYA,  
Shichinohe

Topics for discussion:

- Schedule and work
- Commodity code
- Responsibility for data input work for each department

No. 3 DBWT Meeting

Date : 25 May 2015 (Mon) 9:30~10:30

Venue: Dept. Construction 3rd floor GDMR

Participants: Chettra, NINOMIYA

Topics for discussion: DBWT Meeting

- Progress for data input work
- Issue on data input work

No 4 DBWT Meeting

Date : 26 May 2015 (Tue) 9:30~10:30

Venue: Dept. Geology 2nd GDMR

Participants: Rathborith, NINOMIYA

Topics for discussion:

- Progress for data input work
- Geological information of Geology

No. 5 DBWT Meeting

Date : 27 May 2015 (Wed) 9:00~10:00  
Venue: Dept. Exploration 2nd GDMR  
Participants: Ou Chak, Pharorth, NINOMIYA  
Topics for discussion:  
- Progress for data input work  
- License information of Dept. Exploration

No. 6 DBWT Meeting

Date : 28 May 2015 (Thu) 9:00~9:30  
Venue: Dept. Promotion 3rd GDMR  
Participants: Ol Ratana, NINOMIYA  
Topics for discussion:  
- Progress for data input work

No. 7 DBWT Meeting

Date : 29 May 2015 (Fri) 9:15~10:00  
Venue: Office of Sokhom 3rd GDMR  
Participants: Sokhom, NINOMIYA  
Topics for discussion:  
- Schedule and work

No. 8 DBWT general assembly

Date: 5 Jun 2015 (Fri) Fri, 9:00-11:00  
Venue: Kandieng (Sapphire) Meeting room, 6th floor GDMR  
Participants: Sotham, Ou Chak, Chettra, Ou Narath, Rathborith, Pharorth, Ol Ratana,  
Seng Darathin, NINOMIYA  
Topics for discussion:  
- Progress for data input work  
- Commodity code  
- Modification of input items on Template

No. 9 DBWT Meeting

Date: 9 Jun 2015 (Thu) 14:00-15:00  
Venue: JICA expert office, 4th Floor, GDMR  
Participants: Sotham, NINOMIYA  
Topics for discussion: DBWT Meeting

- Confirmation on memorandum of general assembly 5th Jun

No. 10 DBWT general assembly

Date: 12 Jun 2015 (Fri) 9:00-11:00

Venue: Kandieng (Sapphire) Meeting room, 6th floor GDMR

Participants: Sotham, Ou Chak, Ou Narath, Rathborith, Pharorth, Ol Ratana, Darathin,  
NINOMIYA

Topics for discussion: DBWT general assembly

- Base map on ASEAN DB
- Geological map (ASEAN DB)
- Concession
- Artisanal and Small-Scale Mining
- Stage after data input

No. 11 DBWT Meeting

Date: 16 Jun 2015 (Tue) 8:15-9:00

Venue: Office of Sokhom 3rd floor GDMR

Participants: Sokhom, NINOMIYA

Topics for discussion:

- Discussion on GDMR budget for server and server model

No. 12 DBWT Meeting

Date: 22 Jun 2015 (Mon) 9:00-10:00

Venue: Office of Sotham 2nd floor GDMR

Participants: Sotham, NINOMIYA

Topics for discussion: DBWT Meeting

- Create Concession Map from Excel

No. 13 DBWT Meeting

Date: 23 Jun 2015 (Tue) 8:15-9:00

Venue: Office of Sokhom 3rd floor GDMR

Participants: Sokhom, NINOMIYA

Topics for discussion: DBWT Meeting

- Proposal for GDMR server plan from JICA experts

No. 14 DBWT general assembly



Date: 26 Jun 2015 (Fri) 9:00-11:00

Venue: Kandieng (Sapphire) Meeting room, 6th floor GDMR

Participants: Sotham, Ou Chak, Chettra, Ou Narath, Rathborith, Ol Ratana, Darathin,  
NINOMIYA, Sam Sidara (guest)

Topics for discussion:

- Base map about geological map and elevation
- Progress for data input work
- Introduction for network security

No. 15 DBWT general assembly

Date: 3 Jul 2015 (Fri) 9:00-11:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Chettra, Ou Narath, Rathborith, Ol Ratana, Pharorth,  
NINOMIYA

Topics for discussion: DBWT general assembly

- GDMR brief presentation, 02 Jul and GDMR server
- Digital data for Concession of Construction Material
- Relationship between License No. of Promotion and License No. of Mining and Exploration

(4) Fourth visit of Database Team

No. 1 DBWT Meeting

Date: 27 Oct 2015 (Tue) 8:30-9:00

Venue: Dept. Geology 2nd floor GDMR

Participants: Sotham, SUZUKI, NINOMIYA

Topics for discussion:

- Schedule
- Events
- Objectives

No.2 DBWT general assembly

Date: 30 Oct 2015 (Fri) 9:00-12:00

Venue: Tbound Kandieng Meeting Room, 6th floor GDMR

Participants: Sotham, Ol Ratana, Ou Narath, Pharorth, Virinrath, Channa, Uy Rith,  
SUZUKI, NINOMIYA

Topics for discussion:

- Schedule
- Events
- Objectives
- Data which should be included in DB
- Data Tree Structure
- Draft of Operating Manual for DB management system
- Next DBWT Meeting

No. 3 DBWT general assembly

Date: 13 Nov 2015 (Fri) 8:30-10:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, Chettra, Ol Ratana, Ou Chak, Virinrath, NINOMIYA

Topics for discussion:

- Detail of the folder tree structure and files
- Outline of the tentative Database Management Manual

No. 4 DBWT Meeting

Date: 16 Nov 2015 (Mon) 9:00-11:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Chettra, SUZUKI, NINOMIYA

Topics for discussion:

- License ID
- OJT for ArcGIS

No. 5 DBWT Meeting

Date: 17 Nov 2015 (Tue) 9:00-10:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Chettra, SUZUKI, NINOMIYA

Topics for discussion:

Discussion on the issue about License number

No. 6 DBWT Meeting

Date: 17 Nov 2015 (Tue) 10:00-10:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Ol Ratana, SUZUKI, NINOMIYA

Topics for discussion:

- OJT on excel data sheet operation
- Discussion on License ID

No. 7 DBWT general assembly

Date: 20 Nov 2015 (Fri) 8:30-10:00

Venue: Tboung Kandieng Meeting Room, 6th floor GDMR

Participants: Sotham, Ou Chak, Ol Ratana, Chettra, Ou Narath, Thin, Virinrath,  
SUZUKI, NINOMIYA

Topics for discussion:

- Confirmation for Commodity\_Code and Company ID
- Should data sheets for License and Concession create for each year?
- Excel column format
- Outline of Database Management Manual
- Khmer character is available on your ArcGIS?
- Range for publish

No. 8 DBWT general assembly

Date: 27 Nov 2015 (Fri) 8:30-11:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Ol Ratana, Virinrath, SUZUKI, NINOMIYA

Topics for discussion:

- Demonstration for Georeferencing on ArcGIS

No. 9 DBWT Meeting

Date: 30 Nov 2015 (Mon) 10:00-11:00

Venue: JICA expert office, 4th Floor, GDMR

Participants: Ol Ratana, Ou Chak Chettra, SUZUKI, NINOMIYA

Topics for discussion:

- Discussion on the issue about License number
- OJT for operating ArcMap

No. 10 DBWT Meeting

Date: 1 Dec 2015 (Tue) 9:30-10:30

Venue: JICA expert office, 4th Floor, GDMR

Participants: Sotham, SUZUKI, NINOMIYA

Topics for discussion:

- Discussion on License ID and Updating

No. 11 DBWT general assembly

Date: 4 Dec 2015 (Fri) 8:30-11:30

Venue: Dept. Geology 2nd floor GDMR

Participants: Sotham, Ou Chak, Pharorth, Ol Ratana, Chettra, Ou Narath, Thin, Rith,  
SUZUKI, NINOMIYA

Topics for discussion:

- Confirmation for License ID
- Confirmation for updating
- Confirmation for inputting error for the concession coordination
- Color information for legend of the Geological map
- Workshop on the Database for Mining Management, 16th Dec

No. 12 DBWT Meeting

Date: 7 Dec 2015 (Mon) 9:30-10:30

Venue: Office of Sotham 2nd floor GDMR

Participants: Sotham, ONUMA

Topics for discussion:

- Request from GDMR about lecture for Remote sensing analysis

No.13 DBWT Meeting

Date: 8 Dec 2015 (Tue) 9:30-10:00

Venue: Dept. Exploration 2nd GDMR

Participants: Pharorth, SUZUKI, NINOMIYA

Topics for discussion:

- Discussion on License data of Dept. Exploration
- OJT for operating Polygon on ArcMap

No. 14 DBWT Meeting

Date: 8 Dec 2015 (Tue) 10:00-10:30

Venue: Dept. Promotion, 3rd floor GDMR

Participants: Ol Ratana, SUZUKI, NINOMIYA

Topics for discussion:

- Confirmation for License ID

No. 15 DBWT Meeting

Date: 9 Dec 2015 (Wed) 10:00-10:30

Venue: Dept. Exploration, 2nd floor GDMR

Participants: Ou Chak, Pharorth, SUZUKI, NINOMIYA

Topics for discussion:

- Discussion on License data of Dept. Exploration
- OJT for operating Polygon on ArcMap

No. 16 DBWT general assembly

Date: 11 Dec 2015 (Fri) 8:30-10:00

Venue: Tbound Kan Deang, 6th floor GDMR

Participants: Sotham, Ou Chak, Borith, Pharorth, Ol Ratana, Chettra, Ou Narath,  
ONUMA, SUZUKI, NINOMIYA

Topics for discussion:

- Demonstration to join License information to Revenue information with reference to License ID on ArcMap.
- Proposal for the format of License ID including department, year and serial No.
- Interpreter for GDMR\_database on the GDMR Meeting, 21st Dec, Mon
- Outline of the Workshop, Wed, 16th Dec.
- Latest Excel sheets

No. 17 DBWT general assembly

Date: 18 Dec 2015 (Fri) 8:30-10:00

Venue: Dept. Geology, 2nd floor GDMR

Participants: Sotham, Borith, Ou Chak, Narath, ONUMA, SUZUKI, NINOMIYA

Topics for discussion:

- Delivery the final draft version of GDMR\_Database
- Challenges for the future
- Demonstration on the requests from GD and DGD

(5) Fifth visit of Database Team

No.1 DBWT general assembly

Date :2 Nov 2016 (Wed) 9:00-10:00

Venue: Department of Geology, 5<sup>th</sup> floor of GDMR

Participants: Virinrath, Ninomiya

Topics for discussion: Team meeting

- Schedule and Program during visit
- Issue to be solved

No.2 DBWT general assembly

Date: 4 Nov 2016 (Fri) 14: 30-15: 30

Venue: Meeting room, 4<sup>th</sup> floor of GDMR

Participants: Pharaorth, Virinrath, Darathin, Rith, Onuma, Hara, Ninomiya

Topics for discussion: Team Meeting

- Scheduling
- Review discussed during last visit
- Progress check to database building
- Outstanding problems during this time of visit

No.3 DBWT general assembly

Date :4 Nov 2016 (Mon) 9:00-11:00

Venue: Department of Geology, 5<sup>th</sup> floor of GDMR

Participants: Sotham, Ninomiya

Topics for discussion: Leader Meeting

- Progress report on working team meeting on 4<sup>th</sup> Nov of leader's absence
- Hearing about Order from H.E. Dith Tina
- Solution to order from Dith Tina; Ninomiya summarize as table list about current status, possible solution, outstanding issue

No.4 DBWT general assembly

Date: 8 Nov 2016 (Tue) 9:00-11:00

Venue: Department of Geology, 5<sup>th</sup> floor of GDMR

Participants: Sotham, Ninomiya

Topics for discussion: Leader Meeting

- To revise yesterday's summarized table through leader's discussion
- Scheduling for database meeting on 10<sup>th</sup> Nov with H.E. Dith Tina

No.5 DBWT general assembly

Date: 10 Nov 2016 (Thu) 9:00-12:30

Venue: Meeting room (Thmor Kuch), 6<sup>th</sup> floor of GDMR

Participants: H.E. Dith Tina, Mr. Sotham, Mr. Sokhom, Pharaorth, Virinrath, Darathin, Ol Ratana, Ou Narath, Chettra, Onuma, Ninomiya, a woman officer

Topics for discussion: Team Meeting

- Outline of Project for database (by Director Sotham)
- Progress on establishment of database
- Question from H.E. Dith Tina and Discussion

No.6 DBWT general assembly

Date: 10 Nov 2016 (Thu) 14:00-17:00

Venue: JICA Experts room, 5<sup>th</sup> floor of GDMR

Participants: Sotham, Ninomiya

Topics for discussion: Team Meeting

- Preparation of minutes of meeting held this morning

(6) Final (sixth) visit of Database Team

No.1 DBWT general assembly

Date: 13 Feb 2017 (Mon) 9:00-11:40, 14:30-17:00

Topics for discussion: Team Meeting

- Scheduling
- Listing of outstanding problem and discussion
- Installation of mine safety inspection data to database
- Method to show valid concession of requested year
- Remaining work and planning

Venue: Meeting room, 6<sup>th</sup> floor of GDMR

Participants: Sieng Sotham, Yang Virinrath, Ratana Ol, Ou Chak, NY Pharorth Seng  
Darathin, Uy Rith,

No.2 DBWT general assembly

Date: 14 Feb 2017 (Tue) 9:00-11:00, 14:30-17:00

Venue: Department of Geology, 5<sup>th</sup> floor of GDMR

Participants: Sieng Sotham, Yang Virinrath, Ratana Ol, Ou Chak, NY Pharorth, Mak  
So Chettra, Seng Darathin, Uy Rith,

Topics for discussion: Team Meeting

- Solution about License\_ID
- Priority to input (data of 2012 or later, currently)
- Additional requests for lecture by Leader Sotham (how to statistical output, counting concessions over two or triple boundary of province through GIS database)
- Lecture and Demonstration for above requests

- Temporal replacement of Leader to Virinrath during three days absence by official conference held in Thailand

No.3 DBWT general assembly

Date: 15 Feb 2017 (Wed) 10:00-11:30

Venue: JICA Experts room, 5<sup>th</sup> floor of GDMR

Participants: Yang Virinrath, Ratana Ol, Ou Chak, NY Pharorth Seng Darathin, Uy Rith,

Topics for discussion: Team Meeting

- To assign License\_ID by Department of Promotion
- To check data to be corrected

No.4 DBWT general assembly

Date: 16 Feb 2017 (Thu) 10:00-11:30

Venue: JICA Experts room, 5<sup>th</sup> floor of GDMR

Participants: Yang Virinrath, Ratana Ol, Ou Chak, NY Pharorth, Mak So Chettra, Seng Darathin, Uy Rith,

Topics for discussion: Team Meeting

- Input of License\_ID by each department, distributed by Department of Promotion
- To check data to be corrected
- To create new format template file to input additional revenue started from July 2016

No.5 DBWT general assembly

Date: 17 Feb 2017 (Fri) 10:00-12:00, 14:30-17:30

Topics for discussion: Team Meeting

Venue: Department of Geology, 5<sup>th</sup> floor of GDMR

Participants: Yang Virinrath, Ratana Ol, Ou Chak, Seng Darathin, Uy Rith,

Topics for discussion: Team Meeting

- To collect updated data and checking
- To check data to be corrected
- To collect updated legend and symbology of geological map

No.6 DBWT general assembly

Date: 22 Feb 2017 (Wed) 9:20-9:40, 14:30-15:00

Venue: JICA Experts room, 5<sup>th</sup> floor of GDMR

Topics for discussion: Individual Lecture



Participants: Ou Chak,

(About how to overlap ratio of protect area to concession)

Participants: Seng Darathin

(To check corrected concession polygon of Department of  
Construction Material)

#### No.7 DBWT general assembly

Date: 22 Feb 2017 (Wed) 15:10-15:30

Venue: JICA Experts room, 5<sup>th</sup> floor of GDMR

Participants: Sieng Sotham

Topics for discussion: Remaining work and scheduling

- Next meeting on 24 Feb due to tomorrow's GDMR annual conference
- Remaining work (Lecture for requested topics, Update Database into Server)

#### No.8 DBWT general assembly

Date: 24 Feb 2017 (Fri) 8:00-11:40

Venue: Department of Geology, 5<sup>th</sup> floor of GDMR

Participants: Sieng Sotham, Yang Virinrath, Ratana Ol, Ou Chak, NY Pharorth Seng  
Darathin

Topics for discussion: Team Meeting

- To correct License data of Dept. of Exploration
- Lecture and demonstration how to integrate the various shapes of concession of  
Dept\_ Construction Material
- Continuous lecture about additional request: How to find statistic answers in relation  
to concession on topics
- Free ArcGIS viewer (ArcGIS Explorer) for guest users

#### No.9 DBWT general assembly

Date: 24 Feb 2017 (Fri) 14:00-15:30

Venue: Server room, third floor of GDMR

Participants: Sieng Sotham, Ratana Ol

Topics for discussion: Update Database in Server

- Update of database of Feb 2017 revision into Server
- Back up old version database of Dec 2015 revision, in Server
- Server room is prepared overside of Department of Promotion
- Setting Server through UPS and connecting electric line

LAN (Local Area Network) is not ready, although required equipment is put in Server room. Leader Sotham prefers LAN by cable, not wireless. It is necessary for IT officers to connect LAN cables to user's PC and setting like IP address.

#### **2.2.4 Output**

Output of Database working of this project as follows ;

- (1) GDMR Database for mining management
- (2) Database Management Manual and Database Operational Manual

- (1) GDMR Database for mining management

The containing information is ;

- Cadastral information (Concession, License), Commodity code, Revenue data
- Mineral resource map, geological map
- Base map datasets: elevation contour, river, administrative boundary, roads, airports, ports, protected areas, satellite images, aerial photographs, unexploded bombs and mine areas, etc.
- Mine safety inspection data
- Manuals for database operation / management

The database is stored in server computer in GDMR server room. Root folder is "GDMR\_Database" folder, just under the D drive, and consisting of eight main folders

"Dept. Geology" folder

"Dept. Exploration" folder

"Dept. Construction" folder

"Dept. Mining" folder

"Dept. Promotion" folder

"National\_data" folder

"Common" folder

"Inspection" folder

Table 2.2.5 “GDMR\_Database” Folders and File Content

Folder	Contents	File type
National_Data	Province, River, Road, Remote Sensing...	GIS data
Dept_Geology	Geology, Mineral Resource	
Dept_Exploration	Cadastral Information (Concession, License)	
Dept_Construction		
Dept_Mining		
Dept_Promotion	Revenue Record	EXCEL file
Common	Manual	PDF
Inspection	Report	PDF

Database is based on GIS, which displays map using ArcMap file (from Ver. 10.0 to Ver. 10.3). ArcMap file is put at the top of the eight main folders.

Specification of GDMR database;

- GIS-based database, displaying geological or mineral resource map, concessions, on country basemap.
- ArcGIS Version 10 is required as GIS software, that has been common in GDMR.
- Map projection and datum is UTM WGS1984.
- The folders are separated by each department, with the responsibility for and management of data to be distinguished. The officers in charge of each department have responsibility for data and update work.
- For input format, Microsoft Excel file, most popular software in GDMR.
- GIS files were adopted as the method to prepare data from Excel.
- License data to be input at first priority is those issued in 2012 or later year.
- The database coverage for user shall be within GDMR for the time being (NOT open externally in the moment).

Since this database is displayed on map by ArcMap software, various types of data contained in the database can be overlaid and displayed as stacking layers. From concession map excel datasheet is accessible through hyperlink.

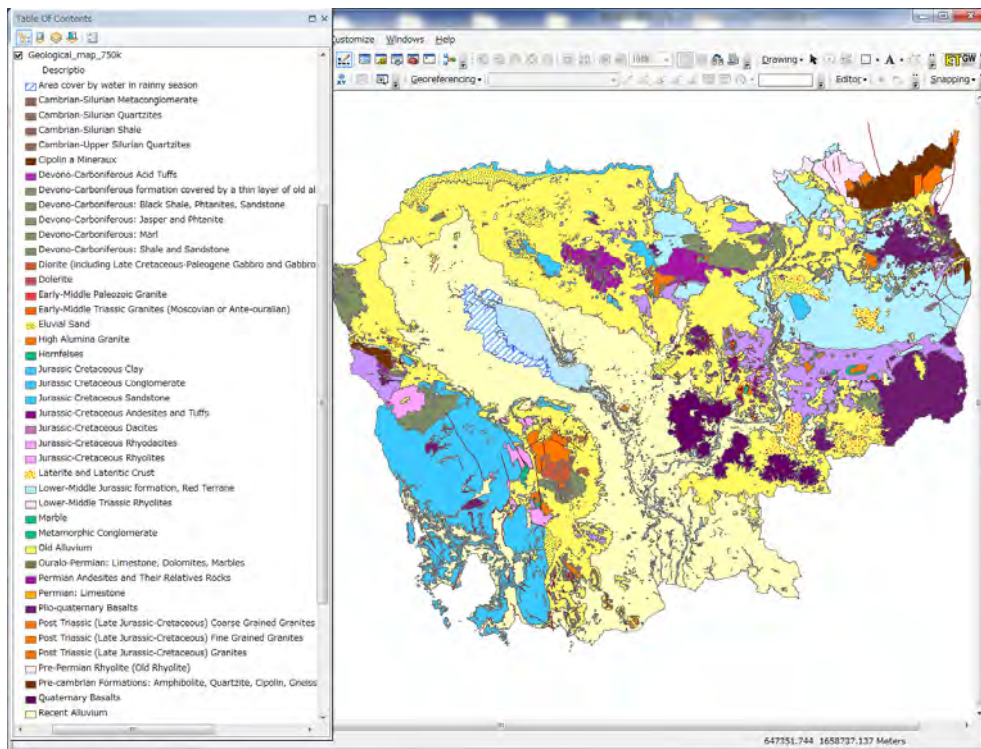


Figure 2.2.3 Geological map

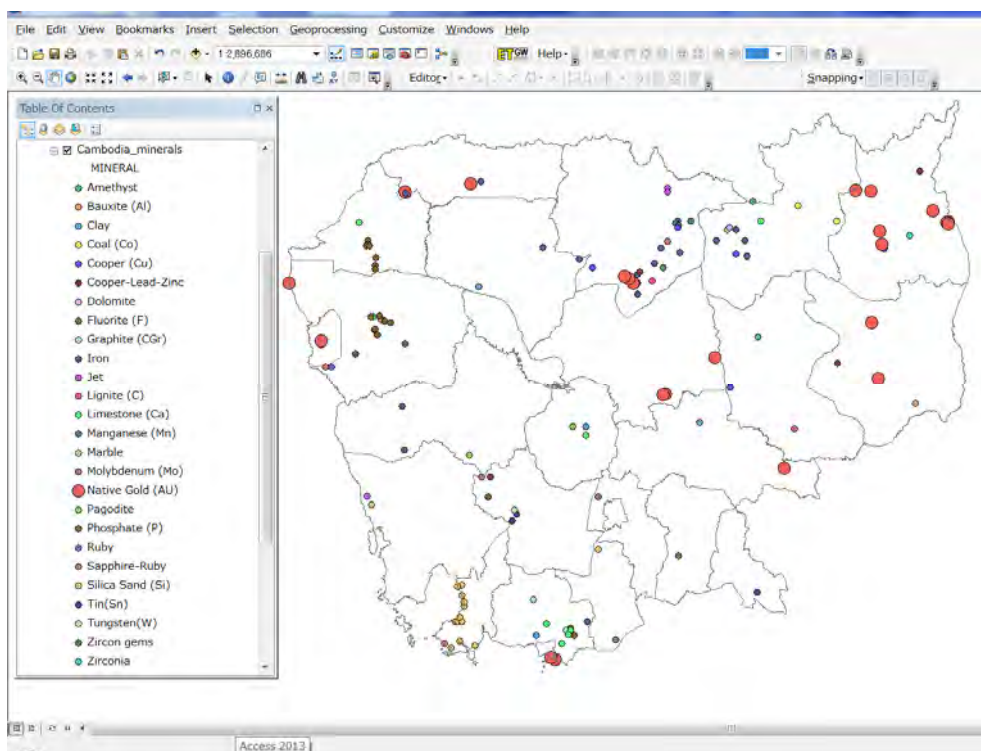


Figure 2.2.4 Mineral resource map

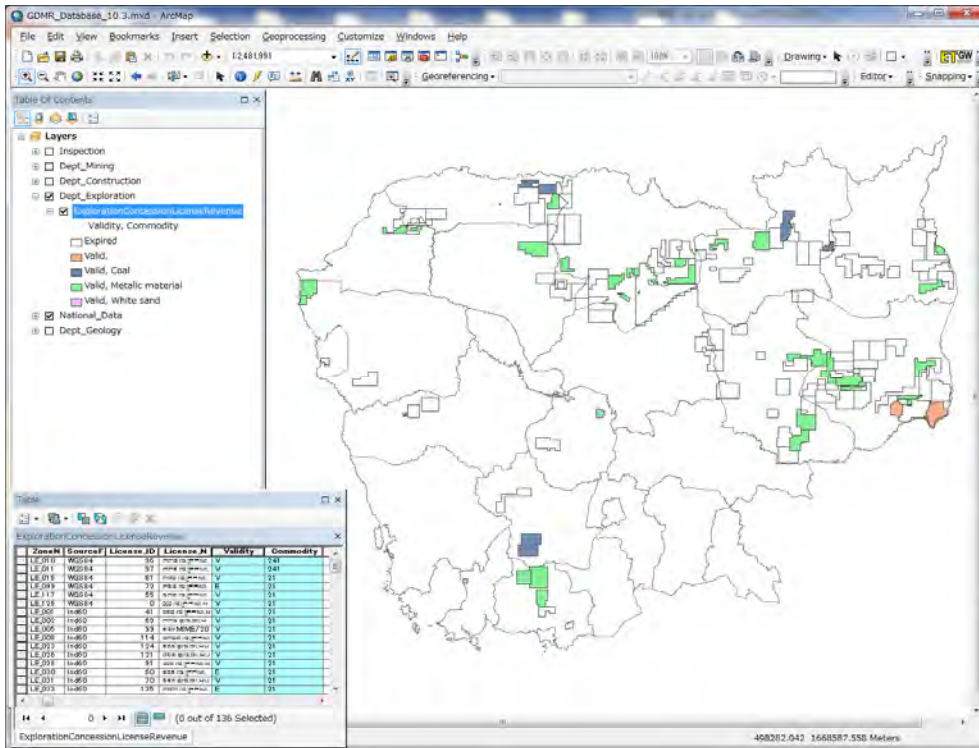


Figure 2.2.5 Concession map for Exploration (136 Concessions, by Commodity in color)

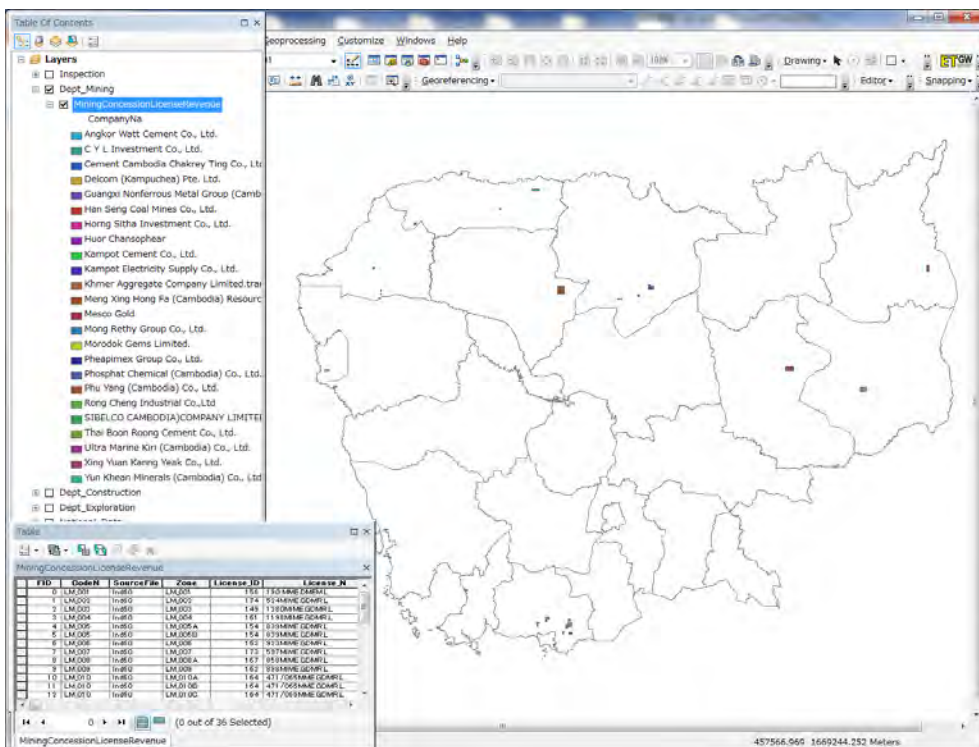


Figure 2.2.6 Concession map for Mining (36 Concessions, by Company in color)

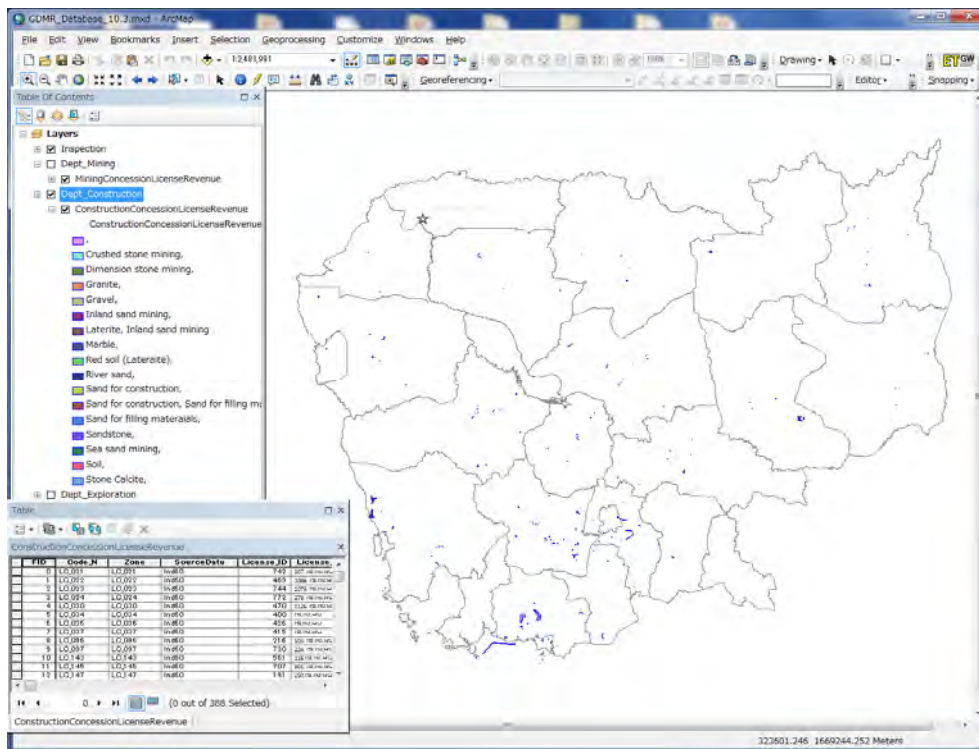


Figure 2.2.7 Concession map for Construction materials (388 data, by Commodity in color)

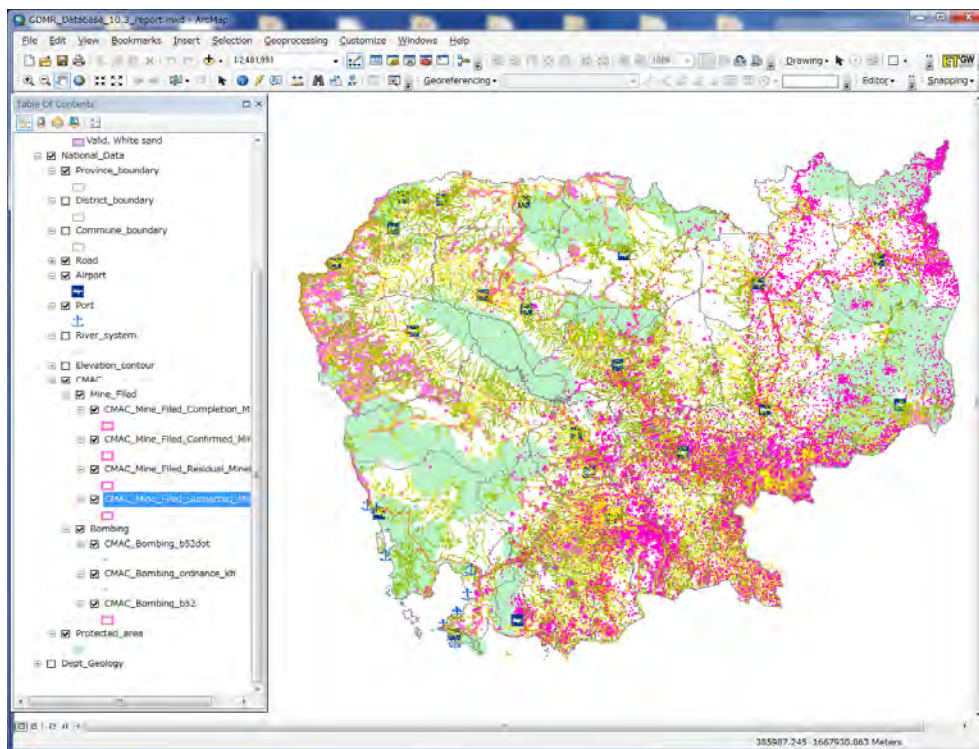


Figure 2.2.8 National data (Administrative, Road, Protect area, UXO and mines...)

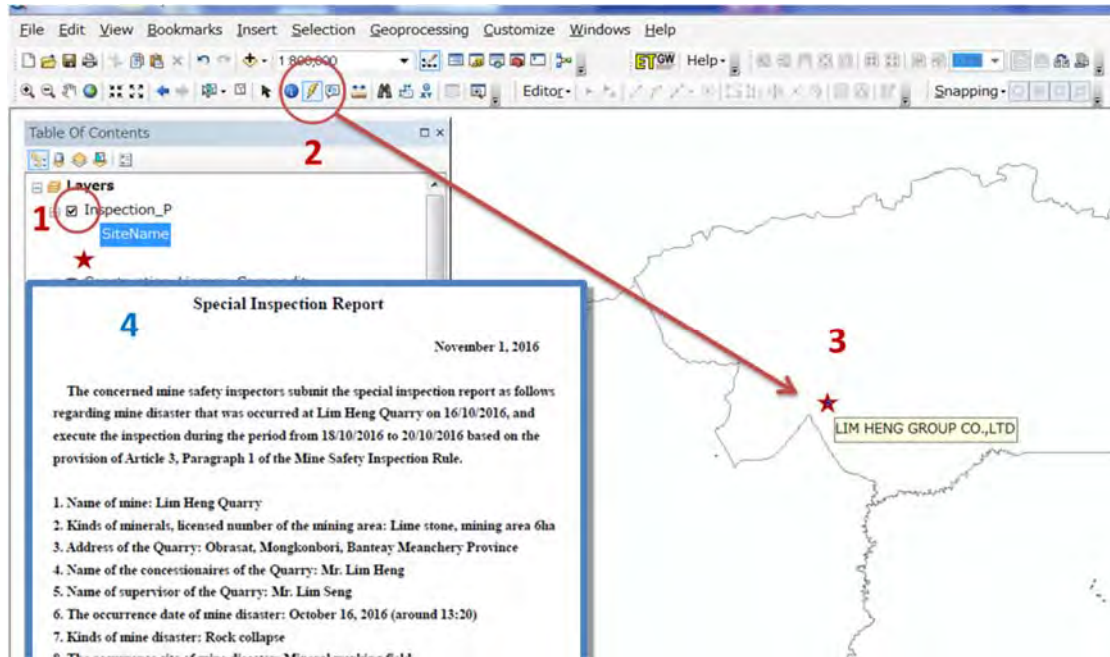


Figure 2.2.9 Mine safety inspection point, from which report is hyperlinked.

(2) Database management manual and database operational manual

Database management manual describes the manager and responsible manager and data update management. This manual is composed of the following items with 6 pages and accompanied in this report as Annex.

1. GENERAL ABOUT GDMR DATABASE
2. ROLES AND TASKS FOR MANAGEMENT AND MAINTENANCE
3. PROCEDURES ON UPDATE WORK

Database operational manual describes the operation methods of software as Microsoft Excel and ArcGIS to create the database. This manual is composed of the following items with 301 pages and accompanied in this report as Annex.

1. GENERAL INFORMATION
  - 1-1 LIST OF DATA AND THE STORAGE STRUCTURE
  - 1-2 RESPONSIBILITY TO DATA
  - 1-3 SOFTWARE REQUIRED
  - 1-4 APPLIED COORDINATE SYSTEM TO THIS DATABASE

- 1-5 WORKFLOW OF THIS MANUAL
2. INPUT NEW DATA
  - 2-1 LIST OF DATA TO BE INPUT
  - 2-2 RELATIONSHIP BETWEEN THE DATA
  - 2-3 FILE LIST TO BE CREATED
  - 2-4 PREPARE THE WORK-FILES IN YOUR PC
  - 2-5 INPUT INTO THE EXCEL FILES
  - 2-6 CODE LIST AND DATA VALIDATION
3. CREATE A SHAPEFILE
  - 3-1 CREATE A CONCESSION SHAPEFILE FROM X,Y DATA
  - 3-2 ADVANCE STEP TO COMPLETE A CONCESSION SHAPEFILE
  - 3-3 CREATE A BLANK SHAPEFILE AND DRAW ON MAP
4. USING EXISTING DATA
  - 4-1 VECTOR DATA
  - 4-2 RASTER IMAGE DATA
5. CREATE A NEW MAP IN ARCMAP
  - 5-1 SETUP A NEW MAP FRAME
  - 5-2 ADD LAYERS OF SPATIAL DATA
  - 5-3 LAYER CONTROL
  - 5-4 SYMBOLOGY OF LAYER
  - 5-5 SAVE AS LAYER FILE (LYR FILE)
  - 5-6 SAVE AS ARCMAP FILE (MXD FILE)
  - 5-7 TROUBLESHOOTING
6. UPDATE DATA
  - 6-1 KIND OF DATA TO BE UPDATED
  - 6-2 FILE LIST AND THE RESPONSIBILITY TO UPDATE
  - 6-3 PROCEDURE TO UPDATE THE FILES
  - 6-4 ANNUAL UPDATES OF WHOLE PART OF DATABASE (TASK FOR DATABASE ADMINISTRATORS)
7. VIEW A MAP ON ARCMAP
  - 7-1 VIEW A MAP
  - 7-2 LAYER CONTROL
  - 7-3 ATTRIBUTE TABLE OF SHAPEFILE
  - 7-4 ATTRIBUTE SEARCH FOR THE CONCESSION
  - 7-5 SPATIAL SEARCH FOR THE CONCESSION
8. PRINTING MAP



- 8-1 CREATE LAYOUT IN ARCMAP
- 8-2 SAVE ARCMAP FILE
- 8-3 PRINT OUT
- 8-4 EXPORT AS DIGITAL MAP
- 9. OTHER USAGE OF GIS DATA
  - 9-1 GOOGLEEARTH
  - 9-2 GPS

### **2.3 Workshop**

- (1) The First Workshop (Independently held for Mine Safety Team)

Title; The Draft Law and Regulation of MINE and Safety Co-Organized by  
GDMR/MME and JICA

Date; December 12, 2015, 8:00~17:00

Venue; Hotel HIMAWARI Sunflower Ballroom

Attendees: GDMR/MME Headquarter Staff: 29, PDME Staff: 31, Private Enterprise  
person; 11, JICA 5, Total of 76 persons

## Program

8:00~8:30	Registration
8:30~8:35	National Anthem of Kingdom of Cambodia
8:35~8:45	Opening Remarks GDMR
8:45~9:05	Outline of the Project on Capacity Development for Mining Administration Mr. Kashima, JICA Expert
9:05~9:50	Introduction of Mine Safety Law of Cambodia (Draft) Mr. Aoki, JICA Expert
9:50~10:10	Coffee Break
10:10~12:00	Introduction of Mining Safety Regulation of Cambodia (Draft) Mr. Aoki, JICA Expert
12:00~13:30	Lunch Break
13:30~14:10	Introduction of Mining Safety Regulation of Cambodia (Draft) Mr. Aoki, JICA Expert
14:10~14:30	Next Step of Activities Mr. Kashima, JICA Expert
14:30~15:10	Questions and Answers
15:10~15:30	Coffee Break
15:30~16:30	Japanese Limestone Mining and Quarrying Mr. Shichinohe, JICA Expert
16:30~16:50	Questions and Answers
16:50~17:00	Closing Remarks GDMR



(2) First Workshop (Independently Held for Database Team)

There was a plan to include the workshop concerning the database in the Mine Safety Act workshop, but this workshop was held on a separate day, including the lecture concerning remote sensing requested by GDMR.

Name: Workshop on the Database for Mining Management

Date: December 16, 2015, 8:00 – 12:00

Venue: GDMR 2<sup>nd</sup> Floor Conference Room

Attendees: GDMR Headquarter Staff / Regional Office Staff: Total of 42 persons

Attendee Breakdown

Headquarter Staff (DBWT members): 8 persons

Headquarter Staff (Other than DBWT members): 3 persons

ID	Province	No.
1	Banteay Meanchey	1
2	Battambang	1
3	Kampong Cham	1
4	Kampong Chhnang	1
5	Kampong Speu	3
6	Kampong Thom	1
7	Kampot	2
8	Kandal	1
9	Kep	1
10	Koh Kong	2
11	Kratié	1
12	Mondulkiri	3

ID	Province	No.
13	Oddar Meanchey	1
14	Pailin	1
15	Phnom Penh	1
16	Preah Vihear	1
17	Prey Veng	1
18	Pursat	1
19	Ratanakiri	1
20	Siem Reap	2
21	Stung Treng	1
22	Svay Rieng	1
23	Takéo	1
24	Tboung Khmum	1

Municipal officers: 31 attendees

There were attendees from all provinces except for Preah Sihanouk Province. It has not been confirmed whether or not there is a regional office in Preah Sihanouk Province.

## Program

The lecture was conducted by having Japanese interpreted into Khmer. The presentation materials were in English.

Time	Description
8:00 – 8:30	Registration
8:30 – 8:40	Opening Remarks GDMR
8:40 – 8:50	Outline of the JICA Project Onuma, JICA
8:50 – 9:00	Basics of GIS Onuma, JICA
9:00 – 9:45	GIS database created in the JICA Project How to use and manage the Database according to its manual Ninomiya, JICA
9:45 – 10:05	Coffee Break
10:05 – 10:50	How to create GIS database according to its manual Suzuki, JICA
10:50 – 11:35	Basics of Remote sensing Onuma, JICA
11:35 – 11:50	Q&A JICA experts
11:50 – 12:00	Closing Remarks GDMR

## Questions and Answers concerning GIS database created in the JICA Project

Q: Can staff other than DBWT members access the database?

A: No, not at this point in time.

Q: GDMR originally used a coordinate system that is not WGS84. Is there an error with WGS84?

A: The coordinate system is described as Indian1960 in the GDMR license document, but the coordinate system is converted to WGS84 when it is added to ArcGIS.

Q: Revenue contains a lot of information. Is it described in Excel sheets?

A: We do not know if all of it is described. The Excel sheet items were determined at the DBWT conference.

Q: There was talk about the GDMR server. Will the JICA project provide the server?

A: No, the JICA project will not provide the server. Plans call for it to be prepared with

the GDMR budget.



Opening by Director Sotham,  
Leader of Database working team



Lecture by Onuma  
(About Remote Sensing data)



Lecture by Suzuki  
(About how to create Database)



Lecture by Ninomiya  
(About Content of Database)

Photo at First Workshop for database

**(3) Second Workshop (Jointly with Mine Safety Team and Database team)**

**Overall Name: Joint Workshop with MME/GDMR and JICA**

**The Project on Capacity Development for Mining Administration**

**Date: February 21, 2017 (Tuesday), 9:00-17:00**

**Venue: Tonle Bassac II Restaurant, Phnom Penh**

**Attendees: MME/GDMR staffs; 65, PDME; 53, JICA; 8, Total; 126**

## Program

The Joint Workshop with MME/GDMR and JICA  
The Project on Capacity Development for Mining Administration  
in the Kingdom of Cambodia

Date: 21 February 2017

Place: Tonle Bassac II Restaurant  
Building 534 Preah Monivong Blvd,  
Sangkat Tonlebasac, Khan Chamkamon,  
Phnom Penh

### PROGRAM

The Arrival of Guests and Participants Registration by 8:30 - 9:00

#### OPENING CEREMONY

Introduction of Distinguished Guests 9:00 - 9:05

(1) National Anthem of the Kingdom of Cambodia 9:05 - 9:10

(2) Opening Speech

- H.E. Dith Tina Secretary of State, Ministry of Mines and Energy,  
Project Director 9:10 - 9:20

(3) Presentation

“Progress of the Project on Capacity Development for Mining Administration”

- Mr. Aoki Atsushi Short term expert of JICA Project  
9:20 - 9:40

“Database of Mineral Resources”

- Mr. Suzuki Ioki Short term expert of JICA Project  
9:40 - 10:00

(Coffee Break 10:00 - 10:20)

“Outline of drafting Mine Safety Law”

- Mr. Hong Bona Head of Working Team (mine safety law)  
Deputy Director, Department of Construction Material Resources  
10:20 - 10:40

“Drafting Mine Safety Inspection Rule”

- Mr. Lai Zanith Member of WT  
Deputy Director, Department of Mining 10:40 - 11:00

“Support for Improvement of Coal Mine Safety in Vietnam and Its Results”

● Dr. Isei Takehiro	Short term expert of JICA	11:00 - 12:00
	Questions and Answers	12:00 - 12:10
	(Lunch 12:10 – 13:30)	
“Manual on Risk Management for Mine Safety”		
● Mr. Sou Phires	Member of WT Officer, Department of Mining	13:30 - 13:50
“On-Job Training in JICA Project”		
● Mr. Im Sim	Member of WT Chief Officer, Department of Geology	13:50 - 14:10
“Mine Safety Inspection Manual (prevention of mine disaster)”		
● Mr. Yin Ratanak	Member of WT Officer, Department of Exploration Management	14:10 - 14:30
	(Coffee Break 14:30 - 15:00)	
“Mine Safety Inspection Manual (prevention of mine pollution)”		
● Mr. Ty Pisethcheat	Member of WT Officer, Department of Mining	15:00 - 15:20
“On- Job Training in Japan on Mine Safety”		
● Mr. Kong Sitha	Member of WT Deputy Director, Department of Construction Material Resources	15:20 -15:40
	Questions and Answers	15:40 -16:00
(4) Closing remarks		
● Dr. Hosoi Yoshitaka	Senior Advisor for Natural Resources of JICA	16:00-16:15
● H.E. Dith Tina	Secretary of State, Ministry of Mines and Energy, Project Director	16:15 -16:30
● Providing the certification to WT Members		16:30 -
	16:50	
(5) National Anthem of the Kingdom of Cambodia		
	End of Program	16:50 -17:00



Opening Speech by H.E. Dith Tina



Presentation by Mr. Hong Bona



Conferral of Certification to WTs



A signing ceremony of MOM



Closing remarks by Dr. Hosoi



Interview of the TV station

## 2.4 JCC (Joint Coordination Committee)

### (1) First JCC

Date: January 23, 2015

Venue: Conference room, GDMR 4th floor

Attendees: MME/GDMR; Secretary of State HE. Dith Tina, Deputy Director General

Mr. Peng Navuth, respective department heads, WT members of both Mine Safety law and Database.

JICA; Deputy Director of Cambodia office Mr. Ito, STEs (Kashima, Sueoka, Aoki, Onuma, Suzuki), long-term expert Shichinohe.

Content: Approval of Work Plan





View at Committee



Signing on Work Plan

(2) Second JCC

Date: December 21, 2015 (Monday), 8:30-10:00

Venue: Meeting room, GDMR 6th floor

Attendees: MME/GDMR; Secretary of State HE. Dith Tina, Director General HE. Yos Mony Rath, Deputy Director General Mr. Peng Navuth, respective department heads, WT members of both Mine Safety law and Database.

JICA; Deputy Director of Cambodia office Mr. Ito, Mr. Watanabe, STEs (Kashima, Aoki), long-term expert Shichinohe

Content: Intermediate result report



(3) Final (third) JCC

Date: February 20, 2017 (Monday), 10:30-12:15

Venue: Meeting room, GDMR 4<sup>th</sup> floor

Attendees: MME/GDMR; Secretary of State HE. Dith Tina, Director General HE. Yos Mony Rath, Deputy Director General Mr. Peng Navuth, respective department heads, WT members of both Mine Safety law and Database.

JICA; Director of Cambodia office Mr. Adachi, Mr. Watanabe, Senior advisor Dr. Hosoi, STEs (Takahata, Aoki, Onuma, Suzuki), long-term expert Shichinohe, Advisor Dr. Isei

Content: General overview of the project



### **3. Measures against the proposals in the progress of the Project**

#### **3.1 Formulation of the draft of mine safety law and strengthen the enforcement system of the Law**

(1) Issues concerning understanding for the technical term of the mining and means of provisions of drafting Mine Safety Law and its regulations

1) In 2015, JICA short term experts (hereinafter referred to as “STEs”) first visited MME/GDMR office, and talked about technology transferring on Mine Safety Law and applicable regulations with executives of MME/GDMR, they requested that the provisions of drafting Mine Safety Law are composed of open-pit mining as well as underground mining.

In the progress of the Project, parties between MME/GDMR and STEs had a meeting about the issues and proposals that the documents concerning technical term of the mining and drafting Mine Safety Law and its regulations translated into Khmer and English are not understandable to the working team members (hereinafter referred to as “WTs”) who were chosen among staffs of GDMR and do not have much experience in underground mining.

STEs offered ideas that technical term of the mining and drafting Law and its regulations need to be illustrated in drawings using the board, quoted applicable photos, audio/visual equipment from the Internet and some videos concerning mine safety brought from Japan beside the verbal explanation especially underground mining technologies to WTs, and both parties agreed the solution about issues.

2) The contents of specifications of the “Safety Rules” are incorporated into the draft of “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”, STEs had ideas to introduce a model case of the “Safety Rules at ABE mine” as the attachment of drafting regulation referring to how to make safety rules easily toward the concessionaire or how to guide and support the establishment of safety rules toward the concessionaires by staffs of GDMR.

(2) Issues concerning attendance state of WTs to the Project events

The Director and deputy Directors of GDMR superiors have joined in the WTs, but their attendance rate to the events of the Project was not good in the first half of the Project because they had busy their original business or sudden business trip and other reasons for their offerings.

MME/GDMR executives and STEs had a meeting called a “brief presentation” around the end date of every dispatch, STEs reported summary of technology transferring matters and attendance state of WTs to the events of the Project, STEs also requested the improvement of conditions next visit to executives of MME/GDMR in case the

attendance state was bad.

MME/GDMR executives promised for improvement of the attendance state of WTs for dedication to the Project as thoroughly as possible, and the exchange of the opinions of both parties towards the solution of issues in the latter half of the Project.

(3) Ideas concerning composition of mine safety inspection manuals (NO.1)

As for WTs don't have experience conducting a general inspection at mine so far by using the mine safety inspection manuals (prevention of mine disaster or prevention of mine pollution), STEs paid attention to the following particulars to compose the manuals for practical use, as well as a training program for leverage to receive easy to understand even for beginners.

1) Importance matters concerning preparation prior to conducting a general inspection, pre-meeting with mine safety inspectors and drafting implementation plan for the inspection

When conducting a general inspection (prevention of mine disaster or prevention of mine pollution), grasping status of mineral-related operations and safety at the targeted mine, holding a pre-meeting to extract the inspection points (priority items), and drafting an implementation plan for the inspection by the mine safety inspectors and the staffs concerned are importance matters in advance are written up clearly in the manual.

2) Matters that require attention for conducting a general inspection

In the conducting a general inspection, the mine safety inspectors and staffs concerned hold a hearing with supervisors of the mine and confirm whether there are any hindrances or problems for ensuring safety of the mine at a mine office in the beginning.

The contents of a hearing regarding general conditions of mineral-related operations, mine digging plan, status of labor management, and status of safety training to mineworkers, etc. are written clearly in the manual, and in case matters deemed inadequate in terms of safety, improvement guidance must be provided to the concessionaire or supervisor of the mine is written up clearly in the manual, too.

In the conducting the inspection to the mineral working fields and the mine facilities, the mine safety inspectors request the supervisor of the mine to attend the inspection.

When the matters requiring improvement during the inspection, indicating the improvement guidance to ensure safety by mutual consent with attending supervisor of the mine is written up in the manual.

Concerning the inspection points (priority items) at the mineral working fields and the mine facilities in a general inspection, the checkpoints are listed up in question form easy to understand in the manual.

3) Ideas concerning composition of a general inspection (prevention of mine pollution) on noise and vibration

STEs attached a commentary in the Manual on conducting measurement and evaluation methods of noise levels and of vibration levels using a sound level meter and a vibration level meter that were supplied for inspection equipment from JICA.

Method of calculating “Percentile sound pressure level” and “Percentile vibration level” have used for evaluating fluctuating noise and vibration in Japan, however the “Equivalent continuous A-weighted sound level” and “Averaged vibration power level” are used for evaluation of fluctuating noise and vibration rather than the “Percentile sound pressure level” and “Percentile vibration level” in recent years.

But the results of calculating the “Percentile sound pressure level” and “Percentile vibration level” are clear to understand statistical characteristics of certain generating noise and vibration.

In the attached commentary of the Manual on noise and vibration, method of calculating “Percentile sound pressure level” and “Percentile vibration level” are explained using concrete measurement value and diagrams to easy understand in the manual.

4) Measures of supervision and guidance for a general inspection

When the matters required improvement or imminent danger that are violation of Mine Safety Law and its regulations are found in the result of a general inspection, conducting the administrative disposition such as indicating the improvement guidance to ensure safety or issuing the orders for warning and directing under the provisions of “Mine Safety Inspection Rule” to the concessionaire of the mine is written up clearly in the manual. For matters requiring the aforementioned improvement and matters requiring imminent clearance, recording the results in the field-book, making a sketch drawing and taking some pictures for relevant imminent risks and their details are also important and written up clearly in the manual.

Taking a meeting with the concessionaire, supervisor of the mine concerning matters requiring imminent clearance and improvement instructions, and overall opinions of mine safety inspectors for the results of a general inspection in detail, and hearing about opinions offered the aforementioned matters from the mine concerned after the inspection is written up clearly in the manual.

The form of a general inspection report, matters for which concerns and issues of the mine are handed over to the next inspection, and overall opinions of the mine safety inspectors conducted the inspection after returning back to the office are written up clearly in the manual.

(4) Ideas concerning composition of mine safety inspection manuals (NO.2)

STEs paid attention following particulars to compose “Manual on measurement and evaluation of dust concentrations at mines” and “Manual on risk management for mine safety” for practical use, as well as a training program for leverage to receive easy to understand even for beginners as usual above (3).

- 1) Concerning the measurement design how to choose an appropriate place to assure accurate evaluation of work environment where the dust concentration is measured in the “Manual on measurement and evaluation of dust concentrations at mines”, some diagrams for determination of measurement points on the unit working places in case of an indoor working place, an underground tunneling, curved area and a small space are incorporated to easy understand in the manual.
- 2) When calculating management concentration and evaluation method based on the measurement results of dust concentration, it needs to get the measurement data of free silicic acid content rate containing in the dust, and it also needs to analyze the free silicic acid content rate by X-ray fluorescent spectrometer, STEs got the data of numerical value of free silicic acid content in the rocks or minerals that was organized by Department of Resources and Environment Engineering, Faculty of Science and Engineering, Waseda University in Japan.  
If the analysis of free silicic acid content rate is difficult some reasons, the data of numerical value of free silicic acid content in the rocks and minerals is applicable to use in the formula of management concentration instead of analysis data, however the data of numerical value should be used only as a reference because free silicic acid content containing scattered dust at a measurement point is lower than the data of free silicic acid content in the rocks or minerals. These matters are written up clearly in the manual.
- 3) Methods of calculation and evaluation of measurement results for samples and easy method using a relative concentration measuring instrument are written up clearly as giving a concrete sample to easy understand in the manual.
- 4) When execution of the survey of mine safety conditions at a mine prescribed in the drafting Mine Safety Law, the “Manual on risk management for mine safety” is incorporated in the applicable techniques of risk management system to identify risks, analyze and evaluate each of risks, investigate suitable countermeasures for risks, and implement appropriate measures.  
The view point of creation of “Risk evaluation level” and “Risk evaluation rank” in the Manual, grouping the sum of constituents that are decided by the “Risk evaluation standard” can be specified an extent of level and rank.

How to determine an extent of level and rank for “Risk evaluation level” and “Risk evaluation rank” and grouping method are written up clearly using a numerical value and diagrams to easy understand in the manual.

## **3.2 Formulation of Database**

### **3.2.1 Issues**

#### **(1) Technical Skills**

There are cases where lectures/discussions/demonstration only at team meetings are challenging and not always best ways due to various levels and experiences among members on understanding of database, data type, software handling. JICA experts provided individual instruction as much opportunities as team meetings, especially software operation.

#### **(2) Database Management System**

For the time being, database team leader Sotham, director of Department of Geology, should have a role to manage database. However, supporting technical experts are necessary who have much experiences and understanding both software skills such as data creation and update, and hardware knowledge such as security and management of data.

#### **(3) Additional data items and format**

In the initial plan, establishment of database was scheduled to be completed at the time being in December 2015, and in the following 2 visits through OJT update work was planned.

As of December 2015, although some deficiencies were found, database was once established. However, during fifth visit in November 2016 and final visit in February 2017, some addition and changes in format were brought up one after another. This resulted in unexpected load such as new creation of format, data check and repeated works of update and correction.

#### **(4) Changes of format in Database**

As mentioned above, because of the current status of the database format not being fixed as of yet, further format change will be expected. In the new format, GDMR members are expected to be able to input data based on specified datatype. However it is not fully ensured to integrate database, joining with other data, duplicate check, and finding troubleshooting.

#### (5) Quality of Dataset

The geological maps and mineral resource maps were published in the 1960s. For revision of these map, GDMR is considering about conducting field surveys based on the latest knowledge. When the geological map is revised, the GIS dataset will be necessary to be updated. Under current technical capacity of GDMR, it seems hard to do it, which requires wider GIS skills than experience through this project.

A part of department have found license documents missing, probably during relocation of department in 2016. Therefore such part of data are not available in this database. Secure storage for paper document is also challenging issue.

#### (6) Hardware

Because the GDMR members use various versions of the ArcGIS software, there is a possibility of trouble when reading/writing of ArcMap files made from different versions.

GDMR procured the server in November 2016, and the database was stored on this server. However, there is a problem that ArcGIS software has not been installed in the server, so nobody can view or check the database from Server computer.

### 3.2.2 Devices

#### (1) Manual

Manual is created to be easy and visual with many captures of GIS software operation step by step.

#### (2) OJT

Friendly environment was created where GDMR members and JICA experts can easily communicate and discuss. JICA experts provided solution and instruction at the time of question by GDMR members, not only during team meeting but also individually. Such activities brought a strong relationship of trust. Question from working members to JICA experts is welcome over this project term.

#### (3) Practical Display of Database

For additional request from GDMR of procedure of practical display on map rather than standard display, JICA experts produced the required display as a map layer and provided lecture and demonstration. The examples are concession displayed by commodity, by company, by validity of requested year, etc. Lectures also included



effective utilization of database such as searching script and statistical method for interested topics.

### 3.2.3 Lessons

#### (1) Understanding about input rules

At the early time of project, database working member did not understand the fact about License number that the same number exists in different department or different year even within same department. Problem occurred when joining table with other table and search relevant information to selected concession. By share among working members and through lecture about problem of duplicate License number, GDMR member recognized the requirement of unique numbers (IDs) in database. License ID was proposed, which has unique ID value over GDMR, and should be assigned by the Department of Mineral Resources Development & Promotion which is keeping all data beyond department. Currently, no particular problems have happened with License ID, but it will be desired that there must be another better and suitable way of managing in future when number of data become big.

It was clarified that the different date format was used by person. Proposed rule is d/M/yyyy (Day/Month/Year) which is common in Cambodia, but some members mis-inputted as M/d/yyyy (Month/Day/Year) in part, or as character format in part. This wrong input cause big problems when exported to GIS data and processing. The input format for the data preparation sheets needs to be fixed.

There are characters not allowed for the heading line of fieldname. Bad examples were found such Khmer language, over 10 letters, and other banned characters input. Instructions were given and data were corrected.

#### (2) Checking input Data

It was clarified that there were mistakes that duplicate data were included. The method to find out duplicate data is not so difficult, but it was not lectured at early time out of expectation. A lecture on the tips to find duplicate data was given during the final visit, and duplicate data were corrected through personal advice.

## 4. Degree of attainment

### 4.1 Formulation of the draft of mine safety law and strengthen the enforcement system of the Law

Formulation of the drafts of Mine Safety Law and applicable regulations	Degree
(1) Formulation of the Working Team	100%
(2) Drafting Mine Safety Law	100%
(3) Drafting Mine Safety Regulation (phase 1)	100%
(4) Drafting Mine Safety Regulation (phase 2)	100%
(5) Drafting Regulation on Procedures and Items of in Mine Safety Law and its Regulations	100%
(6) Drafting Mine Safety Inspection Rule	100%
<b>Establishment of an enforcement system of the Law and applicable regulations</b>	
(1) Manual on Measurement and Evaluation of dust Concentration at Mines	100%
(2) Manual on Risk Management for Mine Safety	100%
(3) Manual on Mine Safety Inspection (Vol. 1 prevention of mine disaster)	100%
(4) Manual on Mine Safety Inspection (Vol. 2 prevention of mine pollution)	100%
(5) Designing a Policy for an Annual Inspection Plan at Mines	100%
(6) Support for Establishment of Supervised Governmental Structures that are Suitable for the Enforcement of Mine Safety Law and its Regulations	100%
(7) Management and Sharing of Mine Safety Information such as Inspection Results of Mines between GDMR and Provincial DMEs	100%
<b>Strengthening of capacity of inspections</b>	
(1) OJT on handling the equipment for inspection at open-pit mine	100%
(2) OJT on a general inspection using mine safety inspection manuals at open-pit mines	100%
(3) OJT on a general inspection using mine safety inspection manuals at underground mines	100%
(4) OJT on a special inspection (survey of mine disaster caused by rock collapse) using mine safety inspection manuals at open-pit mines (An additional item)	100%
<b>Other activities</b>	
(1) Joint Workshop between MME/GDMR and JICA First time: 14 <sup>th</sup> Dec. 2015 Second time: 21 <sup>st</sup> Feb. 2017	100%
(2) Promotion of Enlightening Campaign for Mine Safety in Japan	100%
(3) Editing Guidebook on Mine Safety in Cambodian version (An additional item)	100%

### 4.2 Formulation of Database

#### (1) Achievement

The level of achievement of work related to formulation of the database is shown in the table below. Fundamentally, the level of achievement of all items was 100%.

Items for database development	achievement
(1) Formulate the Working Team for building database	100%
(2) Review the mine information that GDMR holds	100%
(3) Clarification of information necessary for database	100%
(4) Establishment of a database management system	100%

(5) Data input and correction through the OJT	100%
(6) Database utilization in enforcement of the mine safety law	100%
(7) Creation of database manuals	100%
(8) Revision of database manuals	100%
(9) Update database through OJT and manuals	100%

The GIS database was established that enables revenue items viewed on maps that are linked to concession map, upon higher GDMR's interest.

Due to the nature of database, various types of data are cumulated in database, and continuous update work is required. Accordingly, regarding "(5) Data Input", this is the level of achievement at the time of final visit in this project. However, due to the fact that GDMR requested additional format just several days before leaving to Japan, the following portion of work at GDMR side is still remaining.

- Input work of new format for additional revenue items
- Integration of new data to the database

Regarding "(6) Utilization of Database for Enforcement of Mining Safety Law", one report (PDF file) for a Mining Safety Inspection conducted during the project was imported into the database. Through created hyperlink, the report file can be referred to from the inspection site on map on ArcMap software. This method is described in the manual. Saving the inspection report in the database is significant since this allows information to be shared within GDRM, as well as display/confirmation of mining information in the GIS database

## **5. Proposal for the achievement of the high rank target**

### **5.1 Formulation of the draft of mine safety law and strengthen the enforcement system of the Law**

During the implementation process of the Project, STEs had a chance to know the safety states of mines conducted 4 times of OJT and 1 time of a mine inspection with WTs, including one (1) of metal mine, 2 of lime stone mines, 4 of quarry mines and 2 areas of illegal mining, most of concessionaires, the supervisors and mineworkers at mines were no concept of “Safety and Security” and “Environment Preservation” except mines managed by foreign affiliated corporations because lots of dangerous and unsafe acts were found around the mineral working fields and mine facilities through the OJTs and a mine inspection.

STEs imagine that other mines may be as same levels of awareness of safety and security that are the problems of mineral-related operations throughout Cambodia at present.

In the OJT and a mine inspection, there were found that dangerous explosives were placed on goods shelves, kept explosives and pyrotechnics (detonators) together in the box, and put explosives and pyrotechnics on the ground beside drilling work for blasting holes at a mineral working field of open-pit mines without much thought. And many mineworkers who didn't wear a safety hat (helmet) and wore only sandals engaged in the mineral working fields of open-pit mines.

GDMR requested STEs to transfer the technical guidance to WTs about the survey of mine disaster that was caused by a rock collapse at an open-pit quarry mine, and STEs conducted the survey of mine disaster by added as “OJT on a special inspection” during the ninth visit.

According to the explanation of supervisor of the mine, the heavy rain had continued around the mine for a week before a mine disaster happened, so digging work had stopped while raining. And the direct causes of the mine disaster of rock collapse were estimated that nobody confirmed safety and security at the mineral working field before resumption of the operation, and rainwater penetrated into the joints and cracks of the deposit of minerals at the working field during heavy rain that caused easy sliding the bedrock of the deposit in condition.

In the mineral working field of the quarry mine, the board-formed joints develop a lot into the deposit of minerals, and there are many cracks entered the right angle for a direction of the joints.

The indirect causes of the disaster were estimated that the slope of digging face was easy to slide or collapse because the slope of the digging face ran side by side with the direction and dip of board-formed joints, the concessionaire and the supervisor of the mine adopted digging method considering only economic and increase production making use of the

joints, but they didn't consider the risks and any measures about the board-formed joints that proved the awareness of safety and security at the mine was lower.

Mine Safety Law regulates the duties and obligations of the concessionaires at mines to prevent danger and injuries to mineworkers, to prevent mine pollution, to maintain and manage the mine facilities in common, but occurring number of mine disasters and mine pollution problems shall not expect a significant decrease involved in the enforcement of the Law in Cambodia near future.

Uplifting awareness of mine safety for the concessionaires, supervisors and mineworkers whole mines in Cambodia is very important to lead decrease in number of mine disasters and mine pollution problems.

As the matter of the top priority, the concessionaires and supervisors of mines should be understood the importance of ensuring the safety and security enough at first, and then they should train the mineworkers to raise awareness of safety and security next taken the lead by the supervised governmental organization of GDMR.

STEs took consideration with MME/GDMR superiors about the concrete measures and initiatives taken the lead by GDMR using materials of the "Establishment of supervised governmental structures involved in the enforcement of Mine Safety Law and its regulations" even though Mine Safety Law didn't establish yet, and proposed suitable measures taken the lead by GDMR were as follows.

(1) Promotion of enlightening campaigns for mine safety based on the designing a policy for an annual inspection plan and conducting a general inspection continuously

The staffs of GDMR together with staffs of provincial DME take a general inspection at mines based on the designing a policy for an annual inspection plan at mines that was technology transferred in the Project, and provide safety education about the health management of mineworkers, and maintenance and elimination of hazards in the mineral working fields for promotion of enlightening campaigns for safety and security to the concessionaires and supervisors of mines.

The staffs of GDMR and of provincial DME hold a small seminar at a mine using a textbook of "Guidebook for mine safety" in Cambodia version or the copy of the guidebook by PDF, and audio-visual equipment, such as safety educational videos to the targeted concessionaires and supervisors of mines around areas for the purpose of promotion of enlightening campaigns for safety and security.

And, also guide the concessionaires and supervisors to conduct safety trainings thoroughly to the mineworkers at mines what they were educated at the seminar.

In addition, when the staffs of GDMR and of provincial DME conduct a general inspection for mineral working fields or mine facilities such as an ore crushing plant,

they guide the supervisors of the mine how to identify risks, analyze and evaluate each of risks, investigate suitable countermeasures for risks, and implement appropriate measures using the “Risk Management System”, and collaboration work with the supervisors will lead to spread the techniques of the system.

Not only the concessionaires and supervisors of mines but also staffs of GDMR and of provincial DME are able to recognize the importance of safety education by continuing the inspection duties that focus on safety education.

In the ongoing promotion of enlightenment campaigns for mine safety through the inspection at mines, the safety awareness is reached into the lowest levels of mineworkers will happen to appear as the decrease in number of mine disasters/accidents and mine pollution problems.

(2) Guidance for establishment of “Safety Rules” toward the concessionaires at mines

The GDMR supervises and guides the concessionaires about the establishment of “Safety Rules” at mines that employ a certain scale number of mineworkers like more than 30 workers engaged in early stage, and also supervises and guides the concessionaires for promotion of voluntary safety activities in accordance with their own rules that will lead the improvement of safety awareness to the supervisors and mineworkers.

The need for “Safety Rules” means that mining methods, work procedures and safety countermeasures during holidays, etc. are different each mine in common, and these matters cannot treat and prescribe in the law and regulation.

(3) Establishment of a mine safety training system targeted on nominated mine safety inspectors

The supervision and guidance on mine safety and environment preservation to mines conducted by the supervised governmental organization of GDMR alone is considered to be physically and functionally difficult because numbers of the mineral-related operations are expected to develop and expand depending on the economic situation in Cambodia in the near future.

Therefore, specific measures concerning supervision and guidance to mines conducted not only GDMR but also provincial DMEs as a premise for designation of mine safety inspectors in the office of provincial DMEs or by coordinating with provincial DMEs are considered to be the best optimum administration policy.

When considering supervised governmental structures on mine safety in Cambodia in the near future, the training system targeted on nominated mine safety inspectors that provides well knowledge of mine safety, security and environmental management and OJT on a general inspection and a special inspection is an urgent task, and the well-

planned management of the training for increasing the number of mine safety inspectors is important subjects in GDMR.

After first training for nominated mine safety inspectors with making good use of training program, for an example, who will be the core of the inspectors and take the role of leaders and guide their subordinates. To achieve this objective, it is important and easy method to constitute a mine safety training system taken the lead by GDMR.

When establishing a mine safety training system targeted on nominated mine safety inspectors, the experienced mine safety inspectors serve as instructors along the line of the needs of the system, and the mine safety inspection manuals which have already been transferred to WTs in the Project can be utilized as the teaching materials.

A general inspection on mineral working fields and mine facilities at mines conducted by experienced mine safety inspectors that also makes a better use of a practical training for the trainees.

(4) A mine safety training system targeted on nominated safety engineers at mines

The working environment conditions at mines are worse and the disaster occurrence rate is higher than other industries in common.

It needs to establish a mine safety training system targeted on nominated safety engineers that provides well knowledge of mine safety and skills of techniques in order to eliminate the risks of mine disasters, and to maintain safety, security and environmental preservation at mines.

In Japan, with the central government taking the lead, the following mine safety training system had been conducted successfully under the old Mine Safety Law.

This system will be useful when investigating the establishment of a mine safety training system targeted on nominated safety engineers in Cambodia, as a reference.

- 1) Establishing training facilities named “Mine Safety Center” where various training courses, such as risk prediction trainings, relief trainings, safety practices and editing of training textbooks were held by instructors.
  - 2) Holding study classes for mining-related Laws and regulations
  - 3) Conducting OJTs by experts on the mine site
- (5) Practical use of information and statistic data concerning mine disasters and mine pollution problems

When a mine disaster or mine pollution problem occurs in Japan, the Department of Industrial Safety and Inspection (DISI) dispatches mine safety inspectors to the mine for investigation the causes of the disaster or mine pollution problem.

The DISI provides information and statistic data about the causes, countermeasures and kinds of the disaster or mine pollution problem to mines and related organizations

nationwide after the investigation conducted by mine safety inspectors.

The owners of mining right (concessionaires) and safety committees at mines that get the information and statistics data concerning a mine disaster or mine pollution problem investigate at similar places in the mineral-related operations based on the information.

Implementing safety measures when similar places are discovered is useful in eliminating risks of mine disasters or mine pollution problems.

The practical use of information and statistic data concerning the investigation of a mine disaster or mine pollution problem conducted by mine safety inspectors to mines nationwide is the essential key to eliminate risks of similar disasters or pollution problems taken the lead by GDMR after the enforcement of Mine Safety Law and its regulations.

## **5.2 Formulation of Database**

### **5.2.1 Database Update Work**

Updating the data in the database formulated with this project without changing the format is sustainable if the instructions in the manual are observed. However, it is expected that information that should be imported into the database will increase due to growth of the mining industry in Cambodia.

If the types of data simply increase, it is not that difficult to add the data to the database and import it into the GIS system and display it. However, in the event the current format of the database is changed or new analysis/display capabilities are needed, it will be difficult to achieve with the current technical capabilities of GDMR.

Director General H.E. Dith Tina voiced concern in anticipation of this situation at the final JCC conference. In other words, this consisted of the question “The project has ended, but can GDMR members consult with JICA experts by e-mail or other means in the event they encounter problems concerning the database?” The JICA expert responded “JICA experts will gladly consult with you anytime based on the cooperative relationship that has been established”. Manager Sotham in the Department of Geology, the database working team leader also has the same concern.

As stated above, in consideration of the current status in which the database format has not been fixed, short-term dispatch of experts as follow-up work should be performed until database updating and other such work is being performed smoothly.

### **5.2.2 Formulation of Database Management Environment**

#### **(1) Server and Server Room**

GDMR purchased a server (Windows Server 2012 R2) and Uninterruptible Power



Supply (UPS) in October 2016. In addition, during the fifth visit in November 2016, a switching hub, LAN cable, WiFi router and receiver were purchased. Plans called for setup of the server room during this period, but the server room was not completed due to ongoing large-scale renovation of the GDRM building.

Setup of the server as a file server and setting of Windows users was performed during the visit in November 2016. In addition, the switching hub was connected to the server using LAN cable, and the LAN connection was confirmed with a notebook PC. Furthermore, LAN connection of the WiFi router and switching hub was attempted, but was not successful (cause unknown).

The server room had been completed at the time of the final visit in February 2017, and the set of above procured items were in custody (photo below). The JICA expert started up the server, confirmed operation, and stored the prepared database on the server.



Server PC (on desk) and UPS (at floor), in Server room of GDMR office

## (2) Network and Security

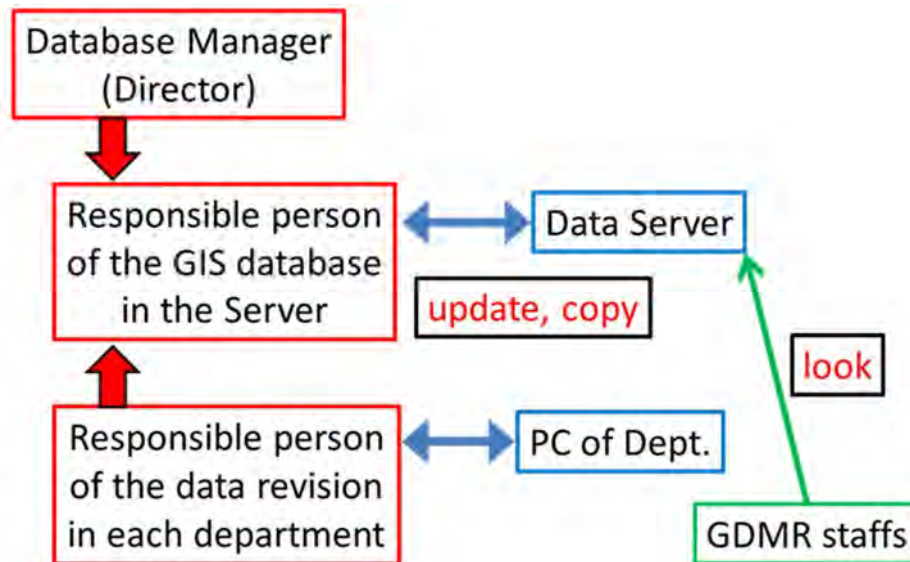
Connection of a laptop to the server through switching hub was verified in November 2016, but it was not succeeded at the time of the final visit in February 2017. Improper setting of the IP address for the notebook PC is thought to be the cause. It is believed that LAN connections in the future should be solved by IT personnel within GDMR.

GDMR has a plan to conduct database updating work using a LAN connection. However, when security is considered, adopting the method of directly updating data on

the server is safer. Security settings should be made so that only browsing of the database can be performed when using a LAN connection.

### (3) Database Management System

In order to manage database at higher security level, it is necessary to establish a management system, formulate operation regulations and implement safety measures, including anti-virus check system. The diagram below shows the database management system proposed by the JICA expert at the final JCC. Since the recognition of safety management and the importance seems still low, follow-up support is highly desired.



Proposed Database Management System

### 5.2.3 Technical Support

The database was established which allows users to view on map, but further technical skills such as searching data with complicated condition, calculating or processing tips and statistical analysis have not been transferred which will be essential when utilizing database. JICA experts received additional request from GDMR on advanced data processing during the final visit in February 2017, but only a simple lecture was provided on the last day of visit. GDMR is seeking methods to utilize the database, and it is much considerable that further technical training is needed with respect to database analysis and GIS analysis.