

## Chapter 8 the Master Plan

### 8.1 Policy and Purpose of the Master Plan

The policy for the Master Plan has been materialized by the past surveys, discussion with counterparts and Progress/Interim Workshop, has been confirmed by MEM and MEP, and has been also consented by the related organizations and international organizations. The Master Plan has been formulated, taking account of the current state of transferring period of the mining management from state ownership to private sector under a market economy as well as the future after privatization, based on the results of the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> local surveys.

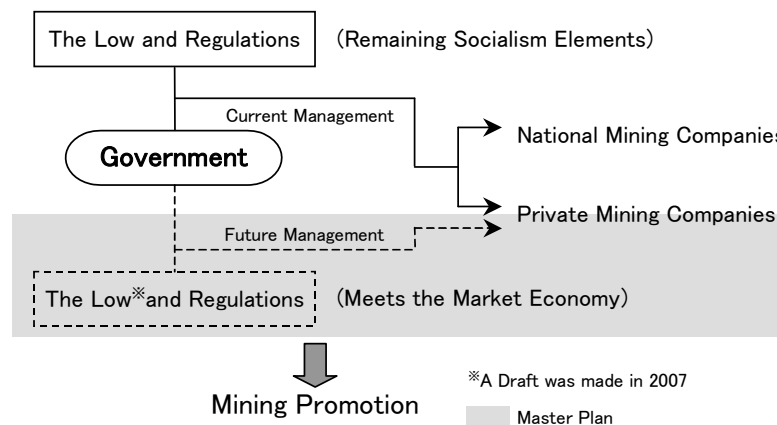


Fig.8.1 Relationship between Current Mining Management and the Master Plan

As the purpose of the Master Plan is to promote the mining sector, it must help realize mining activities, increase employment, and link with economic growth. Therefore, specific measures have been considered for mining organization, investment promotion, private sector management, developing private sector human resources, and the interactive effects between the mining institute and mining policy.

The highest priority for promotion of the Serbian mining sector is to reform the existing socialist era structure of the institute, and strengthen and systemize it to manage the mining sector under a market economy.

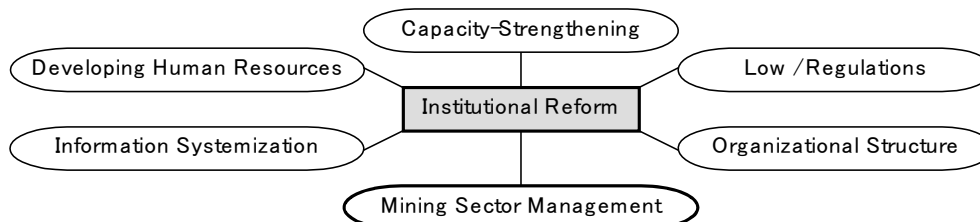


Fig.8.2 Roles of the Institutional Reform

To understand the formulated Master Plan, it is necessary to realize the relationship between institutional reform and sector management and its roles (Fig. 8.2), to understand the flow of mining improvement, to identify specific measures, and to select an action program and Institutional Reform Program with an appropriate budget (Fig. 8.3).

Basic policy for the Master Plan is as follows;

- The period of the Master Plan is 10 years under smooth private initiative.
- The first period (5 years) is the mining sector building period, and last period (5 years) is the mining promotion period.
- Concrete measures composing of the Master Plan will be materialized by self-funding, not by dependence on donor countries/organizations.

The Master Plan will be begun in 2008, and will be completed in 2018. A target in 2018 is to achieve 10% of the GDP by mining activities.

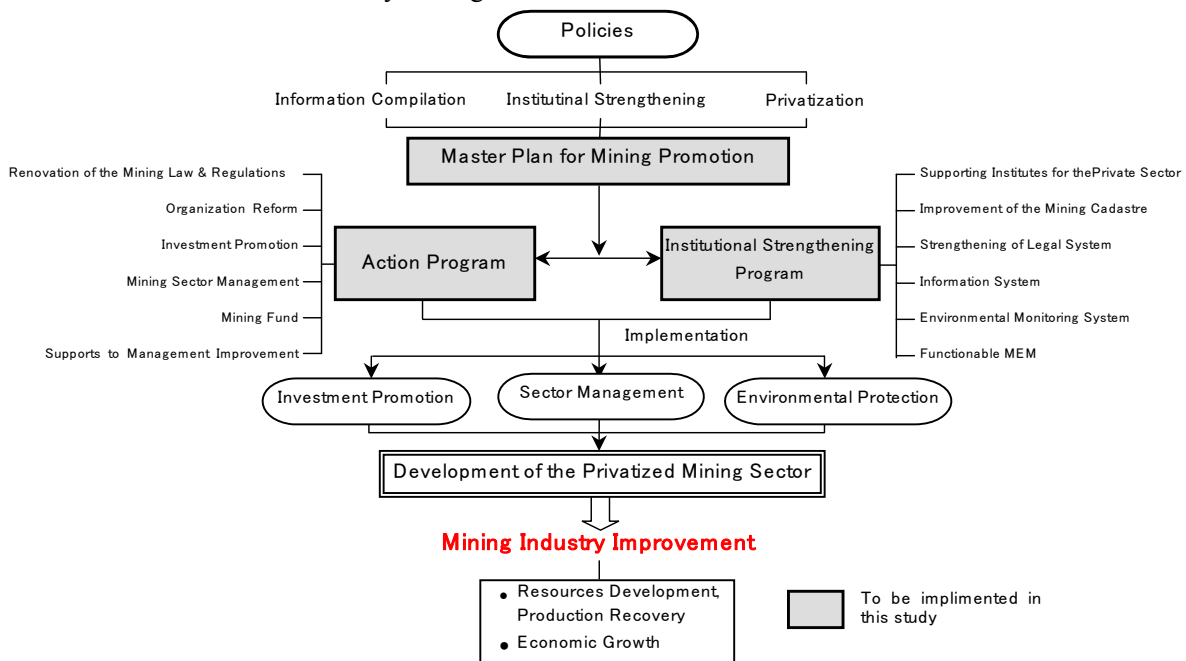


Fig.8.3 The Master Plan for Improvement of the Mining Sector

The Master Plan has a 10-year period to transfer mining management smoothly from state ownership to the private sector, to complete institutional reforms, and to increase the mining sector’s contribution to GDP to 10% after 10 years, which would link with reform of the mining sector. The Master Plan has specific measures such as the 5-year Action Program to materialize solution for urgent matters, including a part of the Institutional Reform Program which would be continued and expanded in the mining promotion period.

Serbia has the potential to fund the Action Program. As long as privatized mines and smelters are not able to increase production after privatization, royalties and revenues will not increase, so the funds to materialize measures consisting of the Action Program and Institutional Reform Program must depend on international organizations or donor countries. Therefore, it should be emphasized to attain the fund to implement measures by Serbia’s own effort. Basically, the first half period (5 years) should be carried out by self-attained fund.

The Master Plan is divided into 2 periods, a mining sector building period (the first 5

years) and a mining promotion period (the second 5 years) (Table 8.1).

Table 8.1 Schedule for the Master Plan, Action Program and Institutional Reform Program

| Year                         | 1                             | 2 | 3 | 4 | 5 | 6                       | 7 | 8 | 9 | 10 |
|------------------------------|-------------------------------|---|---|---|---|-------------------------|---|---|---|----|
| Master Plan                  | Mining Sector Building Period |   |   |   |   | Mining Promotion Period |   |   |   |    |
| Action Program               | ←                             |   |   |   |   |                         |   |   |   |    |
| Institutional Reform Program |                               |   |   |   |   | ←                       |   |   |   |    |
| Mining Activities            | ← Promoting Exploration       |   |   |   |   | ←                       |   |   |   |    |
|                              | ← Recovery of Productivity    |   |   |   |   | ← Enhancing Development |   |   |   |    |

The Action Program will be implemented in the first 5 years and the Institutional Reform Program will be mainly implemented in the second 5 years. The financial resources for these programs are mainly taxes and royalties. Therefore, to assure the financial resources, it is necessary to advance both production recovery and management of the mining sector (private sector) harmoniously (Fig.8.4). In addition, it is necessary to enact the Mining Law and implement mining policies as soon as completion of privatization for reconstruction (basis building) and promotion of the mining sector. Furthermore, various concrete measures (programs) must be implemented to establish the management of the mining sector activated by the private companies (Table 8.2).

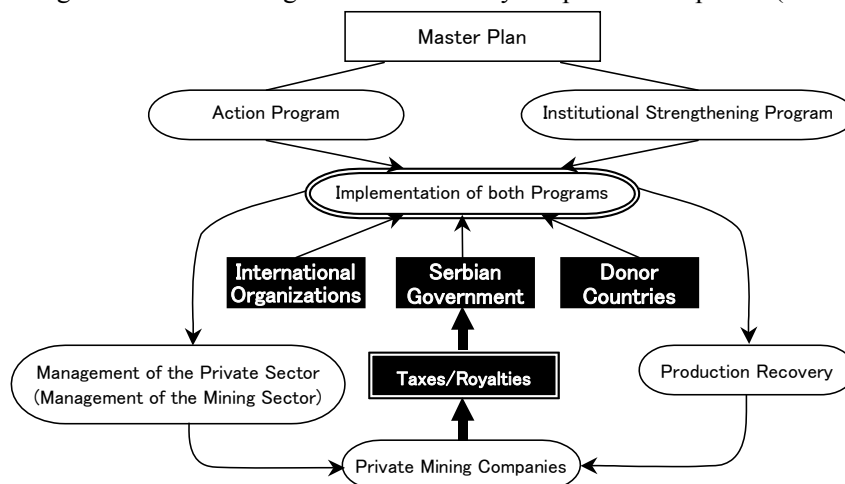


Fig.8.4 Financial Resources to Implement each Program

Table 8.2 Scheduling for Reconstruction and Promotion of the Mining Sector

| Years                           | 1                          | 2                              | 3                 | 4 | 5  | 6  | 7         | 8 | 9 | 10 |
|---------------------------------|----------------------------|--------------------------------|-------------------|---|--|--|-----------|---|---|----|
| Privatization                   | Completion                 | Rehabilitation, Reconstruction |                   |   | Complete Privatization, Production Expansion |  |           |   |   |    |
| Mining Low*                     | Study                      | Implementation                 |                   |   | Review                                       | Revise                                     | Effective |   |   |    |
| Mining Policies*                | Study                      | Implementation                 |                   |   | Review                                       | Revise                                     | Implement |   |   |    |
| Management of the Mining Sector | Conduct the Action Program |                                |                   |   |  | Conduct the I.S.P                          |           |   |   |    |
|                                 |                            |                                |                   |   |  | Stabilize Management of the Private Sector |           |   |   |    |
| Mining Organizations            | Study                      | Reorganize                     | New Organizations |   | Activate and Stabilize the Organizations     |  |           |   |   |    |

Starting Point to implement the Master Plan (2008)

Note : I.S.P : Institutional Reform Program \*Draft was made in 2007 by supports of the World Bank

## 8.2 Mining Sector Institutional Strengthening and Visions

Mining sector institutional reform, which is the highest priority task in the mining sector building, will create the foundation for mining promotion. It will be the basis for promotion of investment in mining exploration and development under the market economy, and production sector management for the private companies (Fig.8.5). The principal subjects for institutional reform must be interrelated. For example, the cadastre management has close connection with the Mining Law, and also it will be included by organization reform.

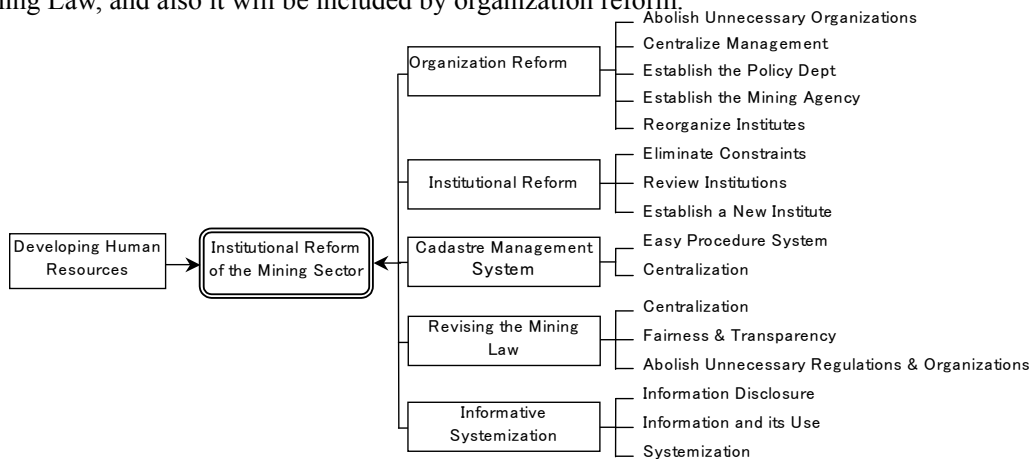


Fig.8.5 Institutional Reform

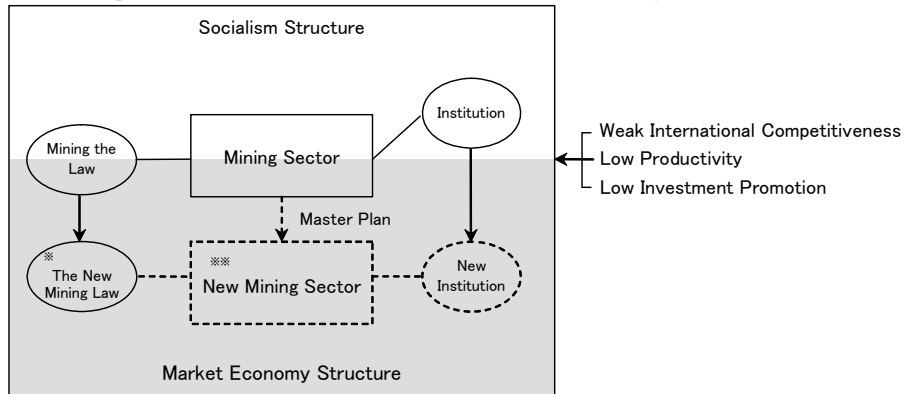
### (1) Organizational Reform

It is necessary to review, unite and activate organizations such as the MEM, MEP, Mining Institute, Geological Institute, and related organizations to promote mining activities mainly by the private companies. Currently, each organization related to mining activities does not necessarily bring out its potential power to mining promotion. In other words, it is indispensable to abolish unnecessary organizations under the market economy and combine the similar organizations or departments from viewpoint of simplification. Furthermore, it is necessary to identify the role of research departments to be reorganized. If synergistic effects would occur between administration and research departments, they might be expectedly more functionable.

### (2) Institutional Reform

Restrictions and regulations of the former socialism age must be eliminated and existing institutions must be reviewed. It is necessary to formulate concepts for the institutions to activate mining activities, find out tasks to establish these institutions, and clarify effects to be attained by establishment of these institutions. There is a concrete example for necessity of the institutional reform in excess management of the national/privatized mines such as obligatory reports for exploration/production, etc. The concept for the institutions must be formulated from the viewpoint of the private sector management in fostering human resources, managing the mining concessions, , exploration, development, compiling information, etc. in order to help reforming the whole mining sector. The current stance of the mining sector is in the border between the old socialism and

market economy. Therefore, it should be moved completely to the market economy by the Master Plan. The current mining sector is low in productivity and weak in competitiveness. Investment promotion cannot be expected under the current stance of the sector (Fig.8.6).



\* This draft was made in 2007.  
 \*\* It will match up to the Market Economy.

Fig.8.6 Stance of the Mining Sector before and after Implementing the Master Plan

**(3) Management System of the Mining Concessions**

The management of the mining concessions based on the current Mining Law needs complicate procedures without transparency, and demands a lot of time and work. It may be even a barrier to improve stagnated mining activities. Therefore, it is necessary to simplify and consolidate procedures and management of the system. In other words, it is necessary to materialize the modernized system used IT based on the new Mining Law. It is necessary to design the complete systemized mining concession management, taking account of simplification of application for the new mining concessions (Fig.8.7) as well as management of approved mining concessions.

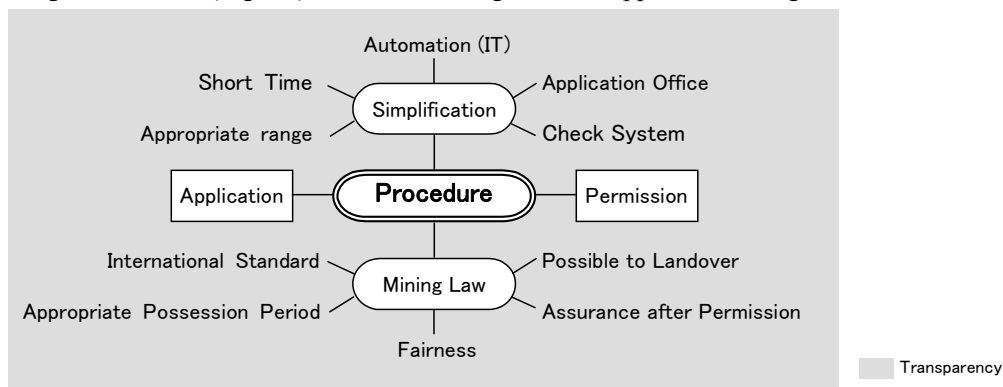


Fig.8.7 Viewpoint of Improvement for Management System of the Mining Concession

**(4) Revising of the Ming Law**

A draft for the new Mining Law is currently formulating. The current Mining Law is not effective for promotion of mining activities, because it has not fairness and transparency. Therefore, it is necessary to enact urgently the new Mining Law based on the international standard. The Mining Law has a strong relation with issues of the institutional reform and the management system of the mining concessions. Laws and regulations of the former socialism age are not

reasonable under the market economy. This matter also links with the rigid and complicate organization. The investors expect fairness, transparency and simplification in the Mining Law which may be disincentive to investment adversely. It is necessary to discuss revising of the Mining Law, considering the above-mentioned “organizational reform” and “management system of the mining concessions”.

**(5) Compilation of Information**

There exist a large amount of information which have been accumulated in the Geological Institute, the MEP and the MEM in Serbia. Although a part of the information is converted into and managed in GIS database, a plenty of mining-related information is still stocked in analog form such as reports and documents and is not computerized. Therefore, such information shall be integrated, and be utilized effectively in multipurpose and be systemized by specifying usage approach. Information maintenance used for national development policy and land conservation must be crucial. Information shall be disclosed in public, and it shall lead to varieties of usages by not only investors but also possible people and organizations. In order to use more existing analog information, it is necessary to rebuild a new systemized database which includes the GIS database and existing analog data.

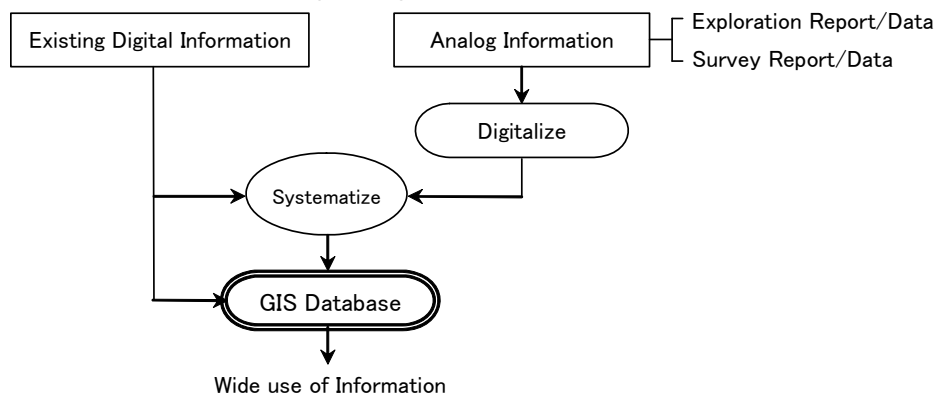


Fig.8.8 Compilation of Information

**(6) Fostering Human Resources**

There are several places to foster human resources for mining activities. For example, they are the existing research facilities and skill training fields such as open pits, underground mines, smelters, and environmentally contaminated areas, etc. However, each institute has independent budget in principle, so the role to foster human resources is disappearing. Fostering human resources could not link with mining promotion, if it were not advanced according to mining activities.

**8.3 Action Program and Institutional Program**

Purpose of the Action Program is to solve urgent issues for construction of the mining foundation to activate mining activities under the market economy through reconstruction of the

existing mining industry. It will be implemented mainly by the Serbian government itself and international consultants, and it must be conducted to transfer knowledge, information, skills and methods to manage the mining sector under the market economy.

The Institutional Reform Program consists of programs related to the institutional reform and strengthening, and urgent matters to take priority are included in the Action Program. It is important for the Serbian mining sector to change the current existing institutions to the competitive institutions suitable for the market economy. The Institutional Reform Program must proceed systematically, strategically and comprehensively.

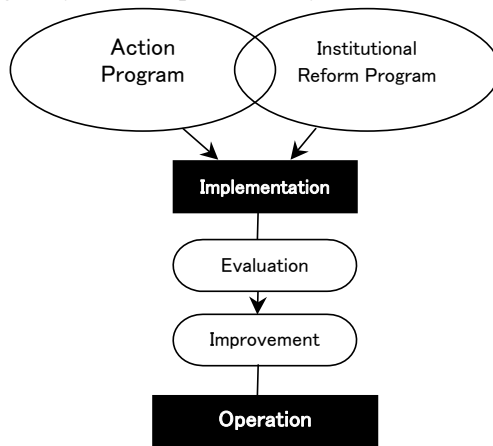


Fig.8.9 Relation between the Action Program and Institutional Reform Program

Table 8.3 Action Program and Institutional Reform Program

|   | Program  | Target  | Implementation Period                   |                   |
|---|--|---|---|-------------------|
|   |  |   | Sector building (5yrs.)                 | Promotion (5yrs.) |
| Action Program                            | 1. Mining Organization                                       | functionalize the sector management               | -----                                   |                   |
|   | 2. Investment Promotion                                      | Expand mining investment                          | -----                                   |                   |
|   | Investment Seminar   | Intrduce foreign investment                       | <-->   <-->   <-->   <-->   <-->   <--> |                   |
|   | one-stop-shop  | Provide information to investors                  | -----                                   |                   |
|   | Publication of maps, etc.                                    | Provide information to investors                  | -----                                   |                   |
|   | Periodical publication                                       | Provide late trend to investors                   | -----                                   |                   |
|   | 3. Management of the mining sector                           | Abolish old institutions                          | -----                                   |                   |
|   | 4. Foster humanresources                                     | Continue mining wokers training                   | -----                                   |                   |
|   | 5. Mining Fund   | Support the privatized companies                  | -----                                   |                   |
|   | 6. Two-step-loan   | Help privatized companies                         | -----                                   |                   |
|   | 7. Instruction of Accounting System                          | Healthy mining activities                         | -----                                   |                   |
|   | 8. Establishment of the Mining Association                   | Activate the privatized companies                 | -----                                   |                   |
|   | 9. Rehabilitation of the tailings dams and monitoring system | Environmental protection                          | -----                                   |                   |
| 10. Concession management system          | Simplify procedures for application                          | -----   |   |                   |
| 11. Technical Training Center             | Foster human resources (skilled workers)                     | -----   |   |                   |
| 12. Support for Management Reconstruction | Improve the privatized companies                             | -----   |   |                   |
| 13. Mining Training Sessions              | Attain knowledge and technologies                            | -----   |   |                   |
| Institutional Reform Program              | 1. Supporting Institution for the Private Sector             | Promote exploration and development               | -----                                   |                   |
|   | Subsidy for Exploration                                      | Promote exploration by Serbian companies          | -----                                   |                   |
|   | Loan Institution for Exploration                             | Promote exploration (around mines)                | -----                                   |                   |
|   | Loan Institution for Development                             |   | -----                                   |                   |
|   | 2. Regional Exploration Institution                          | Acquire basic information                         | -----                                   |                   |
|   | 3. Management of the Mining Cadastre                         | Improve efficiency of mining concessionmanagement | -----                                   |                   |
|   | 4. Strengthening of Legal System                             | Review and renovate the Mining Law                | -----                                   |                   |
|   | 5. Information System  | Network in MEM and MEP.                           | -----                                   |                   |
|   | 6. Monitoring System   | Environmental protection                          | -----                                   |                   |
| 7. Dsiclosure of Information              | Disclose environmental information                           | -----   |   |                   |
| 8. Strengthening of MEM Function          | Abolish old institutions                                     | -----   |   |                   |
| 9. Reviewing of the Mining Tax System     | Activate mining activities.                                  | -----   |   |                   |

These programs consist of each detailed measures shown in Table 8.3, the mining industry will be reconstructed and its basis will be rebuilt by implementing each measure, exploration and development will be enhanced, and finally the mining industry will be promoted under the achieved targets. Relationship between each basis building, reconstruction and promotion of the mining industry, enhancing of exploration and development, and others is shown in Fig.8.10.

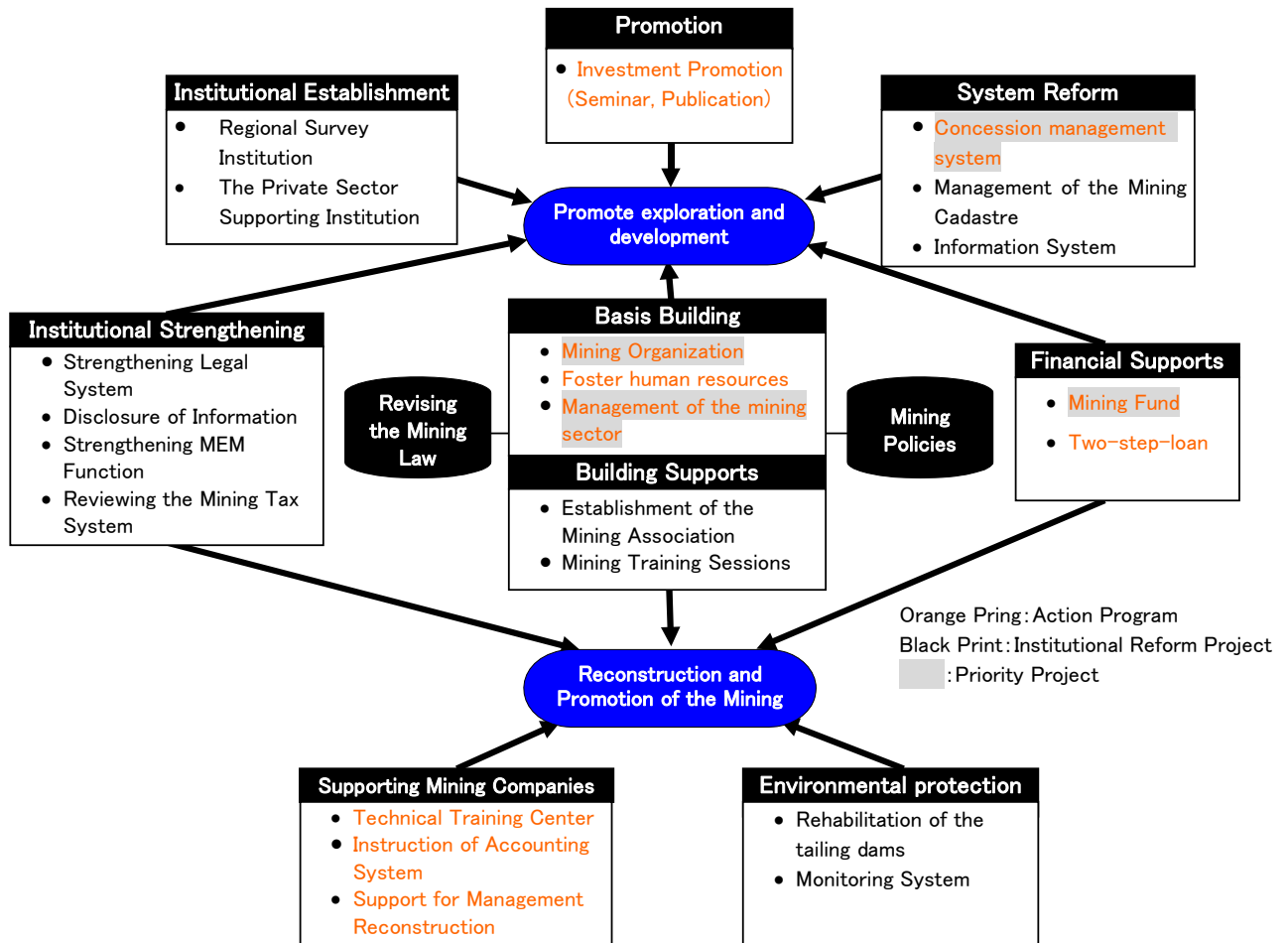


Fig.8.10 Location of each Measure of the Master Plan

It is necessary to drive the institutional strengthening forward through construction of the basis suitable for the market economy as well as detailed measures supported by various fields. These measures have an organic mutual relationship. Therefore, if the measures will be materialized with mutual cooperation, they will link with the management of the mining industry and supports of the private sector and finally promote the mining sector. In other words, it is possible that the mining sector will occupy 10% in the GDP after 10 years (Fig.8.11). All items to be done are divided into three stages for implementation according to their priorities, the 1<sup>st</sup> Implementation, 2<sup>nd</sup> Implementation and 3<sup>rd</sup> Implementation (Table 8.4). These divided items are not scheduled yet. Items in each category are expressed according to priorities. Each item should be implemented observing the order of precedence, and finally targets will be achieved steadily.



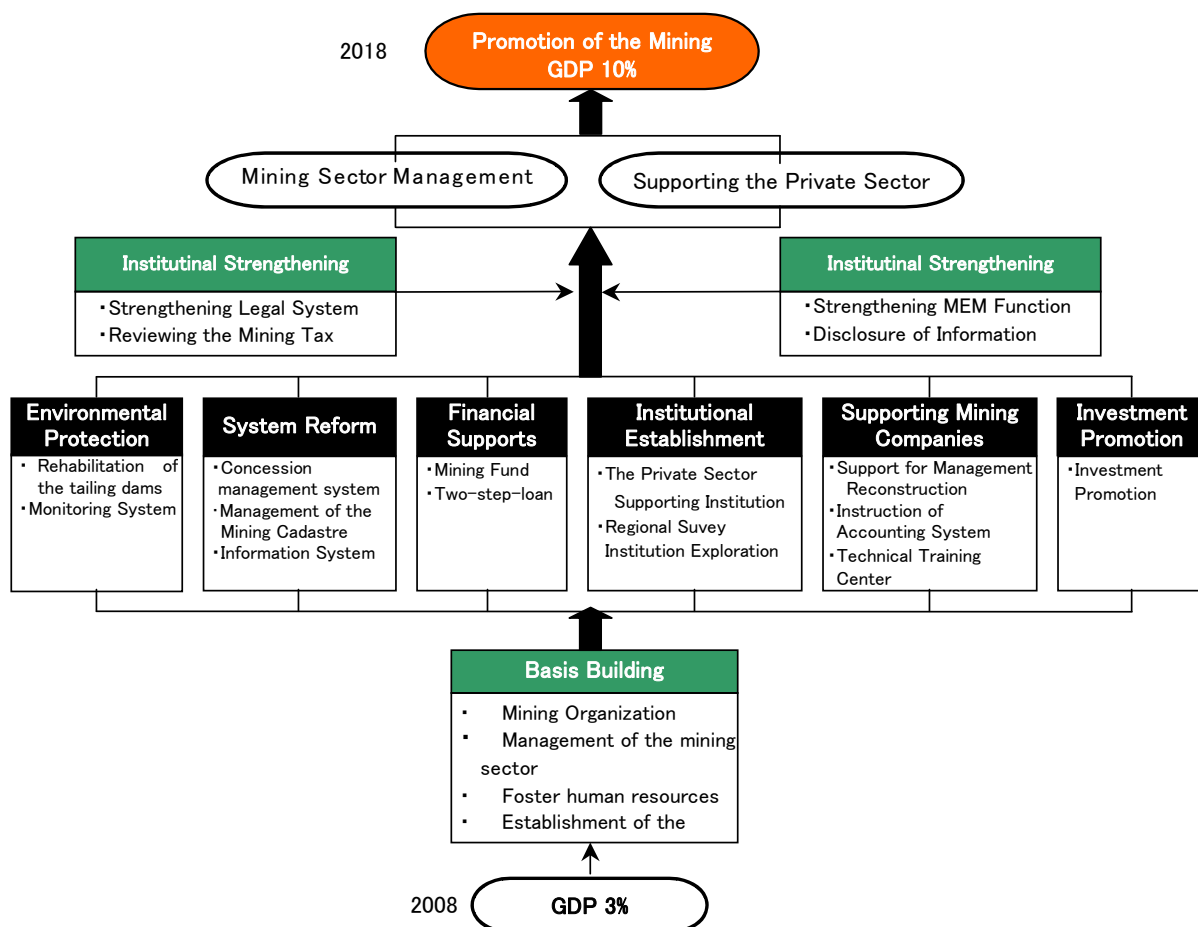


Fig.8.11 Each Measures and Mining Promotion

Table 8.4 Priorities of Implementation Items in each Category

| Category                    | First Implementation (Priority)  | Second Implementation   | Third Implementation  |
|-----------------------------|--|---|---|
| Sector Building             | <ul style="list-style-type: none"> <li>• Mining Organization</li> <li>• Management of the mining sector</li> <li>• Foster human resources</li> </ul> | <ul style="list-style-type: none"> <li>• Establishment of the Mining Association</li> <li>• Mining Training Sessions</li> </ul>       |   |
| Investment Promotion        | <ul style="list-style-type: none"> <li>• Investment Promotion Periodical publication</li> </ul>  | <ul style="list-style-type: none"> <li>• Investment Promotion one-stop-shop</li> </ul>  |   |
| System Reform               | <ul style="list-style-type: none"> <li>• Concession management System</li> </ul>   | <ul style="list-style-type: none"> <li>• Management of the Mining Cadastre</li> <li>• Information System</li> </ul>                   |   |
| Financial Supports          | <ul style="list-style-type: none"> <li>• Mining Fund</li> </ul>  | <ul style="list-style-type: none"> <li>• Two-step-loan</li> </ul>   |   |
| Institutional Strengthening |  | <ul style="list-style-type: none"> <li>• Strengthening of Legal System</li> <li>• Strengthening of MEM Function</li> </ul>            | <ul style="list-style-type: none"> <li>• Reviewing of the Mining Tax System</li> <li>• Disclosure of Information</li> </ul> |
| Institution Establishment   |  | <ul style="list-style-type: none"> <li>• Supporting Institution for The Private Sector</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Regional Exploration Institution</li> </ul>  |
| Environmental protection    | <ul style="list-style-type: none"> <li>• Rehabilitation of the tailings dams and monitoring system</li> </ul>  |   | <ul style="list-style-type: none"> <li>• Onitoring System</li> </ul>  |
| Help Mining Companies       |  | <ul style="list-style-type: none"> <li>• Support for Management Reconstruction</li> <li>• Instruction of Accounting System</li> </ul> | <ul style="list-style-type: none"> <li>• Technical Training Center</li> </ul>   |

Red Print : Action Program

Black Print : Institutional Reform Program

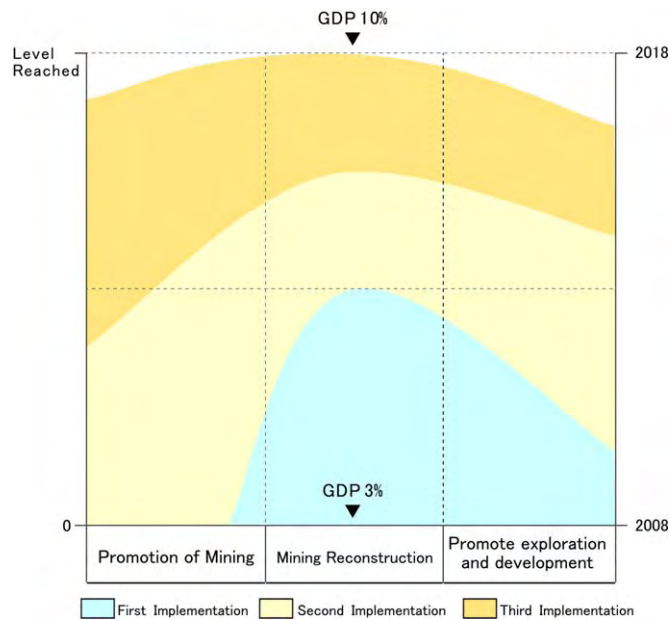


Fig.8.12 Concept for Achievement of Targets by Implementation of Items

#### 8.4 Implementation Organization

The Master Plan must be approved by the government after it is reviewed and examined by MEM and MEP. Approved items include an implementation organization to be described here.

The Master Plan Committee consisting of members from the associated organizations will be set up to implement the Master Plan. The plan will be implemented after preparing a detailed design by the ministry members or private experts/companies to be ordered from the ministry. Implementation results are assessed by the Master Plan Committee.

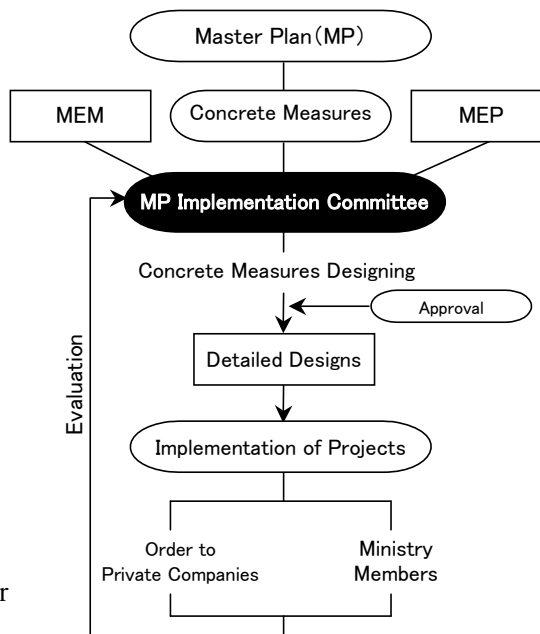


Fig.8.13 Implementation Organization for the Action Plan

## 8.5 Action Program

Various specific measures has been considered and discussed for the formation Action Program and Institutional Reform Program based on the Master Plan. Specific measures identified in the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> local surveys have been examined and are summarized as follows. Each measure should be examined in the future through series of operation such as basic design, budget estimation and detailed design after discussing their roles and effects from the viewpoint of creating a systematic and organic relationship.

### (1) Mining Organization

The current Serbian mining organization and national management were formed during the self-management socialist era and are not appropriate for the present privatization situation or the future. The New Mining Law defines the establishment of a Mining Agency, so it is preferable to assign the Mining Agency to the routine work of mining management, and the MEM to the mining policy. Also, the Mining Institute and Geological Survey should belong to the MEM, which will administrate and manage the mining sector.

The Mining Agency will manage the entire mining sector. It will consist of mine management, concession management, information center, mine pollution measures, environmental preservation, technical management and mineral development. The MEM's work will focus mainly on institutions, policy, laws, and regulations. The Mining Institute will play a role in technical development, technical evaluation, and training for related people. The Geological Survey will create a mining cadastre, and collect and compile resource and geological maps and information. The current environmental administration should be reorganized so that mining environmental management is transferred from the MEP to the MEM, which can centrally manage mining matters of exploration, development, production, smelting, and environmental preservation. Also, this organization should meet the Mineral Policy under preparation.

#### 1) MEM Organization

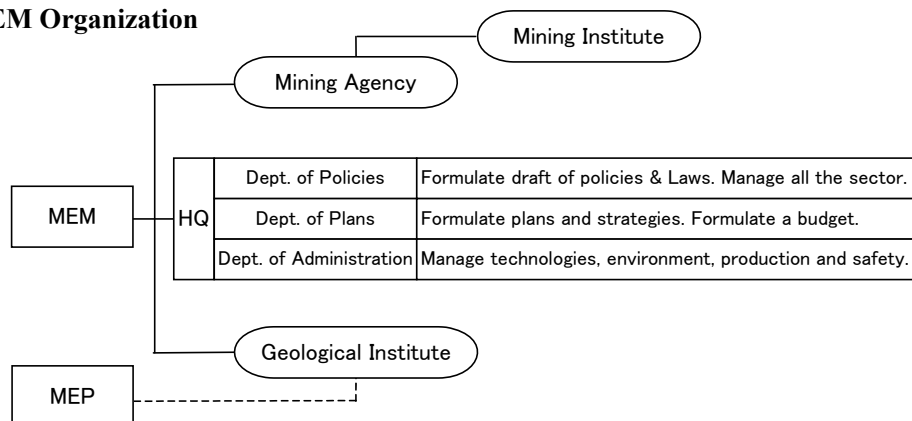


Fig.8.14 Unitary Government Organization Concept for the Mining Sector

#### A. Department of Policy

- Draft policies and institutions.

- Draft the Mining Law, regulations and associated laws.
- Determine orientation of the mining sector and its strategy.
- Manage the mining sector and its risk.
- Build and coordinate external relations.

Table 8.5 Organization of the Department of Policy

| Division                 | Activities   |
|--------------------------|--|
| Division of Policy       | Policies, institutions, orientations, management                 |
| Legal Division           | Draft, review and systematize laws and regulations, Diet affairs |
| Division of Coordination | Foreign negotiation and coordination                             |

B. Department of Plan

- Formulate and revise budget plan, review financial settlement.
- Formulate strategic programs.
- Formulate a promotion plan of the mining sector. Revise the long/medium term plan.
- Implement and manage the Master plan.

Table 8.6 Organization of the Department of Plan

| Division                   | Activities   |
|----------------------------|--|
| Division of Budget Plan    | Formulate, revise and manage budgeting. Long/medium budget plan.               |
| Division of Strategic Plan | Formulate investment plan. Implement the sector promotion and the Master Plan. |

C. Department of Management

- Understand the trend of mining activities (including management of the private companies).
- Understand production situation.
- Manage revenues such as royalties and tax. Manage the Mining Fund.
- Totalize technology and safety.
- Totalize environmental preservation.

Table 8.7 Organization of the Department of Management

| Division   | Activities   |
|--|--|
| Division of Technical & Safety Supervision         | Supervision of technology & Safety, Technical instruction to private companies   |
| Division of Environmental preservation Supervision | Supervision of environmental preservation & measures, Formulation of standards, Instruction to private companies   |
| Administration                                     | Accounting of the mining sector, Establishment & management of committees, Management of revenues, Establishment & management of the Mining Fund, Management of budget |

**2) Mining Agency Organization**

The Mining Agency is an operational unit for the mining sector. In other words, the agency manages and coordinates all mining activities on stance of the government. After reorganizing the current MEM and research organizations as mentioned before, the new MEM has a function and role of headquarters which will think the right direction to get through and lead the mining sector to it. The Mining Agency under the MEM will work effectively to lead and manage the whole mining sector. Therefore, following viewpoints should be taken account for

establishment of the Mining Agency;

- Define the roles and locations of the Mining Agency and associated organizations, and network between them.
- Employ staffs who work in the Mining Agency.
- Incorporate the partial research institutes into the agency.
- Activate the relation between the Mining Agency and MEM, and manage sufficiently the sector.

The Mining Agency consists of Departments of Mines, Concessions, Technical Management & Development, Survey, Environmental preservation, Information Center and Administration (Fig. 8.15).

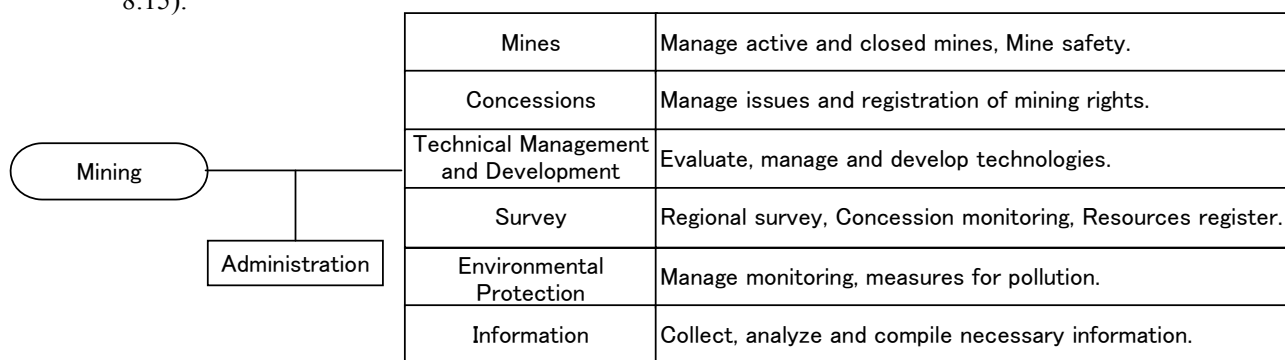


Fig.8.15 Organization of the Mining Agency

#### A. Department of Mines

- To collect and analyze data of active mines and smelters.
- To collect production data of active mines and smelters, to understand each business situation, and to collect and financial data of each company.
- To make calculation bases for royalties and taxes.
- To collect and analyze ore reserve and minable ore of active mines.
- To collect and analyze exploration results of active mines.
- To collect exportation results of materials produced by active mines and smelters.
- To make an inventory book for ore reserve and minable ore of abandoned mines.
- To supervise safety measures and organizations of active mines.
- To supervise and monitor state of abandoned mines.
- To make a list for machines and facilities of active mines and smelters.
- To make safety rules and standards, and to give certificate of safety engineer.

For these works, Divisions of Production Management and Safety are necessary.

#### B. Department of Concession

- To accept application of mining concessions and issue poermmissions.
- To register, compile and renovate mining concessions, and to proceed transfer of mining concessions.

- To make a databank of mining rights.
- To disclose limitation and holders of mining rights.
- To examine development regulations for permission of mining rights.
- To patrol mining concessions.

For these works, Divisions of Concession Application and Concession Management are necessary.

#### D. Technical Management and Development

- To manage technologies of mine machines, facilities, etc. and smelter technologies.
- To permit new technologies and machines based on safety confirmation.
- To instruct technologies through mine technical concessions and training seminars.
- To collect technical information for mining.
- To make technical standards for mining.
- To develop new technologies for mining and ore-processing.
- To manage environmental technologies.

For these works, Divisions of Technical Management and Technical Development are necessary.

#### E. Department of Survey

- To project, plan and tender regional surveys.
- To supervise exploration activities of mining right holders.
- To make a plan to impellent an exploration institution.
- To make a standard for ore reserve calculation.
- To collect exploration results.
- To analyze regional survey reports and to store them into the databank.
- To make a register book for resources potentials and ore reserves.
- To evaluate resources potentials.

For these works, Divisions of Regional Surveys and Surveys Management are necessary.

#### F. Department of Environmental preservation

- To analyze environmental monitoring data in active mines and smelters.
- To analyze environmental monitoring data in abandoned mines.
- To project, plan and tender environmental contamination surveys.
- To analyze environmental contamination survey reports and to store them into the databank.
- To formulate and implement countermeasures for pollutions and environment, and to instruct environmental measures in mines and smelters.
- To implement measures for contamination in abandoned mines.
- To implement environmental measures for tailings dams, waste dumps and slag dams.

For these works, Divisions of Environmental Surveys and Environmental Measures are necessary.

#### G. Information Center

- To compile resources information by GIS database, and to investigate how to use it.
- To renovate the website.
- To collect, accumulate and analyze domestic resources information.
- To collect and analyze foreign resources information, and to provide them to the associated organizations.
- To issue and distribute periodical publications such as Newsletters, etc.
- To sale geological maps, distribution of mineral resources, etc.
- To project and implement investment promotion activities such as seminars.
- To interact with foreign organizations for mineral resources.
- To open sessions for resources information and technical training for domestic companies.

For these works, Divisions of Information Analyses, Information Management and Publication/Sales/Investment-Promotion are necessary.

#### G. Department of Administration

- To manage the whole Mining Agency.
- To compile the budget and financial settlement for the Mining Agent.
- To manage accounting of the Mining Agent, and to manage contracts.
- To coordinate relationship of foreign countries.
- To manage legal matters for the Mining Agent.

It is necessary for the Mining Agency to select employees from staffs of MEM, MEP, Geological Institute, Mining Institute and CIB. Therefore, it should be discussed simultaneously to establish the Mining Agency and reconstruct the Institutes above-mentioned. The national projects ordered by the government occupies only 10 to 50% of total sales amount in each institute which carries out consultant or engineering businesses at the same time. When all national metal mines and smelters are privatized in the near future, reconstruction businesses related to complete privatization are reportedly estimated in scale of 4 to 5 million Euros which can enable some institutes to be privatized. Therefore, following viewpoints should be taken account for establishment of the Mining Agency. It is also necessary to study financial resources to establish the Mining Agency, including the international supports such as the EU fund and others.

## **(2) Investment Promotion**

Investment promotion includes information disclosure to the potential investors, holding seminars, preparation of investment promotion brochures, and management of the website. The

Information Center within the Mining Agency can handle such functions and also work with the SIEPA. A “one-stop shop” (described later) should be established at the Information Center to assist investors gathering and evaluating information.

If the investment climate and mining foundation were insufficient, the true investment promotion could not be materialized. The Serbian current state for the investment promotion is listed in Table 8.8. Resources are naturally impossible to be replenished, and the mining industry is an apparatus industry with a long payback period for the investment. Therefore, it is a characteristic sector different from others. National political and economic stabilities are indispensable for the investment.

Investment in the mining sector has not so progressed currently, owing to shortage of concrete strategy for privatization and attraction of the investment, just shown as the current privatization of mines. Successful privatization of mines and metal manufacturing plants were carries out in very cheap prices. This state may be called to be temporary investment promotion. Any organization might not be linked with the investment promotion without the mining foundation. It is necessary for one-stop-shop to promote the local investors as well as the foreign investors, not as the SIEPA which put priority on the foreign investors only. In particular, it is necessary to foster the local mining companies which will link directly with the investment promotion by the Serbian investors. There are several Serbian non-mining companies which have already attained some mines by privatization. However, effective management of mines and efficient production of ore are large tasks for them in the future. Furthermore, it is necessary to prepare the basic information for activating the private exploration activities, and also to establish a stock market to provide exploration funds as an economic core of eastern Europe in the long-term range.

Table 8.8 Main Issues and Current State of the Investment Promotion

| Issues                                  | Current state  |
|---|--|
| Mining policies                         | <ul style="list-style-type: none"> <li>Prepared by a World Bank’s consultant</li> </ul>  |
| Mining organization                     | <ul style="list-style-type: none"> <li>Necessary to re-organize and be functionale</li> </ul>  |
| Geological information                  | <ul style="list-style-type: none"> <li>Many information, but insufficient to be compiled</li> <li>Necessary to study how to use information.</li> </ul>          |
| Law and regulation                      | <ul style="list-style-type: none"> <li>Prepared a draft of Mining Law by a World Bank’s consultant (no final Mining Law and no regulations)</li> </ul>           |
| Tax system                              | <ul style="list-style-type: none"> <li>Defined by the new Mining Law (2006 May).</li> </ul>  |
| Infrastructure                          | <ul style="list-style-type: none"> <li>Almost constructed.</li> <li>No barrier for the investment promotion.</li> </ul>  |
| Exploration and development institution | None   |
| Foster experts                          | <ul style="list-style-type: none"> <li>Few enperieneced worker in business under the market economy</li> <li>No organizational fstering system</li> </ul>        |
| Investment promotion                    | <ul style="list-style-type: none"> <li>Implemented by SIEPA, but it is not defined by the Mining Law.</li> <li>Insufficinet disclosure of information</li> </ul> |

**a. Hold an Investment Seminar**



An investment seminar was held in Tokyo in November 27, 2007, and another investment will be held in AMA at London in January, 2008 during this study. Periodical investment seminars such as these seminars will be linked with the promotion of investment in Serbia. It is desirable to open seminars in London and Belgrade once or two times a year. Also representatives of the Serbian government should participate in the PDAC (Prospectors and Development Association of Canada) which is held in March every year at Toronto, Canada. In these seminars, the Serbian mining industry, resources potentials and others should be appealed to attract the foreign investors. The Information Center will have a role to open the seminars and it will help to attract the Serbian companies' interests in the seminars.

Table 8.9 Probable Seminars and their Effects

| Location                | Participants  | Effects of Seminars   |
|-------------------------|---|---|
| Belgrade                | Serbian investors   | To increase interests of the Serbian companies in mining.                                 |
| England (London)        | Banks, mining & exploration companies registered in England | To promote exploration of grass-route and M&A of mines.                                   |
| Canada (Toronto)        | Companies participating in the PDAC                         | To understand the Serbian resources potentials, and to promote exploration of grass-route |
| Asian countries (Tokyo) | Trading companies, mining companies and parts makers        | To understand the Serbian features, and to know advantages of investment in Serbia.       |

Currently, the resources countries hold periodical investment seminars to promote investment in their countries. In case of Serbia, it should be urgent to improve the investment climate, whose reform has been already started. First of all, it is necessary for the investors to understand exploration and mining activities in Serbia, and attractive investment in down-stream business, which are described as follows;

- To be easy to access to Europe, Asia and Russia.
- To have a good infrastructure.
- To hold full set technologies from mines to smelter with many experienced engineers.
- To have high resources potentials without sufficient exploration.
- To be a supply-base of metals and parts for Europe.
- To hold technologies and facilities to manufacture parts.
- To be a free trade country with Russia, and to be a supply-base of parts for Russia.
- To hold research facilities, and to be a probable base of technical development.

Sequentially renovated materials such as the Investment Review, Investment Guidebook (including CD) and Newsletter prepared for the investment seminars during this study, will be used for handout for the periodical seminars mentioned above.

#### **b. one-stop-shop**

SIEPA has a function of one-stop-shop, but is not available to collect information related to the mining sector. It is currently possible to attain mining information in organizations such as MEM, MEP, Geological Institute, Mining Institute, etc. to attain the mining rights. Also, plural departments must be sometimes visited in an organization to meet needs. It is likely that a window

for investment in the mining sector is open, and has some connection with SIEPA. Therefore, it is desirable to have a function of one-stop-shop for the investment promoting in the Information Center for 5 years in the mining sector building period. In the Mining Agency Organization mentioned above, it was expressed as “Division of Publication/Sales/Investment-Promotion”. Roles of the investment promotion are supposed to be as follows;

- To hold seminars, and prepare materials and propaganda for seminars.
- To renovate materials for seminars, and continue issuing Newsletters and distribute them.
- To make a list for global mining/exploration companies.
- To collect information of the investment trend.
- To determine investment targets among the Serbian mining sector.
- To make materials for the investment promotion.
- To hold the investment sessions and instruction seminars to guide the Serbian companies.

In the mining promotion period, it must be investigated whether an independent organization of one-stop-shop only for mining will be newly established or the SIEPA will absorb its works, based on activities of the Information Center.

The EU fund, supports from donor countries or the Mining Fund (currently under concept) will be possible to prepare the works for Division of Publication, Sales and Investment Promotion in the Information Center.

#### **c. Publication of Maps, etc.**

There are many geological maps in Serbia. However, they are not published, and it is not easy to attain the necessary maps. Basic information like geological maps should be published to be provided to people who need them. Not only geological maps but also books such as ore deposit maps, geological structure, mineralization, etc. are necessary for the investors, and so these information should be published as well. It is possible to attain the Serbian basic geological information, because MEP already compiled existing geological information in A4 size such as Serbian geological maps, resources distribution maps, geological structure maps, resources potential maps, and others in 2002. However, it is desirable for the investors to buy digitalized geological maps in various sizes and published guides of ore deposits. Also, it is expected to increase steadily materials which will be provided to the investors.

#### **d. Transmission of Information (Periodical Paper Publication)**

Currently, MEM intends to publish newsletter as periodical paper publication as well as the website in order to transmit the Serbian mining activities. If MEM or MEP will continue the periodical paper publication in alliance with SIEPA after this project completes, it could be an effective method to link with the investment promotion. This newsletter will be distributed to the mining companies in the world. For the time, it is necessary to make efforts to inform the Serbian matters to the potential investors by distributing of the newsletters of the Serbian resources

potentials, mining investment climate, mining and exploration activities, etc.

### (3) Management of the Mining Sector

Privatized companies are currently managed in the same manner as in the state-run era, submitting requested exploration reports, development schedules, etc. For example, ore reserves in privatized mines are self-managed, so the Commission for Verification of Reserves is not necessary. Therefore, such organizations should be abolished, and objectives and methods of management by national organizations must be reviewed. Also, procedures for applying for concessions and exploration licenses should be simplified. A roundtable meeting (described later) between the government and private sector should be established to exchange opinions on mineral policy and institutions. Furthermore, it is desirable to establish a Mining Committee which consists of experienced mining professionals and mining parties to examine administrative renovation such as policy changes, revision of the Mining Law, etc. A private organization, such as the Mining Association (described later) will play an important role in the management of the mining sector, as a window between the government and private companies. The mining sector must be managed so that the activities of the private sector can be conducted actively and safely and will solidly contribute to economic development. As one of measures to change management of the current mining sector, there is reorganization and privatization of national research institutes.

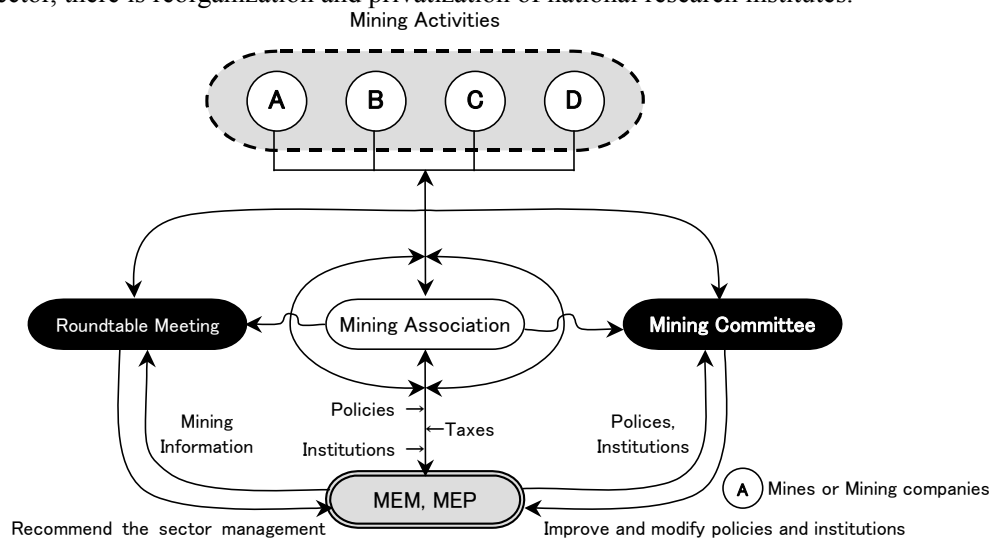


Fig.8.16 Schematic Diagram for Management of the Mining Sector

#### a. Establishment of the Roundtable Meeting

It is necessary to prepare opportunities for local and foreign mining companies to talk freely with government organizations related to mining the mining sector about issues of mining activities. There are many issues to be solved in the transition period when the mining sector is constructed to be one suitable for the current market economy. It might be one method for issues solution to fill a gap between the government and private sector. A roundtable meeting has such a

role.

- To discuss mining policies, and mining institutions.
- To improve the investment climate.
- To formulate mining promotion measures.

**b. Mining Committee**

The Mining Committee consists of mining experts, mining companies, mining related governmental organizations, Mining Association, etc. Members of the committee will discuss policies, institutions, taxes, laws, regulations formulated by the government, and recommend some improvements, modifications and changes on them objectively. It will be a place to attain consensus for orbit adjustment and reform of the sector management.

- To evaluate policies and institutions.
- To advise revising policies and institutions.
- To give comments on policy making to the government.
- To discuss tasks of the mining sector.

**(4) Reorganization of Research Organizations**

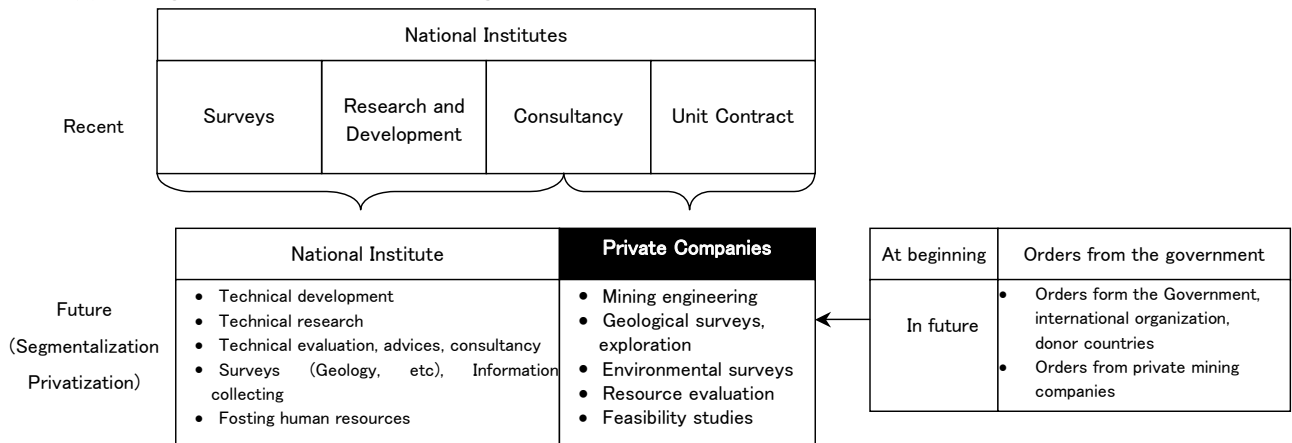
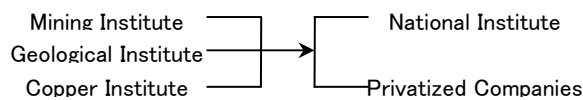


Fig8.17 Structure chart for division and privatization of Research Institution

Research organizations related to the mining sector are the Mining Institute, RTB Bor Copper Institute, Geological Institute and universities. Comparing with the current mining activities, there may be too many organizations. It is necessary to reorganize these research organizations in order to clarify their roles as follows;

Table 8.10 Research Organizations

| Organization         | Main task                  |
|----------------------|----------------------------|
| University           | Academic research          |
| Mining Institute     | Research in Business level |
| Geological Institute | Geological survey          |



It is necessary to review the current work content and to privatize them partially. Truly necessary works under the market economy must be selected as the role of the national organization to reorganize these institutes. For example, the Mining Institute and RTB Bor Copper Institute should be joined to be the National Resources Institute with two departments, metal and coal. The proper work of the Geological Institute should be also selected to be joined with the National Resources Institute, and other works should be privatized. Duplicated, consulting, engineering and contracting works must be privatized, and this privatized company can place its management in orbit by receiving orders from the government (Fig. 8.17, 8.18).

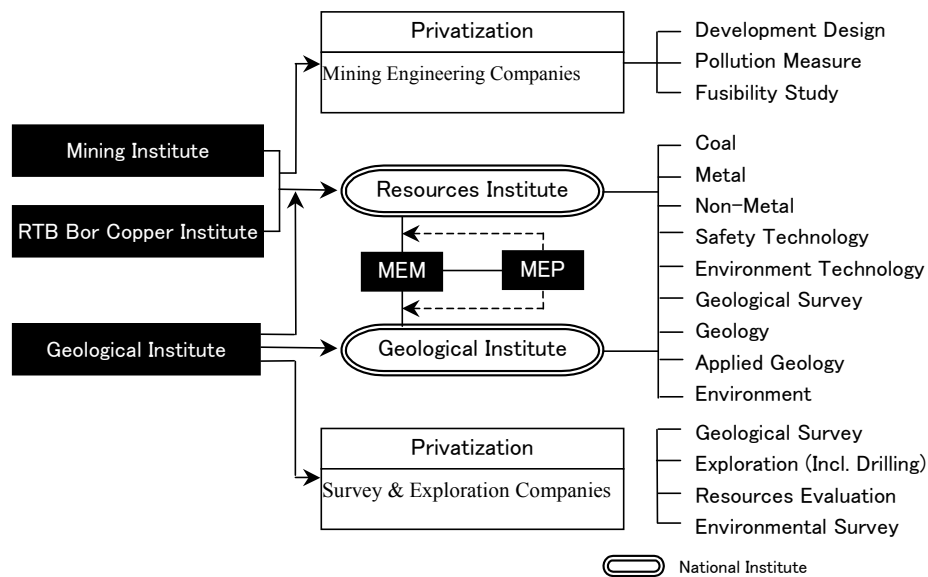


Fig.8.18 Concept for Breakup and Privatization of National Institutes

### (5) Fostering Human Resources

The Bor Copper Institute researches copper exclusively, including exploration, mining, processing, and smelting operations. However, after the privatization of RTB Bor, the Bor Copper Institute will no longer need to support RTB Bor, because it will not be privatized. It has fields and research facilities adjacent to the institute for exploration, mining, processing, smelting, and environmental preservation. In addition, there is the Mining Institute in Belgrade. If they will be joined and reorganized to be the National Resources Institute above-mentioned, the research will be centralized and also the institute can undertake the roll to foster human resources. Therefore, it should have a role in fostering human resources and Serbian private mining companies, along with the faculty of the Mining and Geology department of the University of Belgrade. If it could also provide training for other countries with limited training facilities, like Japan, it might become an international mining training center. Targets for trainees include graduates from Faculty of Mining and Geology of the Belgrade University, and also trainees from associated universities of neighboring and donor countries. The International Mining Training Center should be established to

foster human resources. Trainees will be registered and introduced to the website after terminating courses in the center to meet local and abroad necessities for attaining of employment (Fig.8.19).

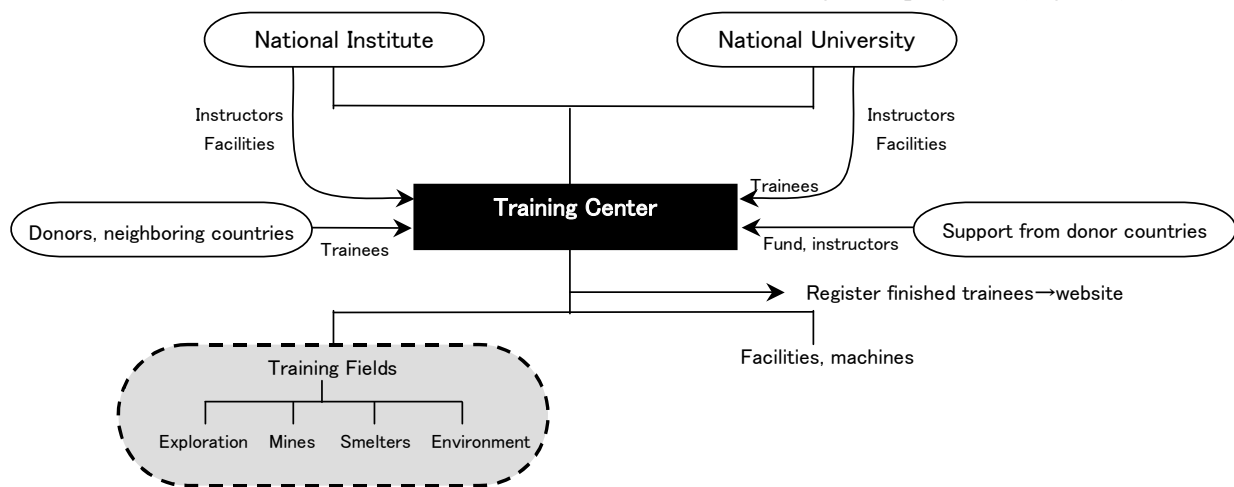


Fig.8.19 A Concept for Fostering Human Resources

This is a training center to give the whole mining knowledge and practices. Currently, there is a trend to decrease mining engineers and experts not only in Serbia all over the world. Therefore, this training center will have a role to provide mining human resources to the world based on the global trend, utilizing fully accumulated mining technologies in Serbia.

Table 8.11 Outline of the Training Center

| items                         | Contents  |
|-------------------------------|---|
| name                          | International Resources Training Center   |
| purpose                       | To foster human resources for the mining industry in the next generation.   |
| jurisdiction                  | MEM & MEP   |
| instructors                   | Serbia, EU countries, Japan, others   |
| Training course               | 1-year course & 2-year course   |
| language                      | English   |
| Training contents             | Resources geology, applied geology, resources economy, mining methods, ore processing methods, smelting methods, tailings dam, ore reserve calculation, drilling methods, mine management, environment technologies, pollution measures, mine infrastructure, production management, mining trend, automation control, transportation, feasibility study, EIA, social consideration, mining finance |
| Site training fields          | Bor Mine, Zn mines, coal mines, Bor Smelter, Zorka Smelter  |
| Laboratory facility           | Resources Institute ( after reorganizing the current facilities)  |
| equipment                     | Newly obtain  |
| Funds (to establish & manage) | Donor counties, EU, international organizations   |

## (6) Mining Fund

The Mining Fund supports improvements to capacities, restricts business, and prevents environmental pollution in the exploration, development, and production activities of local mining companies. Support subjects, institutions, guarantee of funds, and management methods need to be studied when the basic design for the fund will be discussed.

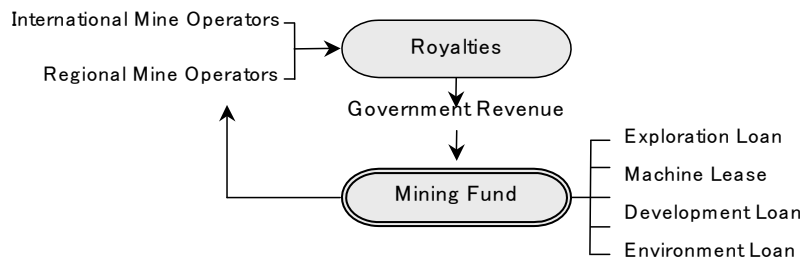


Fig.8.20 Mining Fund Concept

From viewpoint of the current mining situation, it is necessary to build various institutions and supporting systems for mining technology, management improvement, funds for exploration and development, environmental measures in order to promote the mining industry. The government will gain royalties defined by the new Mining Law enacted in May 2006. Various institutions and supporting systems must be studied based on the revenues from royalties. If the two-step loan after-mentioned can be added to the fund of the Mining Fund, the use of the Mining Fund will be expanded. In addition, financial accommodation from the EBRD will be possible as its partial fund. In particular, some helps are needed for companies whose owners are not mining experts. Special urgent attention is needed for these companies to place mining activities in orbit. If the mine production will increase by assistances, the government will also increase the revenue as royalties and taxes, which will contribute to the national finance.

Following matters should be discussed for the Mining Fund;

- Institutional regulation of the Mining Fund
- Extent , targets, kinds of the fund use
- Estimate of the fundamental fund
- Management organization, framework and method
- Institution and organization for check system of the fund
- Condition for concession loan, loan and technical supports
- Preparation of annual report for the fund using

Institutions to use the Mining Fund are described later.

## (7) Two-Step Loan

The Serbian government will obtain a low-interest loan from international organizations, such as the Japan Bank for International Cooperation (JBIC), and will principally finance

medium/small mines through the Mining Fund mentioned-above. It will function as micro-financing.

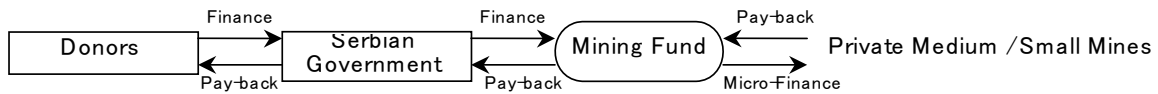


Fig.8.21 Two-Step Loan

If the Mining Fund is available, the Two-Step-Loan will be managed more easily. Payback of loan from the donors will be frozen for 5 to 10 years with low interest, and the payback period is long (15 to 30 years), so it may be used to foster the local mining companies. There is some periodical gap between the governmental return to donor countries and the payback of micro-finance from private companies, there is no financial burden for the Serbian government in return of the loan.

### (8) Accounting System Training

Currently, the international accounting standard was already introduced, but it has not become widely used yet. However, mining is a business which deals with international goods. Therefore, the international accounting standard must be firmly fixed to expand mining activities by the Serbian companies in the future. For that purpose, it is necessary to carry out accounting system training. Global accounting training, including international accounting standards, how to make the financial statements, and strategic accounting for financial management, should be carried out regionally. Trainees should include the staff of medium/small mines, mining-related companies, and government organizations such as the MEM and the MEP.

Methods to promulgate international accounting standards are supposed to be as follows;

- Translate international accounting standards into Serbian language.
- Prepare a summary for international accounting standards (in Serbian language).
- Prepare a guideline for international accounting standards (brochure in Serbian).
- Hold lectures for accountants.
- Hold lectures for staffs in the government.
- Dispatch experts to companies.

Also, the Serbian government should carry out following matters to promulgate it.

- Establish the transition period.
- Foster instructors.
- Establish introduction systems
  - supporting system
  - accounting evaluation system
- Review regulations.



**(9) Establishment of the Mining Association**

The government and private companies should work together to improve the mining industry. Communication between private companies and the government is vital. Private companies also need to understand the policies and institutions formulated by the government. A Mining Association should be established consisting of private companies to maintain communications with the government. While privatization of mines is progressing now, it is the time to establish the Mining Association. MEM must work the Serbian mining companies to establish it. The association will be managed by membership fees. The association will consists of mining members, domestic and foreign, metal and non-metal mines and exploration companies.

Table 8.12 Role of the Mining Association

| Role                         | Content  |
|------------------------------|--|
| Window for the government    | <ul style="list-style-type: none"> <li>• Desire the government policies, institutions, etc.</li> <li>• Inform the governmental information to the mining companies.</li> </ul> |
| Representative of the sector | <ul style="list-style-type: none"> <li>• Collect opinions of members.</li> <li>• Represent the private sector.</li> </ul>  |
| Information collection       | <ul style="list-style-type: none"> <li>• Compile and analyzed mining information.</li> <li>• Inform information to the members.</li> </ul>                                     |
| Transmission of information  | <ul style="list-style-type: none"> <li>• Transmit mining activities to the world.</li> </ul>   |
| International exchange       | <ul style="list-style-type: none"> <li>• Introduce the foreign companies to the members.</li> </ul>  |

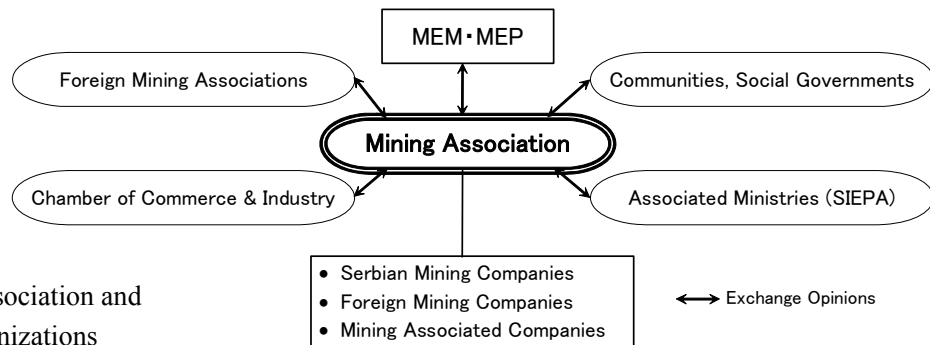


Fig.8.22 the Mining Association and its related organizations

**(10) Refurbishing of Tailings Dams and Monitoring System**

The case study points out the possibilities of environmental contamination and the failure of the tailings dams. To prevent dam failures, like those in Rumania and Macedonia, rehabilitation of the tops of tailings dams, repairing water collection pipes, and the installation of a monitoring system is urgently needed. The government must construct a monitoring GIS database from regional data and mines data, and mining companies must build a monitoring system for dam bodies and side ditches of the tailings ponds. Finally, it is necessary to construct a response system for risk emergency by linking both monitoring systems. A monitoring system for tailings dams is currently constructing in Rumania under assistance of the World Bank. Also, some tailings dams are under rehabilitation. It is necessary for the associated people in Serbia to visit the Rumanian site for reference of construction of monitoring system for tailings dams and other governmental subsidy institutions for privatized mines.

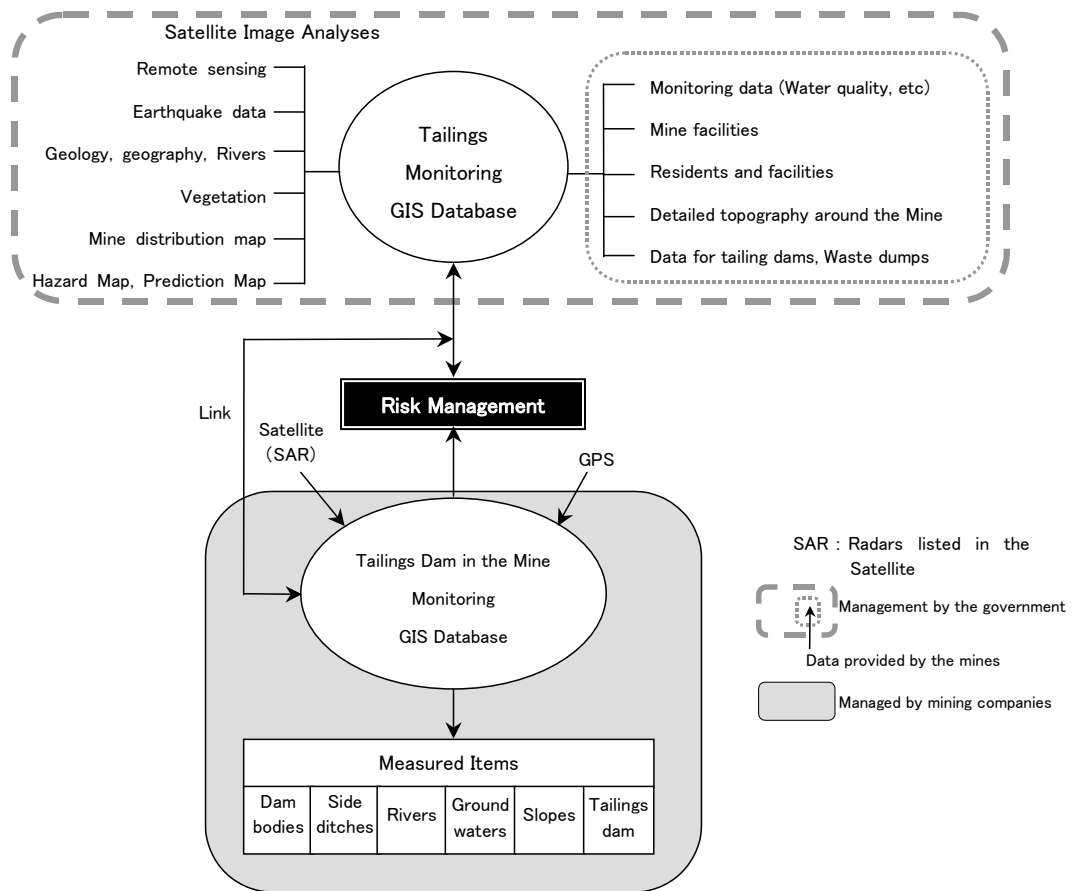


Fig.8.23 Monitoring System for Tailings Dam

When a monitoring system is constructed in tailings dams, it is necessary to investigate the current state of the tailings dam to identify points to be repaired and estimate its rehabilitation costs.

### (11) Concession Management System

Currently, it takes about one year to obtain a concession. The procedure is complicated and not centralized. A system to simplify it needs to be prepared and would have a positive effect on investment promotion. Mining laws need to be revised and linked to expansion of the GIS database. It is necessary to simplify procedures for permission and issue of the mining rights as much as possible. Therefore, procedures above-mentioned are desirable. The procedures are done based on the Mining Law.

Exploration license should be given by submission of the application with exploration plans based on the principle of first-file. Within one week after submission of the application, a prior applicant right is determined, and then within one month, a license is issued to the applicant after examination of the application, exploration plan, overlapping of the concessions, boundary of the concessions, etc. On the other hand, the mining license needs submission of the application with production plan and report on the environmental evaluation impacts. The document is examined

from the viewpoint of technology, safety and environment for the period of 3 months, and then mining license is issued to the applicant. Both licenses are announced officially by the website after registration. A series of procedures should be stored in the database, and the comprehensive examination should be carried out effectively using the GIS technology.

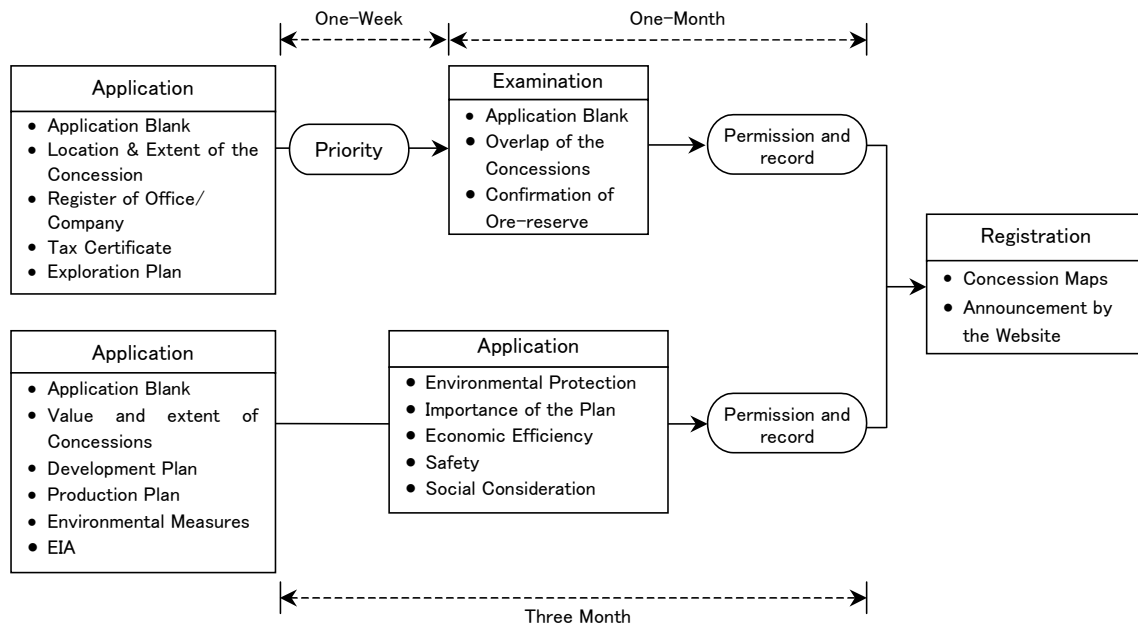


Fig. 8.24 Flow of Procedures to Acquire Mining Concession

## (12) Technical Training Center for the Mining Industry

Due to internal fighting, over the 15 years Serbia has lost opportunities for mining technicians to pass on their mining skills on the next generation. The current mining technicians are elderly. It will be difficult to continue mining activities without developing young technicians. Technicians have roles to work in the front lines in mines, supporting engineers. In Serbia, young people are leaving the mine sites owing to stagnated mining activities. Therefore, it is indispensable to foster technicians in the Technical Training Center as well as foundation and promotion of the mining industry. When a basic design for the training center is prepared, specific measures should be discussed for funds such as the EU Fund, assistance from the donor countries, or financing from the Mining Fund to establish and manage it.

Table 8.13 Summary of the Technical Training Center for the Mining Industry

| Field       | Subject  | Equipment  |
|-------------|--|--|
| Exploration | <ul style="list-style-type: none"> <li>Geological survey, ore deposits, geology</li> <li>Exploration methods, planning, equipment</li> <li>Calculation of ore reserve</li> <li>Topographical survey</li> </ul> | <ul style="list-style-type: none"> <li>Exploration equipment</li> <li>Survey equipment</li> </ul>                              |
| Mining      | <ul style="list-style-type: none"> <li>Mining methods, planning</li> <li>Mining management</li> <li>Mining system</li> <li>Topographical survey equipment</li> </ul>   | <ul style="list-style-type: none"> <li>Drilling machines</li> <li>Mining related machines</li> <li>Survey equipment</li> </ul> |

|            |   |   |
|------------|---|---|
| Boring     | <ul style="list-style-type: none"> <li>• Boring methods, planning</li> <li>• Drilling trouble, trouble shooting</li> <li>• Topographical survey equipment</li> </ul>                            | <ul style="list-style-type: none"> <li>• Boring machines</li> <li>• Survey equipment</li> </ul> |
| Processing | <ul style="list-style-type: none"> <li>• Mineral processing theory</li> <li>• Basic analysis</li> <li>• Production management, environmental management</li> <li>• Automatic control</li> </ul> |   |

### (13) Support for Management Reconstruction

Privatized mines, especially locally-held mines and smelters, have little management experience under a market economy. Some consulting will be needed to support improvements to management and reconstruction, similar to the TAM EBRD program at the Rudnik Mine. At least for the present, Japanese and European experts linked to mining promotion can implement support for improvements and instructions. There are various supports for reconstruction. Some privatized mines can not start production immediately. Some privatized mines can not start production without reconstruction means, mining workers and operation capitals. However, currently there is no governmental supporting system for serious necessities. On the other hand, there are mines with environmental pollutions, but their priority is to rebuild a production system at the moment. At this moment when the government addresses its own reconstruction, each mine must solve their problems by themselves. Supporting measures to reconstruct the mining sector should be materialized as soon as possible, as follows;

#### a. Management Improvement

Mines must be managed with competitiveness under the market economy. It is indispensable to foster experts who can instruct managers necessary management skills under the market economy such as mining system, technologies, effective use of information, strategic formulation, reviewing of cost, financial management and system, strategic accounting, improvement of productivities, budget management and formulation, formulation of medium/long term plan, cash flow analyses, etc. For example, Japanese “KAIZEN” (improvement) activities should be introduced. It is appropriate to invite experts from donor countries. It should be noted that improved management will contribute to increasing of the governmental revenues by increasing of mining royalties and tax.

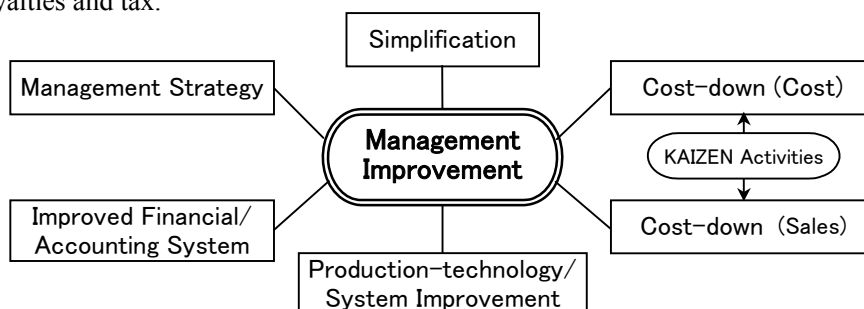


Fig. 8.25 Concept of Management Improvement

**b. Financial Supports**

It is not easy to fund capitals for mining reconstruction and promotion after its reconstruction from city banks due to their interests, mortgages, guarantees, etc. Mining is process industry and always needs reinvestment. Furthermore, mineral products have strong impacts from the international prices, so it is important to fund operation capitals urgently. In addition, rationalization cost is necessary to decrease man power to the appropriate scale which meets production. Financial supports (loans) are thus necessary to attain financing easily. At first, loan system for reconstruction should be discussed. Especially loan system for the Serbian privatized mines is urgently needed.

**c. Environmental Measures**

Many mines have environmental issues, but their current real states are not known. In particular, management of waste dumps and tailings dams is insufficient. There are contaminated problems such as air, water and soil in the RTB Bor Smelter which has high risk of the pollution to cross the border. The government must clarify the responsibility of each mine and smelter after it understands the real state of environmental contamination, because they were originally managed by the government. If mining reconstruction would progress without actions against environmental contamination, this environmental issues could give a large pressures on mining management in the future. The government must implement environmental measures in its responsible extent just before the privatized mines will implement their environmental measures.

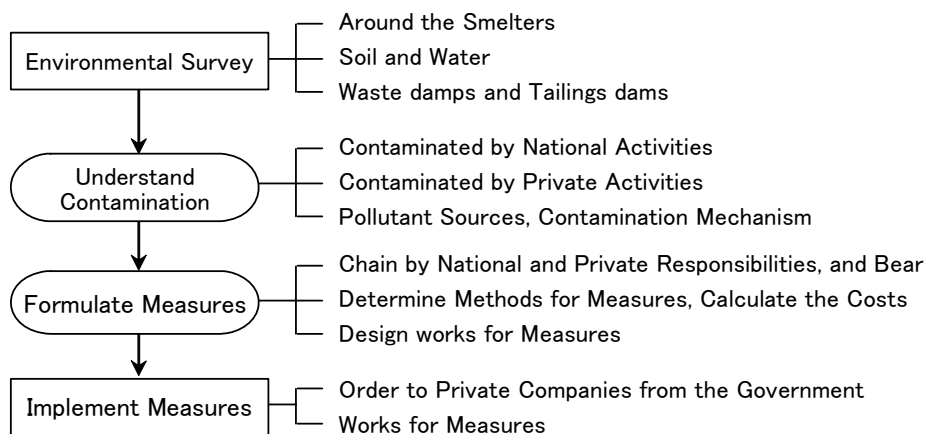


Fig. 8.26 Concept for Implementation Flow of Environmental Measures

**d. Technical Development**

The zinc ore deposit (800,000t) in the near surface of the Rudnik Mine is 60% oxide ore. The mine conducted the recovery test of the oxide ore, but could not attain the economic results, and then it gave up its development. Other mines may have similar problems. Therefore, the government should support the private technical development in the future.

It should noted that the management reconstruction must be done in the mining related survey/engineering companies as well as mining companies. National supports for technical

development are as follows;

- To establish institutions for national subsidy and grant.
- To implement by the national research organizations.
- To use facilities of the national institutes.

It is necessary to formulate the institution for supporting of technical development in order to materialize these supports.

#### **(14) Mining Training Sessions**

Obsolete concepts of management and operation held over from the socialist era still exist in the minds of mine managers, executives, engineers, and other staff. Their cost-awareness is low. The mindsets of people in charge of privatized mines under a market economy need to be updated through local mining training sessions, including mine operation, environmental preservation, cost consciousness, and mining technologies. Instructors can be selected from the experts from Japan or European countries. These must be held periodically to reinforce the mining foundation of the Master Plan.

Subjects for the sessions are supposed as follows;

- |                                    |   |
|------------------------------------|---|
| • Tendency of the mining industry  | • Mining financial                              |
| • Resources economy                | • Project financing                             |
| • Analyses for the market trend    | • Mining accounting and strategic accounting    |
| • Economy technology               | • Production management                         |
| • Evaluation method for resources  | • International accounting standards for mining |
| • Exploration technology           | • Mining company strategy                       |
| • Management of mining environment | • Cost improving methods                        |
| • Mining Law and mining policies   | • Risk management                               |

In addition, the sessions are held in style of seminars, and participants are officials, engineers of the government, researchers and workers (technicians and engineers) of the private companies. The session will be held 2 to 3 times per year to catch up mining activities under the market economy as soon as possible.

### **8.6 Institutional Reform Programs**

Detailed measures for the Institutional Reform Programs was studied as well as the Action Program. Summary of these measures is described based on tasks selected by the local surveys, as follows;

#### **(1) Supporting Institutions for the Private Companies**

Serbian mining privatization will be completed in half of 2008. As main body of mining activities will be privatized mining companies after privatization is completed, it is necessary to prepare an institution to help the Serbian mining companies which will link with mining promotion. The private companies which bought mines will need the investment to rebuild mines. Priority will be put in preparation of production in reopening of the mines. Therefore, indispensable important

factors will need supports out of production, because reopening period will not follow direct production. If the Serbian mining companies are fostered, mining activities will be more activated, and it will lead to the mining promotion. However, it needs official financial supports which may be gained from the Mining Fund financed by royalties and taxes. Its detailed content will be described as follows (Fig8.27);

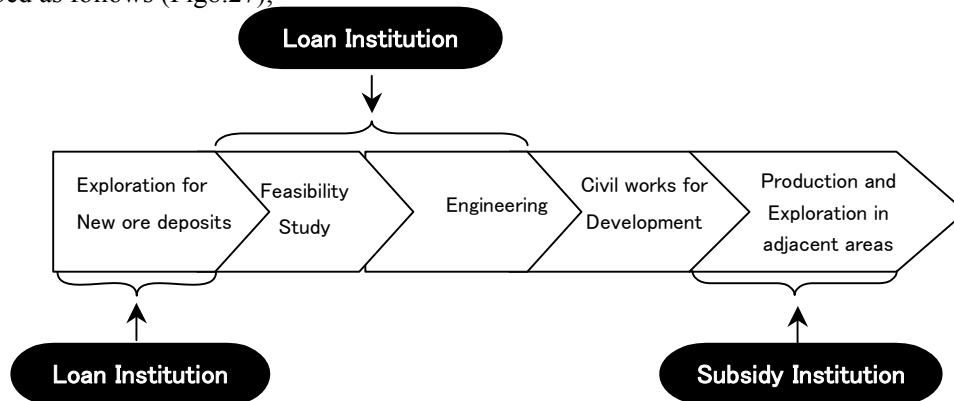


Fig8.27 Supporting Institutions for Private Mining Companies

#### a. Subsidy Institution for Exploration

It is difficult to finance for exploration activities of the mining companies without stable management. Serbian small/medium mines have not sufficient ore reserve, because exploration has not carried out so much since 1990s (the former Yugoslavia period). Their mine lives are only 3 to 5 years, and there is possibility to stop their production activities. If operation is continues by Serbian companies, this Subsidy Institution for Exploration might be helpful to activate exploration activities around the existing mine sites. Also, it will be liked with stable management to attain resources for short/medium range.

Subsidy rate: 50%

Objectives: drilling, drifting, mining license in and around the mine site, concession maps

Exploration period: 1 to 3 years

Limit of subsidy: US\$ 1 million

Fund: royalties and taxes (or the Mining Find)

Payback: yes (only when successful)

Provision of subsidy will be implemented by examination of MEM after application of the mining right holders. If exploration will be successful, payback amount will be calculated based on total paid amount of subsidy, attained ore reserve and contribution to management (maximum payback: total subsidy amount).

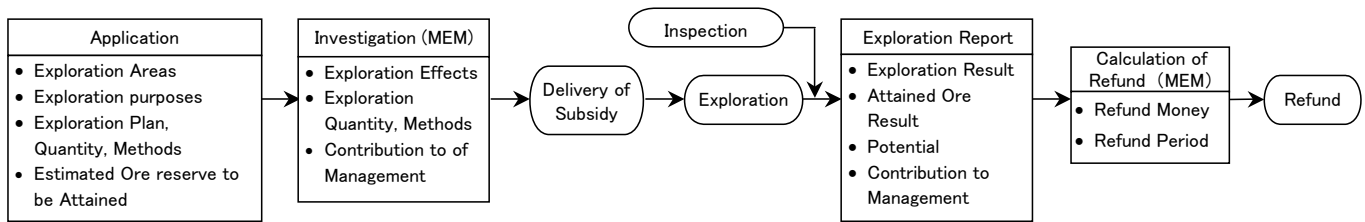


Fig. 8.28 Procedures Flow for Exploration Subsidy Institution

### b. Loan Institution for Exploration

It will be used when Serbian mining companies carry out regional explorations. It will activate exploration activities in virgin areas. It will be supporting system for exploration with large risk. This loan institution is helpful for explorations to find out the new ore deposits.

Loan : 70% of total exploration expenditure and US\$ 2 million at maximum

Objectives: geochemical exploration, geophysical exploration, drilling

Interest: 20% of city banks' interests

Payback: yes with deferment period of 5 years and payback for 5 years

Guarantee or mortgage: 50% of loan amount

Financial source may be fed by the Mining Fund. However, management of fund should be investigated more when the institution will be established, because deferment period is long.

### c. Loan Institution for Development

Currently in Serbia, it is not easy to finance mining developments. However, when good result of the feasibility study is attained, its financing is not so difficult. Therefore, if there is a loan institution for feasibility study and engineering, it would drive mining development. This targets are Serbian mining companies.

Loan: 70% of expenditure for feasibility study and engineering for mining development

Objectives: feasibility study and engineering for mining development, partial infrastructure

Interest: 20% of City banks' interests

Guarantee or mortgage: 50% of loan amount

Loan for development is generally large, and it may be more than US\$ 500 million according to scale of ore deposit to be developed. Therefore, it is difficult to provide loan from the Mining Fund at the beginning stage, and so it will be effective after the Mining Fund will pool efficient money. By that time, the government should consider the mortgage warranty system for loan in the city banks.

## (2) Regional Exploration Institution

The sufficient regional exploration has not been implemented in Serbia since 1990. Its resources potentials are guessed to be comparatively higher by its geological conditions, but there are not data enough to select exploration targets except the existing mines sites and their



surroundings. Therefore, enhancing of exploration activities is hard to expect even under the new Mining Law of the international standard. Exploration activities may be promoted by increasing geological data through geological surveys of the national organizations such as the Geological Institute, etc. The regional exploration financed by the government will activate general exploration activities, and finally lead to development of mines in the new districts.

In addition, orders of these regional explorations to the geological survey companies will contribute to improvement of their technological power, and foster the privatized companies (Fig.8.29 and Table 8.14).

Period: 10 years

Budget: annually 1 US\$ million from the national budget (partially from international supports if possible)

Objectives: resources potential areas

Survey content: geological surveys, geochemical explorations, geophysical explorations, structural drilling

Attained data: stored by the GIS Database

Survey results: disclosed by the website and publications

Subcontractors: Serbian survey companies (possible JV with the foreign companies)

Role of the government: planning, coordination, tender, data compilation

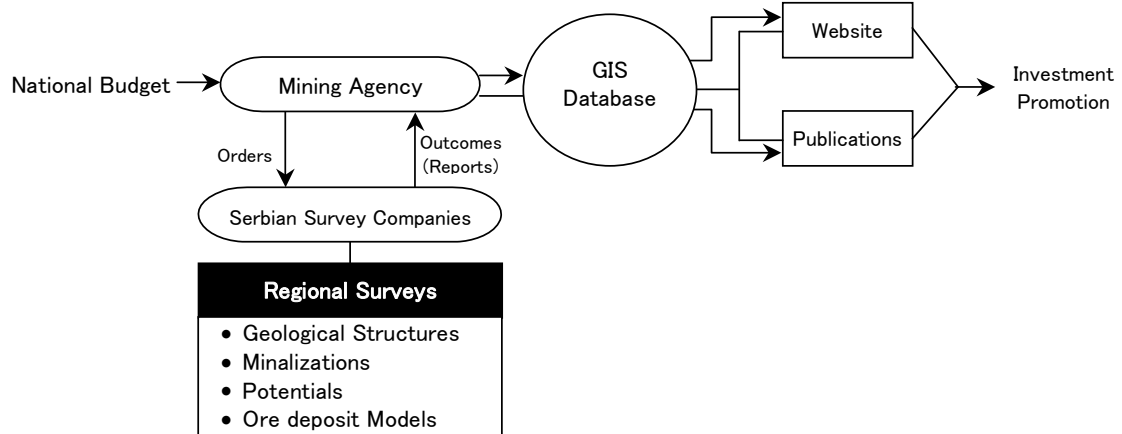


Fig. 8.29 Regional Exploration and Investment Promotion

Table 8.14 Summary of the Regional Exploration

| Item           | Content  |
|----------------|--|
| Survey extent  | 20km×20km (per 1 area)   |
| Survey methods | Geological survey (1:10,000 & 1:50,000)<br>Geophysical exploration (meneralized zones)<br>Geochemical exploration (reconnaissance)<br>Structural drilling 500m to 1,000m/hole (1 to 2 hole/area)<br>Remote sensing |
| Analyses       | Geological structure<br>Determination of ore deposits potential areas<br>mineralization<br>anomaly areas by geochemical and geophysical exploration<br>ore deposit models  |

### (3) Management of the Mining Cadastre

The mining cadastre of MEM must be improved, as mentioned in (1). Currently its procedures demand time and labors in MEM as well as applicants. Therefore, it is necessary to simplify works in application and the cadastre based on the Mining Law. In other words, the works should be divided into unit processes which enable to be managed by the GIS system (Fig.8.30). Its examination will be implemented by the newly established “Examination Commission”, or by the department in charge, using digitalized application form. Many countries already have introduced digitalized application form in their mining cadastres.

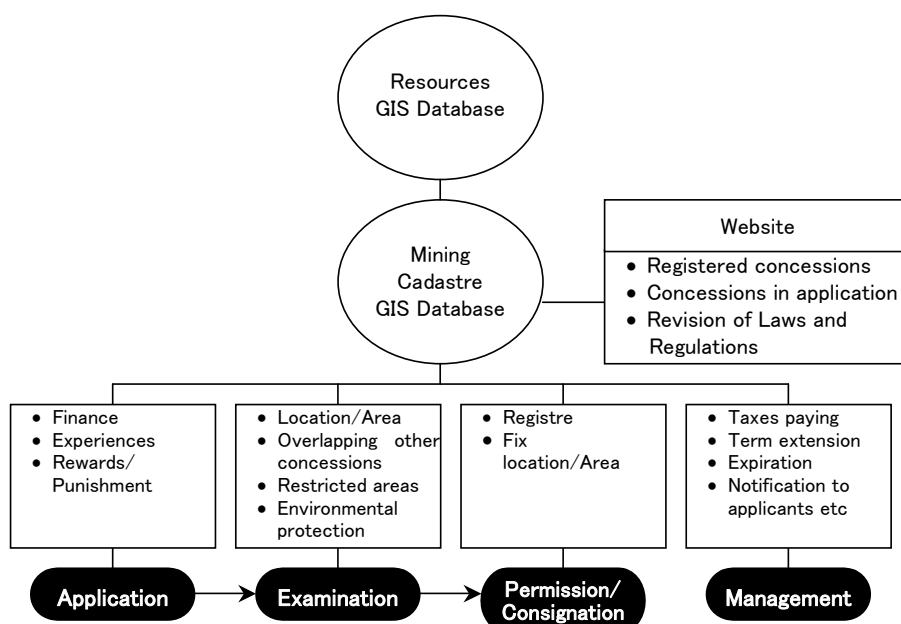


Fig. 8.30 Mining Cadastre Management System

It is desirable to materialize improving the management of mining cadastre under technical and financial supports from donor countries.

### (4) Strengthening of Legal System

The Environmental Law was revised by the EU’s laws. A draft of the Mining Law has been prepared in the in international standard. It is likely that this draft has no large problem. However, its compliance should be verified from the viewpoints of the government, mining owners and investors. Also, the Environmental Law, Mining Law, Investment Law and associated laws should be reviewed comprehensively and systematically, and some inconsistent points must be solved, if they were. All of these laws must be effective comprehensively.

It is also necessary to prepare new legal system including regulations consistent to the new Mining Law. They must include royalties, application for concession, exploration reports, standards for equipment and machines, standards for underground drifts, mine safety, mine safety qualification, mining standards, mining environment protection, mining environmental monitoring,

development plan, and others to manage the mining sector efficiently based on the Mining Law.

### **(5) Ore Reserve Calculation**

As mineral resources are treated as the national treasures, calculation manner of ore reserves for privatized mines are just same as national mines. Ore reserves are verified by the Reserves Verification Commission. Privatization of national mines is currently progressing. Shortage of ore reserve will give a direct impact on private companies as a company management risk. Therefore, ore reserves calculation must be implemented on responsibility of each private company, not by the Reserves Verification Commission. In Japan, calculation method is defined by the Japanese Industrial Standards (JIS), and each mine and company has selected the calculation method based on the JIS according to characteristics of its ore deposits, has improved it, and has made their own standards and manuals to calculate ore reserves. Under the market economy, ore reserve calculation is responsible for each private mine. The government should determine a standard for calculation of ore reserve. In foreseeable future, the government can use the current regulation for ore reserve as standard for ore reserve calculation.

### **(6) Information system**

Serbian government is constructing information system, and its usage is expanding at the present time. In ministries and agencies, varieties of databases, GIS databases and websites have been developed. From now, the following system developments are required to improve operational efficiency for management in mining sector.

- Strengthening and expanding LAN in the Ministry
- Construction of database for documents in the MEM, MEP, relevant organizations and institutes
- Construction of mining cadastre management system and website
- Expanding of mineral resource GIS database
- Links between environmental database and mineral resource GIS database
- Land conservation usage of the GIS database

#### **a. Expanding of Mineral Resource GIS Database**

In this study, mineral resource GIS database is expanded based on the BRGM's database. From now on, the database shall be linked with the following digital archive development for national fundamental spatial information and the mining cadastre management system, and it will drive its repletion of functions as a resource GIS database and broaden usage range.

#### **b. Digital Archive Development**

The MEM has developed geological and mineral resource database, and it could be one of national fundamental systems for geo-information database. The MEM and MEP must

understand characteristics of each database, and enhance information exchanges and mutual utilization and should provide information service for investors. The information systems in the MEM and MEP should be utilized for the other ministries and agencies.

In the future, a digital archive center which integrates and compiles all of geo-science related databases should be established for information sharing of fundamental spatial data in Serbia. The following datasets should be entered.

- Geological survey reports
- Environmental survey reports
- Exploration reports
- Environmental monitoring reports
- Mineral deposit survey reports
- Vegetation data
- Land-use and development plan data
- River water quality data
- Underground water data
- Geological data

**c. Expanding of GIS Database for Land Conservation**

The GIS database construction in this study ranges upgrading of the existing database and design of its expansion of the database. In the future, compiling varieties of datasets for geo-science, mining cadastre management, infrastructure, national land use, meteorological data and monitoring data of tailings dams based on the design, it will be expected to be used for national land conservation system such as natural and humanitarian disasters, and also can be used for regional development. For construction of such comprehensive GIS database, it will be difficult to achieve it only by a limited budget of Serbian government. From here on, possibilities and applications of EU-funded project should be considered. The linkage of this comprehensive GIS data with other GIS database should be implemented step by step, and one idea with 3 steps is shown as follows;

The first step (A): To complete the mineral resources GIS database.

The second step (B): To complete the mining cadastre management GIS database.

(C): To link A with B.

The third step (D): To expand C to be the comprehensive GIS database.

Each specific planning should be formulated to complete A and B during the mining sector building period, and complete D during the mining promotion period in the Master Plan.

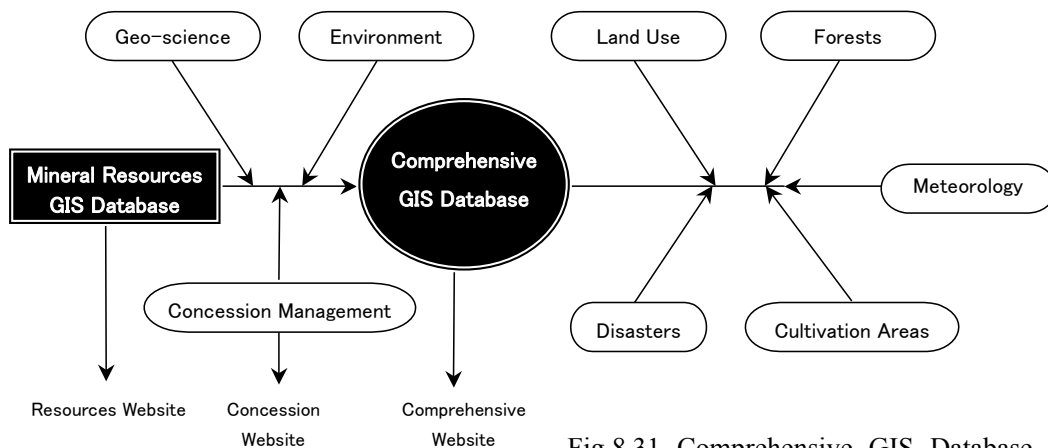


Fig.8.31 Comprehensive GIS Database for Land Conservation

## (7) Monitoring System and Information Disclosure

There is already an environmental monitoring system. However, the system is not effective to improve the environmental reserve, covering all over the country. Therefore, it is necessary to construct a comprehensive system with detailed specifications such as locations of monitoring sites, number of sites, data compilation, data disclosure, etc.

As mining activities give their impacts to the wide range extent including life environment, agriculture, forest and others, information of sampling points and analyzed values in environmental monitoring for mining activities must be shared with other organizations to analyze deviations of monitoring data comprehensively. For it, it is necessary to systemize all current monitoring implemented by each organization. It is dispensable in the future to analyze all monitoring data and cause for temporal variation of data by networking the database of each organization in order to formulate countermeasures. It will link with conservation of national land. In addition, data should be disclosed to the public by the environmental website, to increase the social understanding of the environmental reservation and clear off general worries of environmental contamination (Fig.8.32).

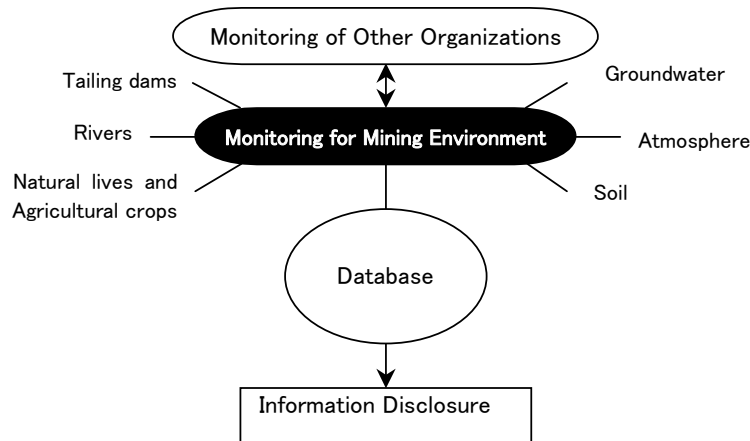


Fig.8.32 Environmental Monitoring and Information Disclosure

Serbia is currently preparing to join the EU. Therefore, it should be seriously discussed to materialize a monitoring system mentioned-above by effective use of the EU Fund.

### a. Monitoring Institution

It should be legally regulated for mining companies to conduct monitoring. In other words, monitoring must be institutionalized based on the Environmental Law and Mining Law. It must be ensured that each mining company or mine carries out necessary monitoring and send attained data to the responsible organization which evaluates them. In addition, MEM and MEP implement regional monitoring by themselves to assess impacts of mining activities on environment (Fig.8.33). It is necessary to institutionalize a series of monitoring to enable to formulate reliable and speedy countermeasures.

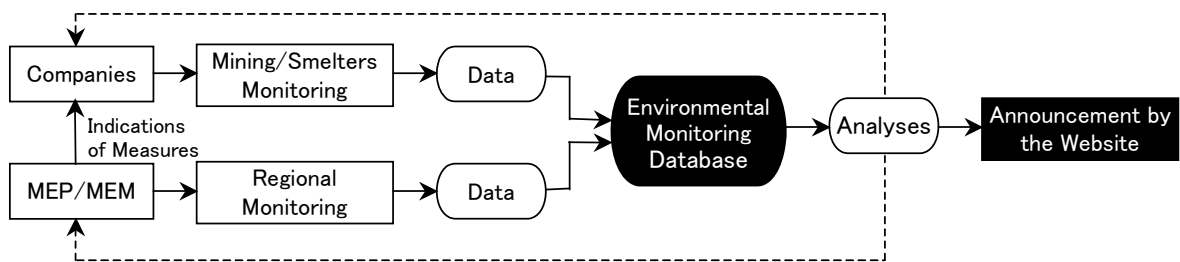


Fig. 8.33 A Concept of Monitoring System for Mining Activities

**b. Institution for Information Disclosure**

Monitoring data must be disclosed to inform impacts of mining activities on environment to the public, indicating data. In this institution, it is necessary to regulate information content, disclosure method, disclosure time, responsible department for information disclosure, as follows;

- Items to disclose information: regional monitoring data, data in mine and smelter
- Renovation frequency of disclosed information: 2 times per month
- Method to disclose: by the websites
- Responsible organization: MEP

**c. Loan Institution for Monitoring System**

It is likely that privatized mining companies have sufficient money due to reconstruction of mine operation. This Loan Institution for Monitoring System will help privatized mines construct a monitoring system rapidly by funding facilities, equipment, computers, etc. Financial source is supposed to be fed by the Mining Fund. Loan scale is estimated to be US\$ 200,000 at maximum, which should be implemented during the mining sector building period.

- Items to make the loan: equipment and facilities related to environmental monitoring.
- Loan amount: US\$ 50,000 to 200,000
- Payback: after 3 years deferment
- Condition for loan: mortgage, etc.

**d. Survey of Environmental Contamination**

it is necessary to survey the current state of environmental contamination around the active and non-active mines to implement monitoring systematically and effectively.

Table 8.15 Summary for Environmental Survey

| Item             | Summary  |
|------------------|--|
| Objective areas  | Around existing and old mines (in extent of 1 to 2km)  |
| Survey objective | Soil, rock, rivers, groundwater, vegetation  |
| Methods          | <ul style="list-style-type: none"> <li>• Grid sampling of rocks and soils</li> <li>• Sampling of water and plants</li> <li>• Chemical analyses of samples</li> <li>• Satellite images analyses like ASTER</li> </ul> |
| Compilation      | Stored in the database (resources GIS database)  |
| analyses         | Selection of anomalies, environmental analyses   |

Just same as (2) Regional Exploration Survey, these environmental surveys will be ordered to the

Serbian survey companies (or JV with foreign investor) by the government under the national budget (or international supports if possible), to strengthen technical capability of the Serbian companies. Surveyed data and results will be stored in the resources GIS database to compare with the monitoring data. As mentioned before, it is linked with clarifying of environmental contamination during period of national mines and its measures. Expenditures for these measures are estimated to be US\$ 1 million/location, and it is likely that at least 5 to 6 contaminated locations must be coped with.

**(8) Strengthening of MEM Functions**

As MEM manages the sector based on the current Mining Law, its management method has still legacy of the former socialism period. The current Mining Law also defines the Mining Agency to increase MEM functions. Furthermore, the draft of the new Mining Law includes functions of MEM. Capacity of MEM to govern the sector will be increased and its function will be strengthened, if following matters are materialized;

- Enact the new Mining Law.
- Formulate regulations based on the new Mining Law.
- Implement the mining policies.
- Simplify management of privatized mining companies.
- Delete the Reserves Verification Commission.
- Establish the Mining Agency and reorganize MEM.
- Simplify procedures of the Mining Cadastre.
- Establish the Department of Policies.
- Reorganize the Mining Institute.
- Privatize the part of the research organizations.
- Expand the resources GIS database.

By implementing these matters, improving of official works such as simplifying of documentation, method of making final decision, sharing of information, procedures to escalate, format of meeting minute, etc. are vital to strengthen the function.

It will link with functionable governance of the sector to implement matters above-mentioned and simplify mandate of the simplified organization shown as below;

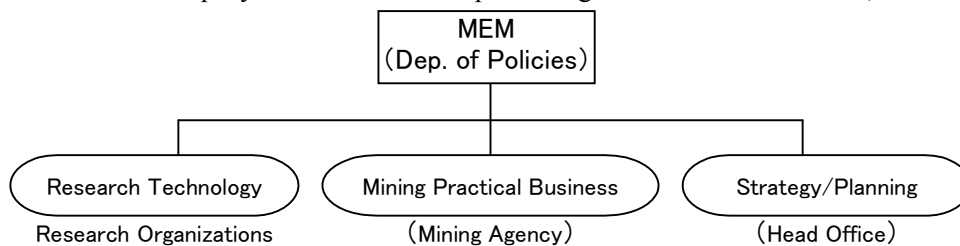


Fig.8.34 Newly Function-Strengthened MEM

It is indispensable to foster staffs for more functionable administration of MEM. Several staffs of MEM went to Japan for training in the past, but staff training is not carried out systematically.

It should be institutionalized to foster staffs in MEM for 10 years during period of implementation of the Master Plan.

**a. Institution for Staff Training**

Staff training will be systematically carried out to govern the mining sector under the market economy. Training for the sector management will be done mainly by site studies in the mining advanced countries.

Period: 3 months per a staff

Objective: staffs and executive officers (administrative and technical officials) of MEM

Subjects: general mining administration

Training places: mining advanced countries (Canada, Australia, etc.)

Cost: governmental budget or international supports

**b. Institution for Experts Invitation**

Experts will be invited to instruct mining administration skills and specific knowledge to MEM staffs. They will also open the sessions which mat double with sessions mentioned in (14).

Period: one month per one expert, 2 times per year

Experts: mining administration, mining law, mining technologies, environmental measures, resources economy, mining policies

Training subjects: mining administration and related knowledge

Training place: MEM

Cost: governmental budget or international supports

**c. Institution for Fostering New Staffs**

Reorganization of MEM and new establishment of the Mining Agency may cause excess or deficiency in MEM staffs. It is necessary to institutionalize fostering new staffs for the future in preparation to employ or relocate new staffs.

Period: 6 months

Objective: staffs newly employed or relocated

Training subjects: mining language (English), mining administration, mining technologies, environmental measures, mining management

Training place: MEM or others

Cost: governmental budget

**(9) Review the Mining Tax System**

At the 5<sup>th</sup> year after starting the Master Plan, it is necessary to review the rates of



royalties and taxes related to the mining sector. It is to reassess their correctitude based on the trend of market commodities prices, taking account of harmonious balance between the national revenues and management of the privatized mining companies. If some inconveniences occur, it is necessary to change their rates. Also, it is necessary to review the procedures and means to collect taxes. It is also necessary to compare rates and management of the Mining Fund if it will be established. At that time, it is necessary to recheck collecting state of royalties and taxes, collecting system and their transparencies. A temporary committee should be established to review the mining tax system.

## Chapter 9 Recommendations

### 9.1 Current State of the Mining Industry and Serbian Mining

#### (1) Global Trend and Structure of the Mining Industry

Mineral products prices have been maintained in high level since 2003. Substantial mineral resources managed by many national governments were released to the free market according to progressed globalization after 1990s. At that time, European and American companies were in a center of the mining industry. However, current situation has been changed. In other words, Russia and China are actively seeking for mineral resources, and BRICs have changed from resource-supplying countries to resource-consuming countries owing to their rapidly progressed industrialization. Serbian people related to the mining industry must understand well this trend and structure of the global mining industry. It should be noted also that economic disparity between the mining companies has been enlarged due to progressed globalization.

- High metal prices have been maintained.
  - enlarged profit and surplus funds of companies
  - activization of exploration and development
- Globalization has been enlarged.
  - reforms by the World Bank
  - newly competition against the international meajors
- Appearance of new powers and networked region
  - China and neighboring countries
  - solidification of former Soviet Union

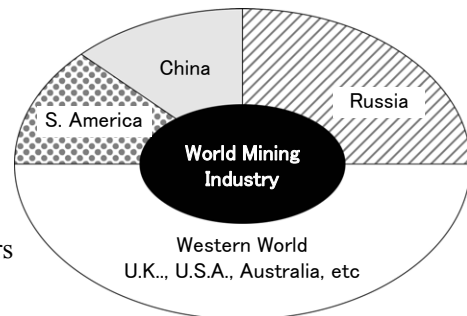


Fig.9.1 Recent Resources Powers

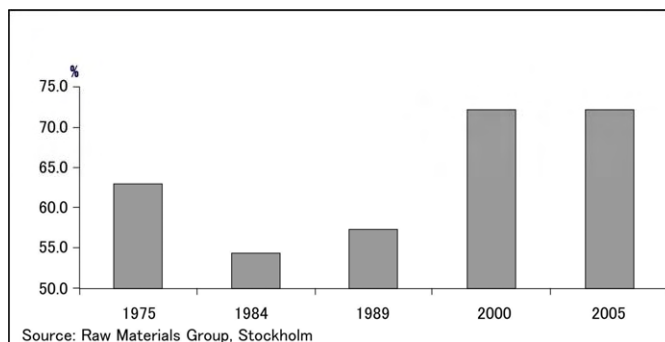


Fig.9.2 Private Share of Mining (non-weighted average 8 metals)

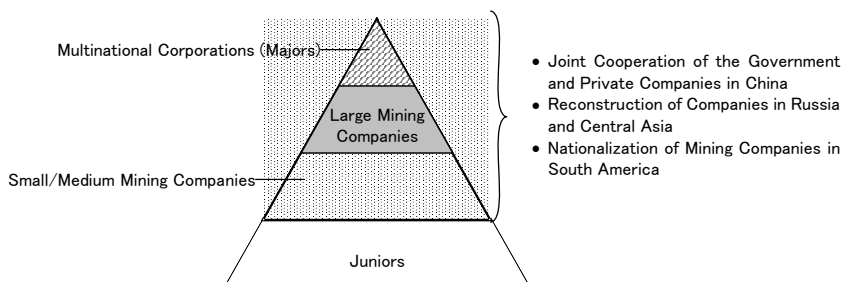


Fig.9.3 Structural Change of Western Mining Companies

In addition, word has it that the international major Rio Tinto will be sold to BHP Bilton, or even that a Chinese steel group will acquire it. The world's mining structure has changed considerably in the last 20 years, shifting from a uni-polar Euro-American focus in the 1990s toward a multi-polar one that includes Russia and China as major players. Thus, the structure of the mining industry has started to undergo far-reaching changes. Against this backdrop, an important question is how Serbia fits in with this changing structure and how it will affect the reconstruction that has just started with the Serbian mining industry. Therefore, it is necessary to construct a mining basement that is compatible with a market economy as soon as possible. A prerequisite for survival in this environment is maintaining international competitiveness.

## **(2) Recent Development of Mineral Development**

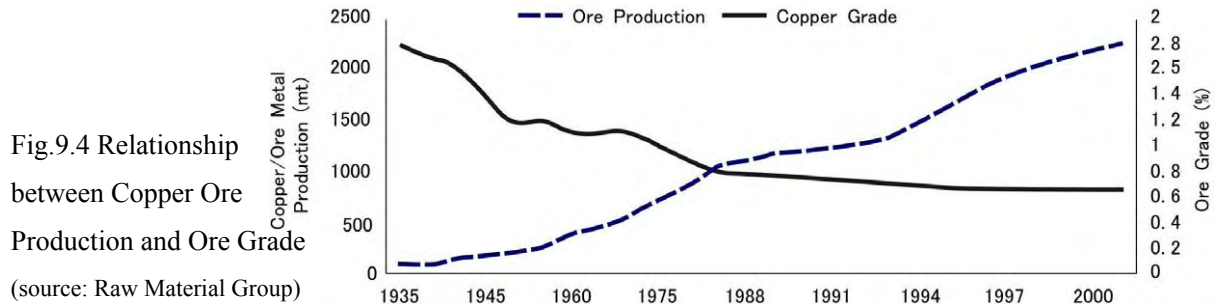
Recent development trend of mineral resources is jumboization of ore deposits to be mined, and also super mass-production due to lowered ore grade such as copper. Therefore, competitiveness of middle/small mines has been weakened. The continuing increase in metals prices is helping small- and medium-size companies to get established. However, if metals prices decline, it is clear that they will have to curtail production or even temporarily or permanently close some mines. It gives importance to prepare the mining laws which are attractive for investors. It is necessary to quickly establish an attractive investment climate.

Accordingly, the mining law itself is a rivalry factor among countries which intend to attract investors. The Serbian mining industry consists of middle and small mines, except the RTB Bor. Therefore, in order to give small and medium privatized mines the competitiveness they need, the national government will have to establish a system for supporting the transition to the private sector.

Most of Serbia's mines are in the process of being restructured and they are seriously lagging behind the global mining industry. This is due to a lack of competitiveness resulting from the deterioration of equipment and facilities, the persistence of a production management system that dates from the Socialist era, and the delayed introduction of IT, among other reasons. Therefore, while metals prices are still, the Serbian mining industry will have to work very hard to catch up with the global industry, and efforts will have to be made to enable the Serbian mining industry to thrive in a market economy.

- Large scale development (open pit operations)
  - mass-production, enlarged machines
- Decreased cost, lowered grade of ore to be mined
- Weakened competitiveness of middle/small mines
  - mine closing, operational stop, difficult management
- Introduction of IT

- introduction of GIS, construction of database, on-line system
- Mining Law, improved tax system (for strengthening of competitiveness)
- Environmental protection



### (3) Strategy of the International Majors

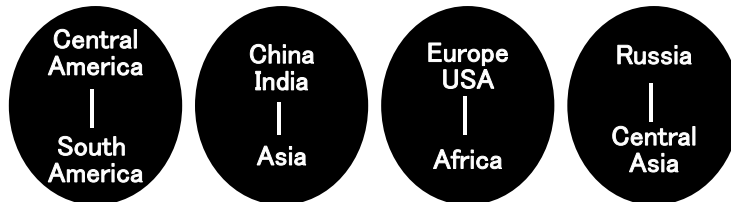
Currently in Europe and America, Juniors, exploration companies shown in Fig.9.3, procure capitals from the stock market to carry out exploration activities. When they get good results, they sell them to the international majors. Under this system, neither juniors nor majors take any risk. However, juniors cannot move actively in Serbia under the current Mining Law. Under the present Serbian mining law, junior companies from the EU, North America, etc., are not allowed to play an active role in the country. This is because, among reasons, the acquisition of mining rights is a very complicated process, and it is not easy to transfer mining rights once they are obtained. Therefore, it is indispensable to change the Mining Law to the global standard in order to attract the foreign investment. The following is a list of some of the major strategies:

- Large ore deposits, open pit→ mass production of low grade ore
- Regions adjacent to the market
- Attain promising projects from juniors
- Mines in regions to construct infrastructure or adjacent to those regions
- M&A of good companies
- Enlargement of resources occupation rate (for control of the market)

As already reported in (1), we are now in an age where the international majors are considering merging with each other, but they still wield great influence over the state of the world's mining industry. In response to the emergence of Russia and China as key players, and the resource nationalism that is occurring in Central and South America, mergers and acquisitions will become even larger and will likely provide the driving force for market monopolization, cost reduction and rationalization. Even in Serbia, Rio Tinto is now exploring for Boron. It is now necessary to be watching trends in the activities of international majors because these can have an effect on efforts to promote the Serbian mining industry.

### (4) Regional Economy

Trend of reciprocal relation is appearing in the global mining sector based on the regional economy (Fig.9.5). Serbia stands in the good geographical terrain. It has a good location which is easy to build business relation between Europe or Russia. Actually, Russian and European investors have already begun investing in mineral resources business (Fig.9.6) It is necessary to build thus reciprocal relation in resources business based on geographical features.



- Industrialization of Semi Advanced Countries
- Supplying Countries = Consuming Countries

Fig.9.5 Schematic Diagram for Regional Economy in Mining

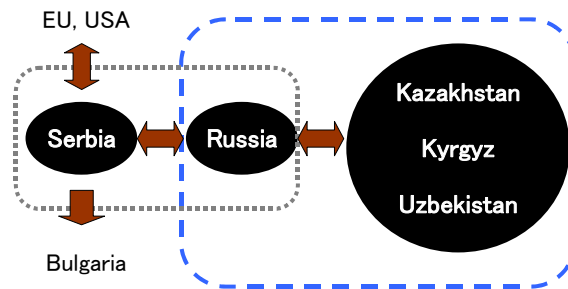


Fig.9.6 Networked Regional Economy between Eastern Europe-Russia-Central Asia

Serbia lies at the crossroads connecting Western Europe, Eastern Europe, and Russia, and this relation will likely even have an effect on how Serbia resolves its political issues. Moreover, the southward expansion of a Serbia-centered economic zone may also have an effect on how decisions are made. At the present time, FTA with Russia will have to be utilized to promote resource businesses and investment. For example, this might involve the following:

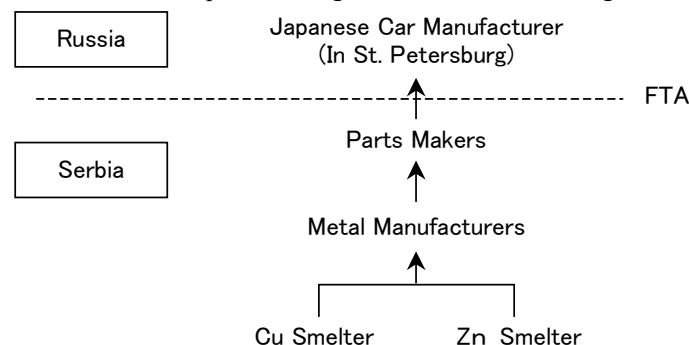


Fig.9.7 The relation between metal mining projects in Serbia and Russia

Already, Japanese companies are considering starting parts supply businesses for automobile assembly plants that are being constructed in Russia. In order to stably expand this business concept, Serbia will have to take the following measures:

- Rehabilitate smelters and construct a production system for a market economy.
- Rehabilitate mines and establish a system to provide a stable supply of copper and zinc concentrates to smelters.
- Optimize sector management after privatization.
- Promote investment in ingot production, parts production, and so on.

## **(5) Serbian State**

Characteristics of the Serbian mining sector are described as follows;

- Full set of mining technology from exploration to smelting and manufacturing
- Plenty staff in institutes (Mining Institute, Geological Research, CIB)
- High technical level

It is possible for companies without mining technologies and management experience of mining companies to manage mines. This is one of the advantages of investing in Serbia. However, despite this advantage, it probably cannot be satisfactorily exploited because of the mentality of the old system that is still entrenched at mines and smelters. Therefore, it is essential that mines and smelters have skilled personnel and adapt their production systems to a market economy, and work to change attitudes of technicians and workers are involved with production. For example, the introduction of Japanese-style quality control systems, Kaizen activities for reducing costs, environmental management, etc., could enable companies without previous experience in the mining industry to operate competitive mines and smelters.

Also, it is possible to foster local and foreign engineers with training places such as true mines and smelters, if it has instruction department reorganized by the institutes. In addition, it has good conditions to invest in assembling cars and manufacturing spare parts, because it has already technologies and plants to produce metals and manufacture metals.

## **9.2 National Economic Development Plan and Master Plan**

### **(1) National Economic Development Plan**

Currently, the Serbian Government is formulating the National Economic Development Plan. Solution of following tasks is necessary to meet membership conditions of the EU.

- Maintain the economic growth.
- Amend regional economic discrepancy.
- Decrease unemployment rate.
- Abolish legacy traces of old institutions.
- Improve the investment climate.

If the unique features of the mining industry could be effectively utilized, it could contribute toward reducing ameliorating regional disparities and reducing unemployment. Mining is

a core economic activity in rural areas which can lead to the formation of spin-off businesses and promote employment. Thus, the promotion of the mining industry in such areas can play a direct role in vitalizing local economies and reducing unemployment.

**(2) Mining’s Role in Economy**

Currently, it is impossible for the weakened Serbian mining sector to contribute to the national economy. However, it has originally economic power to occupy 10% to 30% of GDP, and to give impacts on development and employment of the regional communities.

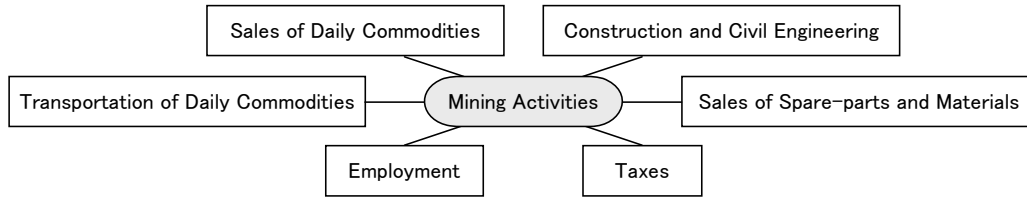


Fig.9.8 Relation between Mining Activities and Economy

Not only does a robust mining industry have a tremendous effect on GDP, but mine products are also international goods that can bring in hard currencies from trading partners. The growth of the mining industry can increase national revenues through royalties and taxes and contribute to the national budget. Furthermore, the mining industry can lead to the formation of “spin-off” business (see Fig. 9) that can help vitalize local economies and expand employment opportunities.

**(3) Implementation of the Master Plan**

It is necessary for the Master Plan to link with the National Economic Development Plan. MEM and MEP must formulate a 10-year mining promotion plan based on the Master Plan and implement it under approval of the government. Financing from the national budget or donors is needed to implement measures recommended by the Master Plan. To be more precise, each content will be studied to formulate its detailed program. It is difficult to materialize it without an execution system based on the plan.

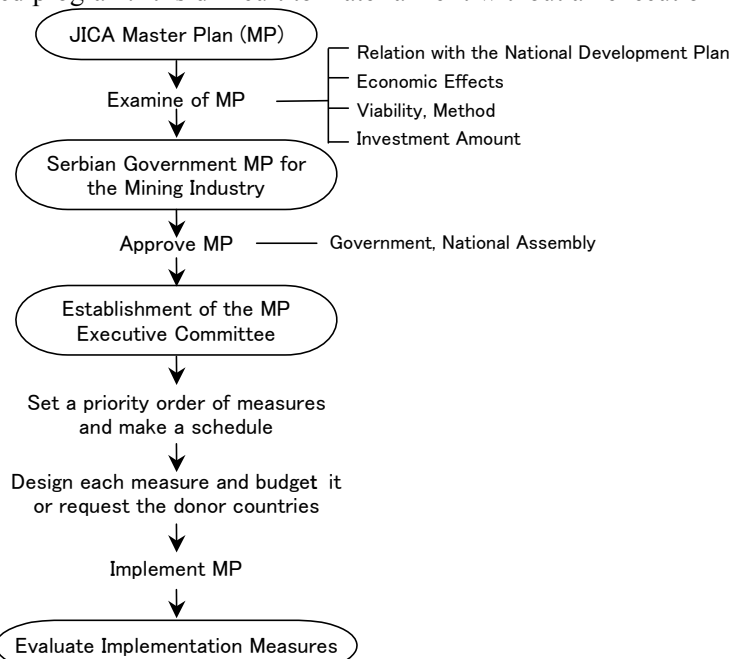


Fig.9.9 Procedure to implement the Master Plan

#### **(4) Relationship with regional communities**

The Master Plan is linked with the National Economic Development Plan as mentioned above, and the mining industry in the regional communities can contribute to regional communities. If a new ore deposit is developed, it will be linked with regional development or regional activation. During the 4<sup>th</sup> local survey, relationship between mining activities and regional communities will be discussed in the Regional workshop at Vranje. It is important for the National Plan to link with relationship between the mining industry and regional communities.

It appears that local communities still do not have an adequate understanding of mining activities. Compared with the former Yugoslavia era, the mining industry is suffering from a severe depression, and many miners are now unemployed. This may also have an effect on the understanding of information that is released to the public about environmental preservation.

Without the understanding of local communities, it is difficult to sustain mining activities. Therefore, once the Master Plan is completed, it should help to improve communication with local communities during the mining basement construction period (the first 5 years), which is essential for promoting the mining industry. It is also extremely important to establish “community roundtable conferences” and other venues that will help to promote mutual understanding among local communities, mines, and MEM/MEP.

### **9.3 Capacity Building**

#### **(1) Strengthening of Capacity to Formulate Policies**

There is no department to formulate policies in MEM. The Master Plan describes necessity to establish a department of policies in MEM. Policies are important to manage the mining sector and enhance mining activities. It is necessary to formulate policies from the comprehensive viewpoints such as analyzed information of the global mining sector, issues of the Serbian mining industry, evaluation of the mining sector, medium/long-term viewpoint, environmental protection, production activities, investment state, others.

#### **(2) Investment Promotion**

Currently, SIEPA is in charge of investment promotion except the mining industry. It has full documentation necessary for investment promotion under assistance of JICA. It has function of “one-stop-shop”. MEM addresses investment promotion for the mining investment as one of an important tasks, with some assistances from this Master Plan study, which recommends concrete measures, as described in Chapter 8. Indispensable factors for investment promotion in the mining sector are as follows;

- The Mining Law should be revised to the international standard.
- Mining policies can link with profits of the stakeholders such as private companies, regional communities, government organizations, and others, and contribute to the national



economy.

- Procedures to attain concessions should be easy.
- The government and economy should be stable.
- The government organizations related to mining should be functionable.
- Tax and royalty should be fair and transparent.
- Geological information should be compiled to determine easily the exploration targets such as geology and ore deposits, and be collected easily by any seekers.
- There should be partners or cooperative companies in Serbia, and human resources should be attainable.
- Full document should be prepared to understand the investment climate.

If the specific proposals described in Chapter 8 can be implemented, all of these important criteria will be met. However, political stability is a matter that it beyond the realm of the mining industry.

### **(3) Organizations**

The government organizations related to the mining sector must administrate and manage the whole sector in order to govern the mining sector and activate mining activities. Serbia needs organization to promote mining activities under the market economy. Important points for reorganization are as follows;

- Policy formulation, routine works for the mining sector and surveillance study should be separated sharply.
- Above-mentioned roles should be reorganized to work together.
- Routine works for the mining sector should cover mining concession, environmental protection, production, technologies, safety and information under communicable system between organizations.
- Appropriate experts should be allocated for the routine works.
- Opportunities and places for intelligence sharing should be prepared at each rank in departments, divisions and sections.
- Communication system should be simplified.
- Organizations should be understandable and prepare a contact window for the privatized company.
- It should be simplified to keep and compile information and documents (by introduction of ISO, etc.).

## **9.4 Exploration, Development and Production Activities**

### **(1) Resources Potential**

Regional Survey System must be established to understand domestic resources potential

and promote exploration, as described in the Institutional Reform Program. Following factors are necessary to understand resources potential.

- Characteristics and locations of mineralization
- Models for ore deposits
- Characteristics of geological structures
- Distribution of mineral promising

In Chapter 8, there is a proposal for a regional survey system, but it will require an effort to establish and implement the system and clarify potential.

### **(2) Exploration Technology**

There are full technologies in Serbia, but following technologies are insufficient;

- Remote sensing analyses
- Electromagnetic exploration
- Ore grade management in mine sites
- Map management (GIS, database) using PCs at the mine site.

### **(3) Mining**

There are full mining technologies in Serbia, and there is no problem in basic technology level. However, following technical improvements will be necessary for privatized mines to survive in the future.

- Complete trackless mining system
- Cut and Fill Method (in middle/small mines)
- Ore grade management in stopes
- Improve operation efficiency of more mechanization or enlarged machines (such as raise boring or 2 boom-jumbo)
- Advanced blasting technologies (smooth blasting, etc.)
- Underground transportation system (for miners and ore/materials)

### **(4) Ore Processing**

Flotation method is adopted in Serbia, and there is no problem in ore processing. However, improvement of recovery is a task in the future. Therefore, attention should be paid to following points;

- Ore processing based on information of mineral occurrence and mineral processing tests.
- Reason analyses and measures for ore grade difference between plan and result for feed ore and concentrate.
- Decrease of metal grade in tailings.

### **(5) Smelting**

Smelting in Serbia will require particular emphasis on the following:

- Safety measures, anti-pollution measures, environmental protection measures.

- The use and storage of sulfuric acid.
- Extracting metals from tailings using the SXEW method.
- Making smelters cleaner.
- Expanding the scope of automated work.
- Stabilizing the supply of concentrate.

## **9.5 The Exploration System in Japan**

Japan is a resource-importing country, and a leading industrial country. Its domestic resource base is poor, and it is dependent on outside sources for nearly all of its resources. At the same time, Japanese copper and zinc smelting account for about 10% of the world's production. With imported metallic materials, intermediate materials, metal ingots and processed metal goods, Japanese industries produce a wide variety of manufactured goods.

Therefore, one of the basic policies of the Japanese government is to secure a stable supply of raw materials. Because this is indispensable to the maintenance and development of Japan's industries, Japanese companies have established mineral exploration systems overseas, and are receiving assistance from the Japanese government to develop these resources and supply them to the country. Furthermore, until about the year 2000, various types of exploration support systems were also set up in Japan to secure domestic supplies of resources.

### **(1) Overseas exploration system**

For overseas resource exploration, the Japanese government mining organization JOGMEC has set up two systems: 1) Joint Basic Exploration Schemes that involve Joint Venture Basic Surveys, and 2) Joint Basic Exploration Schemes that involve Strategic Joint Venture Surveys. In addition, there is also direct assistance to Japanese companies in the form of 3) Overseas Geological Surveys, and 4) Overseas Joint Geological Surveys. The following is an explanation of each of these programs.

#### **A. Joint Venture Basic Surveys**

In this system, JOGMEC conducts joint surveys with overseas resource exploration organizations (foreign mining companies, other foreign companies, etc.), and acquires rights to mining options. In most cases, surveys are conducted for a 3-year period. JOGMEC pays for these surveys, and retains the rights as compensation. After the survey has been completed and JOGMEC's rights have been acquired, the rights are usually auctioned off to a Japanese company, which continues to conduct exploration.

#### **B. Strategic Joint Venture Surveys**

In regions and mineralized areas where Japanese companies are not engaging in exploration activities due to a poor investment climate, technical problems, etc.

#### **C. Overseas Geological Surveys**

Regarding projects where Japanese companies play a major role, the company(s) in question pays for about half of the survey (≠ exploration) fees within its mining concession area and JOGMEC conducts the surveys. If it ascertains the reserves and contributes to production, the company(s) in question will pay part of JOGMEC's expenses back to the Japanese national treasury as a token of its appreciation for a successful effort.

#### **D. Overseas Joint Geological Surveys**

When Japanese companies conduct required surveys of geological structures when they work with foreign companies to do exploration work, part of the funds needed for the survey (≠ exploration) is provided as a grant.

In this way, the exploration system has been set up to contribute to Japan's national benefit, and the Japanese government is supporting Japanese companies. Even for the subsequent full-scale exploration and development stage, there is a system for financing exploration, and another one for raising exploration capital from debt instruments. Thus, there are systems in place for supporting surveys, exploration and development.

Today in Serbia, it is essential to establish a system that will vitalize the country's mining industry and provide a steady supply of domestic resources to make an adequate and sustainable contribution to production activities. The systems described above can be applied in Serbia as survey and exploration systems, but both would require Serbian government funding, so it would first be necessary to secure a source of financing such as through a mining industry fund.

#### **(2) Japanese Domestic Exploration System**

To maintain a domestic supply of resources in Japan, the following system, called the "3-stage method", was used until about 2000 to support the exploration activities of Japanese companies. With the decline in the competitiveness of Japanese mines that began in the 1980s, however, it became difficult to continue this system, and today it is no longer in existence. The system consisted of 1) a regional survey, 2) a detailed survey, and 3) grants for exploration. The following is a brief description of these systems.

##### **A. Regional Surveys**

Regional geological surveys were made of resource potential areas in Japan to the mechanism of mineralization on a regional basis and clarify the resource potential. The cost for this was borne by the national treasury, and MMAJ (the predecessor of JOGMEC) planned and supervised the surveys. The surveys themselves were conducted by private Japanese survey companies. In most cases, a project for one region would last for 3 years. A steering committee composed of MMAJ, private mining companies, university geology/mining professors and others was established to evaluate the results.

Regions were selected by MMAJ based on requests from mining companies, requests from local government, or MMAJ's own initiative.

## **B. Detailed Surveys**

Once a promising resource potential area was selected based on the results of the regional survey, a detailed survey would be conducted. The cost would be shared 3 ways— 1/3 by the national government, 1/3 by local government, and 1/3 by the company holding the mining concession in the promising area. These surveys consisted mainly of detailed geological and boring surveys that would be planned and supervised by MMAJ to acquire mineral reserves. Some of these surveys would also include shaft and tunnel exploration. As with the regional surveys, a steering committee would be set up and members, which would also include local governments, would evaluate the project. In most cases, a project for one zone would last for 3 years, and if reserves could be acquired and production started as a result, the company in question would return part of the government funding as a token of appreciation. The actual surveys would be conducted by Japanese mining survey companies.

## **C. Exploration Grants**

For reserves that were acquired as a result of the above detailed survey, METI (the ministry having jurisdiction over MMAJ) would check exploration budgets and locations and make a decision based on reserves confirmed at the production stage, requests from existing mines, etc. Half of the exploration costs were covered by a grant from the national treasury, and was mainly for boring and shaft/tunnel exploration. If a project led to production, the mine would pay some of the grant back to METI as a token of appreciation.

In this way, Japanese private companies would be assisted in the survey and exploration stages.

This kind of support system would be sufficiently effective for vitalizing domestic exploration and acquiring reserves for existing mines in Serbia. Already, this has been raised as a system reformation program in Chapter 8 of the Master Plan. However, this system requires significant amounts of funding. In Serbia's case, it would first be necessary to establish a mining fund to acquire the resources for setting up and implementing such a system.

## **9.6 Providing Raw Materials to Smelters**

Today, due to declining mine production in Serbia, the RTB Bor copper smelter and the Zorka zinc smelter have been having difficulty in procuring resources (concentrate), and their production levels are lower than their capacity.

At the same time, both smelters are in the process of being privatized but no buyer has yet been found for them. Because the RTB Bor copper smelter and mine are being privatized, the buyer would be able to build a system that integrates the mine with the smelter. However, in the case of the Zorka zinc smelter, zinc concentrate came from mines in Bosnia-Herzegovina and Serbia (that is, from nearby zinc mines) during the Yugoslavia era, but all of these mines are currently being

privatized and either rebuilt or shut down, and there is now a national border between the two former provinces, so these mines are currently supplying almost no domestic zinc concentrate to the smelter. As a result, the smelter has to import zinc concentrate from Greece and other foreign countries.

To promote the mining sector, MEM will have to construct a system that will provide the smelters with a supply of concentrate. This is particularly important for the Zorka smelter, which gets its supply from small- and medium-scale mines that are being given priority for reconstruction and reopening. However, information on the following items will have to be collected and analyzed, a system for supplying raw materials will have to be constructed, and a network will have to be formed between smelters and mines, including those in neighboring countries.

- Listing of potential supply mines (including mines in Bosnia-Herzegovina).
- Restructuring conditions, production, reserve amounts, and exploration conditions of zinc mines in Bosnia-Herzegovina.
- Production amounts, reopening plans, production resumption schedules of privatized mines in Serbia
- Amount of raw materials that can potentially be supplied to smelters
- Plan for a long-term supply system

## 9.7 Mining Management

### (1) Financial Management System

After the Rudnik Mine was privatized, it introduced a financial management software made in Slovenia to carry out financial management by computer. It has already a module type management software to add inventory management.

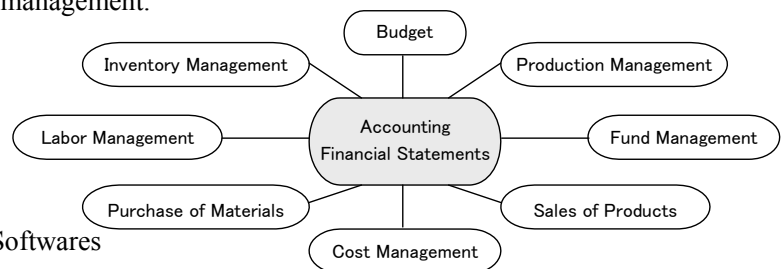


Fig9.10 Financial Management and Softwares

Such a financial management system is being established at many mines. It is possible to make “on time” checks of finances and is very effective for short-term management such as keeping constant track of current inventories, production, and expenditures for capital, production, and storage, among other things.

Thus, the above financial control system would be an integral part of operations, as it would enable the increase of short-term sales, the formulation of cost-reduction strategies, and immediate implementation as a financial management base. It would also be effective for short-, medium- and long-term planning.

## **(2) Strategic Accounting**

At the high level of metal prices like present, if an accountant can give concrete indications to each department such as production ore grade, exploration activities, reinvestment and others, and each department can make efforts to achieve these indications, it might lead to the maximum profit and efficient consumption of money. Strategic predicted accounting could thus link with increased profit of the companies and increased revenue of the government according to metal prices. Thus, the above financial control system would be an integral part of operations, as it would enable the increase of short-term sales, the formulation of cost-reduction strategies, and immediate implementation as a financial management base. It would also be effective for short-, medium- and long-term planning.

## **(3) Finance**

It is not easy to procure capital for small- and medium-scale mines because of issues with bank interest, collateral, and so on. Although it would also depend on the financial strength of the buyer of a privatized mine, there is also a need to acquire knowledge on finance, methods, organization, and types in a market economy, as well as nurture financial experts who can analyze relations with strategic accounting and financial management. This could be done through overseas training and/or inviting foreign experts to come to Serbia.

## **(4) Cost-down**

Toyota, Japanese car maker, is always making efforts to cut the cost down drastically. Its target is a 50% cost-down, and all the company addresses it. In its efforts to reduce costs, the Japanese mining industry has also introduced the same type of quality control and Kaizen activities that Toyota and others have implemented. It is likely that Serbian mining companies must address the same target as Toyota.

### **a. Tasks for the 50% Cost-down**

#### 1) Select items for the 50% cost-down

- Aim at no defect in process, no waiting time and no malfunction time.
- List up targets in variable and fixed cost items respectively.
- Cut 50% down labor costs and direct man-hours.
- Look for cheaper materials and purchase goods without quality down.

#### 2) Clarify quality targets.

- Quality (concentrate grade) is linked directly with sales amount.
- Unit production cost is almost constant in no relation with quality.
- Achieve a quality goal leads to cost-down.
- An ambiguous quality goal does not lead to cost-down.
- It is necessary for achieving a quality goal to unite processing with geology, mining and laboratory.

3) Inform unit cost widely.

- Clarify unit cost for whole mine, each department and each workplace.
- Cost consciousness leads to new ideas.
- Determine unit cost goal, not ambiguous but detailed figure, in each workplace.
- Inform cost down values gained by improvement.

4) Each chief of workplaces is a manager.

- A chief of workplace needs 3 qualities, improvement, leadership and cost consciousness.
- Systemize daily income and expenditure in each workplace.
- Many wastes bring on loss. Inform widely that improvement leads to a good effect.
- A chief of workplace finds wastes, and eliminates them.

**b. Reason for the Cost-down (Strengthening of the Management Foundation)**

In “a” above, capital has been created by reducing costs, and this capital is used to strengthen the management base.

1) Strengthen exploration

- Increase new exploration.
- Make a base to attain a new ore deposit.

Exploration is not tied to direct management activities, but it is making a contribution to medium- and long-term manage for the next fiscal year and beyond

2) Improve the underground structure.

- Systematic structure.
- Eliminate waiting time.
- Increase transportation efficiency, and improve mobility.

3) Decrease number of workers with multi-skilled workers.

- Prepare expenditure for vocational education and attaining new skills.
- Effective management and operation.

Presently in Serbian mining operations, the work of engineers and technicians forms the technological base, and one engineer/technician may be doing several jobs. For this reason, the work system itself must be systematized.

4) Check and eliminate waste.

- Create man hours and money.
- Slim management.

5) Countermeasures against cheaper metal prices

- Almost all mine can make profit under the current metal prices.
- Stable management is important under cheaper metal prices (decrease fixed costs).

6) Make investment capital.

- Purchase or renovate equipment and machines.



- Develop a new ore deposit (e.g. deeper oxide ore-body)

N.B. 1) to 6) are connected organically.

It should be noted that the JICA support system can also be used for improving the operations of small- and medium-scale mines.

## 9.8 Environmental Conservation

### (1) Monitoring

Current monitoring system is not insufficient, because it is carried out by various organizations even if they are reportedly moving to put together. There is no measure for pollutant sources, due to lack of analyses. It is necessary to establish a Monitoring Center governing the whole monitoring across the country to prepare measures for pollutant sources.

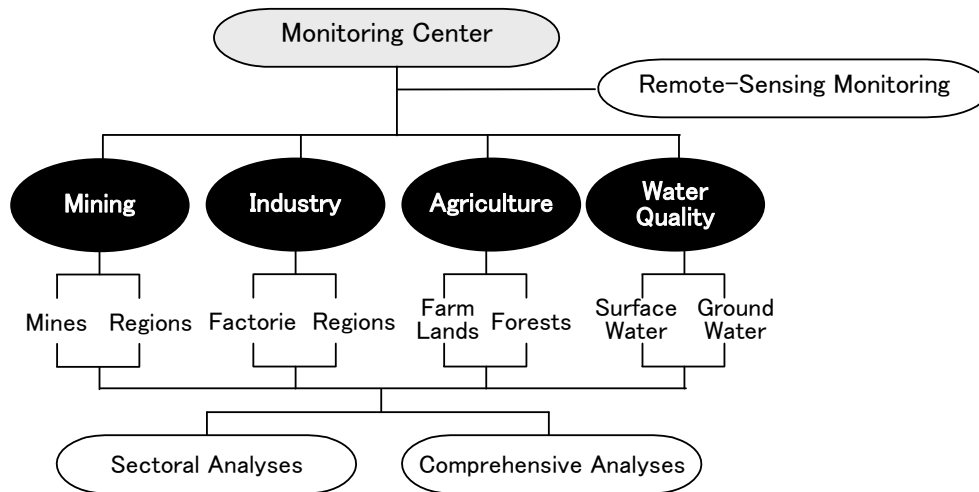


Fig.9.11 A Concept for Monitoring Center

### (2) Measures for Pollutant Sources

Current measurement of 4 times per year is not sufficient basically to understand the polluted state. And also there is not any autonomous environmental management at each mine. It is necessary to study a new institution that enables each pollutant producer to carry out monitoring autonomously and strengthens environmental management. As its first step, it should be discussed to decrease measuring items by limiting to discharging pollutants, but increase measuring frequency. To promote the introduction of processing equipment, some sort of incentive should be provided.

### (3) Environmental Measures

Currently the environmental survey is conducted for the RTB Bor by the World Bank. However, any environmental survey has not been conducted for other mines. First of all, it is necessary to implement these environmental surveys to understand the contaminated state around the mines. Even in the RTB Bor, the pollutant sources and loading dose have not been surveyed so far, and priority of countermeasures has not been determined yet. Following item must be studied to

formulate countermeasures;

- Survey of pollution load (investigate reducing environmental load through the use of BAT, etc.)
- Decontamination of soil (including river beds)
- Cleaning of polluted air (through comprehensive measures that include replacing equipment)
- Cleaning of polluted water (by installing, increasing, replacing treatment equipment)
- Improving regulations to limit areas of discharge
- Policies for handling slag and tailings
- System for recycling wastewater (to reduce water pollution)
- Replanting, revegetating bare land (to reduce water pollution)
- Investigation of measures for isolating wastes
- Implementation of measures for promoting the introduction of treatment equipment (tax incentives, subsidies/grants, low-interest loans, etc.)
- Investigate the allocation of organizations for implementing environmental policy

#### **(4) Tailings Dam**

Issues of tailing dams are pointed out in this study. Rumania, neighboring country, is building a quick response system for emergency and training necessary human resources as the World Bank's project. In Serbia, it is necessary firstly to implement detailed investigations and formulate measures for tailing dams from viewpoints of environment and safety.

### **9.9 Unused Resources**

#### **(1) Possibility to Use the Unused Resources in Serbia**

The unused resources in Serbia are supposed to be as follows;

- Tailings in the tailings dams
- Waste dumps in the mines
- Slag in the Cu smelter (it has been operated with low recovery.), slab in the Zn smelter
- Zn in the smoke from the smelters (recovery from iron net coated by Zn powder)
- Valuable elements like Iridium, etc. in the Zn smelter

It is necessary to study possibilities of their existences, volumes and measures to recover including recycling. It would be desirable for surveys to be budgeted by MEM and MEP and contracted to the Mining Institute, the Geological Institute, and survey companies, which would undertake the surveys to gain a comprehensive understanding of the entire picture.

It should be noted that with the exception of lead, the world recycling rate for metals is low. However, technology is being developed that can recover metals from waste materials. Waste materials that contain metals will likely increase in Serbia. Thus, Serbia will also have to make a

concerted effort to develop recycling technologies. In addition, concepts will also have to be developed for materializing recycling bases (industrial park “eco-towns” in the Balkans in the future.

Table 9.1 Surveys for Unused Resources in Serbia

| Target                               | Content of the Surveys  |
|--------------------------------------|---|
| Tailings Dams                        | Unused Metals in the tailings, Metal Amounts  |
| Waste Dumps                          | Valuable Metals in Dumps, Dump Amounts, Metal Amounts   |
| Slag in the Smelters                 | Amounts of Cu & Zn in Slag, Slag Amounts, Metal Amounts   |
| Zinc in the Dust of the Steel Makers | Accumulation State of Dust from the Electric Furnaces for Steel Making, Amounts of Dust, Zn Grade in Dust |
| Indium                               | Amount of Indium in Zn-concentrate, Amount of Indium in Zn Mines  |

In addition, Serbia is developing a mining industry based on zinc and copper. It already has the capacity for everything from processing metals from mines to producing parts. The country should also expand its field of vision to include such activities as copper foil production.

### (2) Implementation of the Unused Resources Investigations and Economic Evaluation

It is necessary to investigate state and volume of the unused resources including materials mentioned above, and study recovery measures. Based on these results, economic and technical evaluations are implemented to determine the economic viability.

Based on the results of surveys of unused resources, information such as survey results from Western nations, development, collection results, etc., should be acquired to make comparisons with unused resources in Serbia to prepare for their eventual use.

### (3) Implementation of Investigation on the Tailings dams

Currently, investigation of useful metals included in the tailings is being carried out in the 2tailings dams by this study. They are still qualitative study. The quantitative study will be needed based on result of this study in the future, to understand existing state, volume and grade. Finally, economic evaluation will be also needed. This study includes the laboratory tests for the qualitative evaluation. However, based on this evaluation, a pilot test may be also needed for technical evaluation in the future.

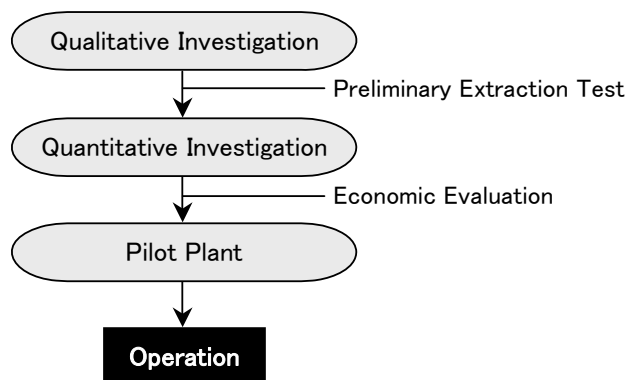


Fig.9.12 Implementation of the Tailings Dam

The tailings dams except the case study must be also investigated as mentioned above.

It should be noted that in the present study, qualitative case studies were conducted on two tailings dams (at Bor and Lece) in order to gain an understanding of the grade of metals contained in the tailings. In the future, it would be desirable to conduct a full-scale survey to investigate collection methods, assess economic feasibility, and consider ways to establish recovery flow at pilot

plants.

It is necessary to consider whether to have this full-scale survey conducted by MEM and/or MEP (at least until the understanding stage), or by a donor country or donor organization. If economically and technologically desirable results can be obtained at the preliminary survey level, then it might be desirable to transfer the project to a private company, or have a joint venture between the private sector and MEM and/or MEP.

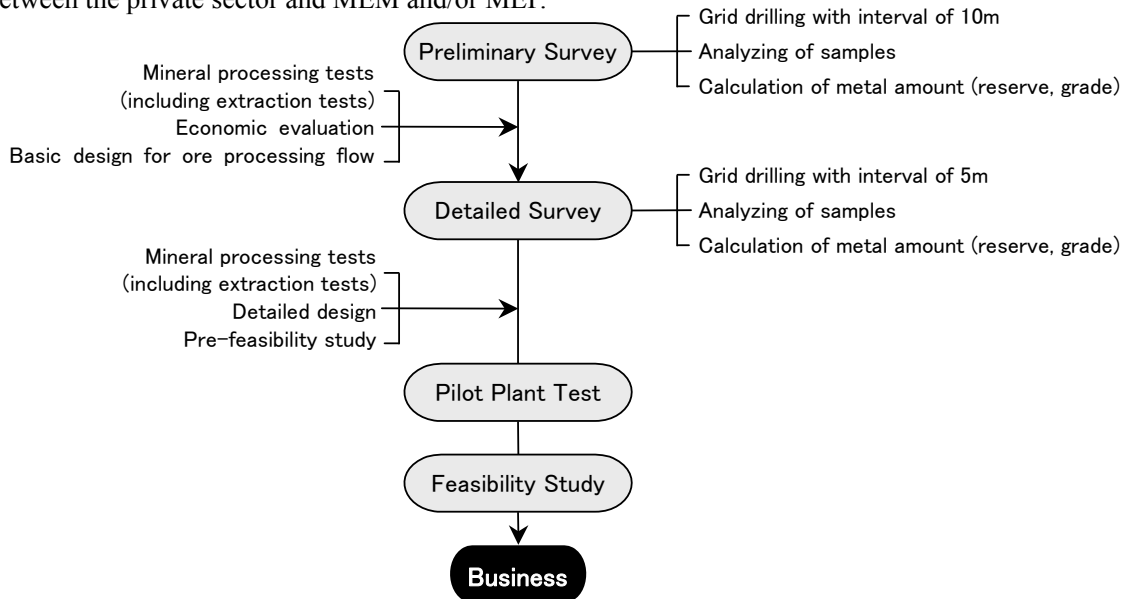


Fig. 9.13 Flow of Recovering Metals from Tailings

## 9.10 Sustainable Development of the Mining Industry

### (1) Conditions for Sustainable Development

The following is a list of conditions necessary for the sustainable development of the mining industry

- Acquisition of reserves and realization of potential that can sustain production over the long term
- Vitalizing the mining industry in a market economy
  - Continuous surveys and exploration
  - Maintenance and expansion of production volume
  - Contribution to the economy (macro-economy, employment, local economy)
- Emphasis on environmental preservation
  - Implementation of anti-pollution measures
  - Monitoring
- Establishment of a good rapport with the local communities
- Keeping technicians and engineers
- Quitable mining tax system and mining law (mutual benefits... government, mining

companies, local communities)

- Cost competitiveness
- Mining infrastructure
- Continuous investment in mining

In Serbia's case, only the conditions for keeping technicians/engineers and mining infrastructure have been met. The construction of a mining basement in the master plan (the first 5 years) will require meeting as many of the above conditions as possible, which will help to promote the mining industry and lead to sustainable development.

## **(2) Private sector initiative and changing attitudes**

Although privatization is giving the private sector a leading role in mine development, the managers, engineers, workers, etc., who are involved with mining today will likely not change, even if the private sector takes over operations. Mining activities in a market economy are in a fiercely competitive environment and must respond appropriately to changes in mining industry conditions. Even today, people involved in the Serbian mining industry still have attitudes that remain from the Socialist era. Everyone at all levels-- federal, ministerial, research institute, (state-owned) enterprise, and individual levels-- must be instilled with an awareness of costs and competitiveness.

## **9.11 Database**

As the Master Plan was taking shape, reports were made of information development and the expansion of the GIS database. If this database can be integrated with databases from each field, then it will be useful not only for the mining sector, but also for geoscience fields, land preservation, and other applications.

Regarding future sharing of fundamental spatial information, some current issues and suggested improvements are listed below.

- Information sharing among government organizations is remarkably hampered, because of the government's vertical administrative structure caused by current laws (laws on mining, geological exploration, environmental protection and so on). This can be remedied by promoting personal exchanges and information sharing through the reformation of organic laws
- Conversion of mapping coordinate system from Serbian local system to the world standard system
- Effective use of existing information basis; for instance, the contents of the BRGM's database should be assessed and utilized effectively for projects such as "Metallogenetic and Minerallogenetic Geological Economic Estimation" and the "Strategy for Sustainable Development of Mineral Resources in Serbia".
- Some of the basic geographical information managed by the MGI should be provided to the

general public, and additional geographic and infrastructural information should be made available.

- There should be a clear definition of the role of the newly organized “Mining Agency”.
- A new agency should be established for managing and operating digital archives.

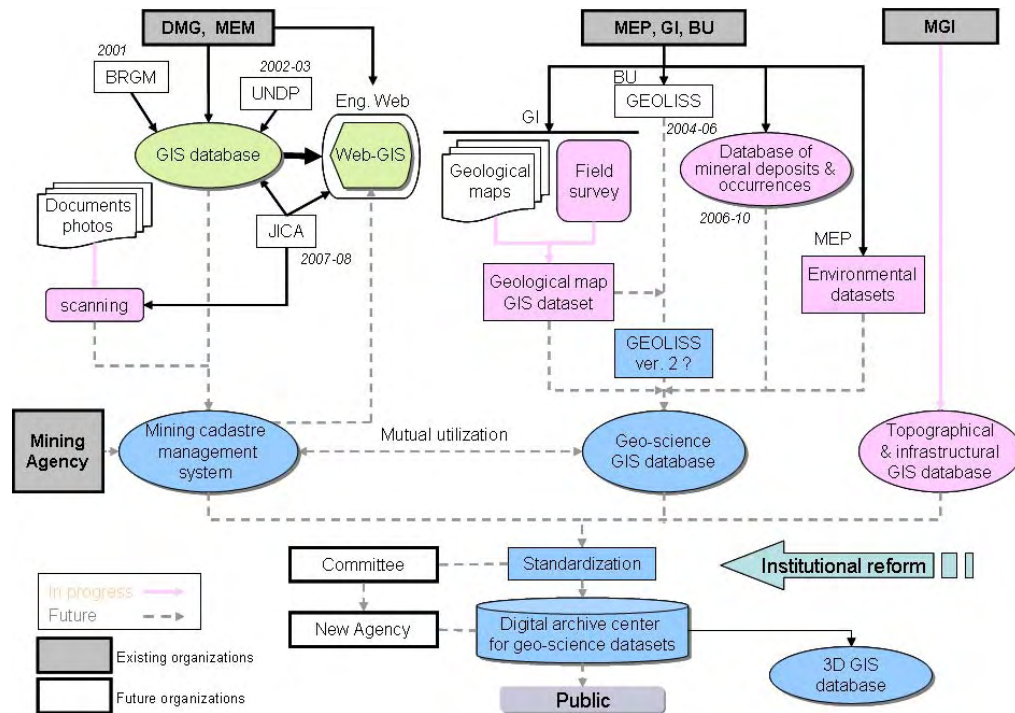


Fig.9.14 Construction and Strategic Flow of Geo-science GIS Databases

## (2) Future expansion of the MEM database system

Considering the current situation of GIS datasets and databases, future needs and usage, some expansion projects for the coming 5 to 10 years are described below. Here, the three main driving projects, MODEL-A1, A2 and B, are shown based on the present system. MODEL-A1 and A2 are mainly approaches to the expansion of the BRGM’s database and existing spatial information, as well as future integration with results from the GEOLISS project. MODEL-B involves the creation of a mining cadastre system including digitizing of the numerous historical mining license documents stored in the archives and the development of a field assistant system using GPS and Personal Digital Assistant (PDA) for mining inspection, and an information sharing system with the mining cadastre management system.

Driving projects

- Database Integration: MODEL-A1

Contents: Complete integration of the BRGM’s database and MEM’s existing spatial datasets through the creation of Graphical User Interface (GUI)

Project style: A project for short-term dispatch of an expert team

Members: 1) One mining system expert

2) Local consultant

3) One temporary counterpart of MEM

Duration: One year

Budget: US\$100,000

Requirements: Cooperation & understanding of the MEM

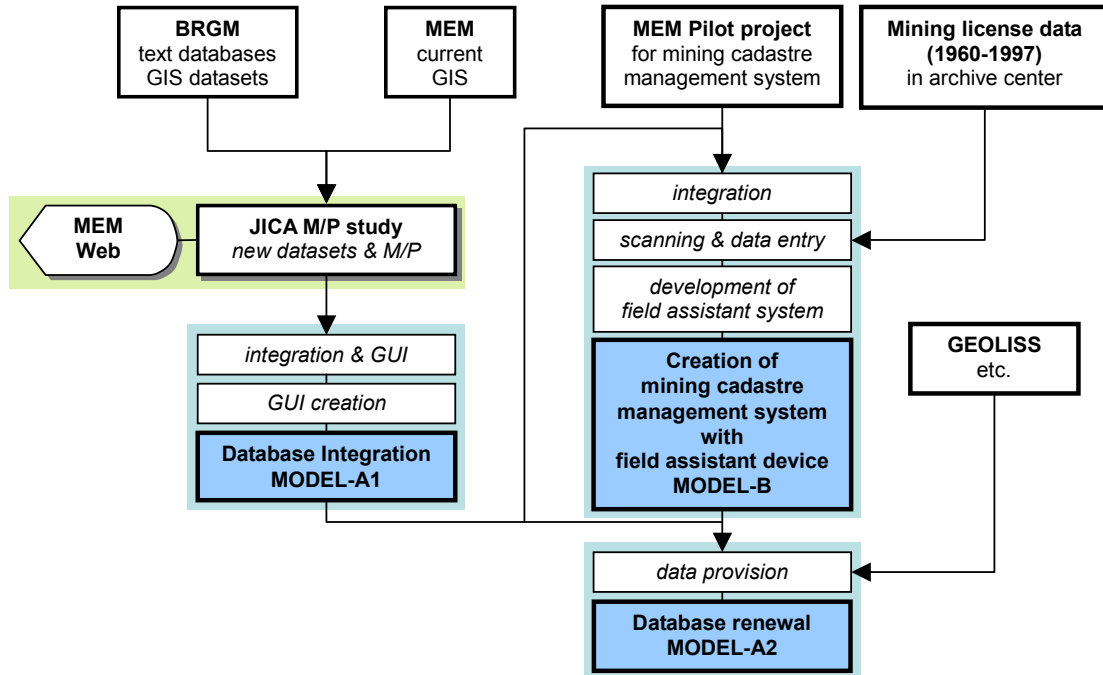


Fig.9.15 Flow of future MEM database

- Development of mining cadastre management system: MODEL-B

Contents: 1) Create a full-fledged mining cadastre system

2) Design and develop a field assistance device for mining inspections

3) Entry of historical mining license data (1960-1997)

Project style: Financed by international assistance organizations (JICA, WB,...)

Members: 1) Three experts (two mining system experts and one mining expert)

2) Two local consultants (one mining specialist and one IT engineer)

3) One counterpart of MEM

Duration: Three years

Budget: US\$1,000,000

Requirements: Results of MEM pilot project conducted in 2006

- Database update: MODEL-A2

Content: Data updating by outputs from GEOLISS or other mineral resource database(s)

Project style: Financed by the Serbian government

Members: 1) One mining system expert

2) One counterpart from MEP or Belgrade University

3) One counterpart from MEM

Duration: One year

Budget: US\$200,000

Requirements: 1) Reform of related laws and regulations (institutional reform)

2) Adequate mutual agreement and cooperation from MEM, MEP and MGI

3) Disclosure of fundamental geographic information (MGI)

### **(3) 3D-GIS database system**

As mentioned above, the creation of geo-science digital datasets is at the stage of two-dimensional digitizing in the geological mapping project based on the GEOLISS project. It will take at least 5 to 10 years to achieve dense coverage of geological and mineral resource information for the entire country. The progress should be accelerated by Serbia itself or with assistance from international assistance organizations to shorten the time to completion. After geological mapping, the next step shall be to develop an approach for three-dimensional (3D) GIS database expansion. In this study, we gathered information to investigate approaches for future 3D geological information construction during a visit to the British Geological Survey (BGS) which has been dealing with such advanced approaches for some time (the survey report is in Appendices). Based on the survey, general approaches for the construction of 3D geological and mineral resource information are shown below.

- Preparation of projects
  - Establishing a steering committee for the project, consisting of MEP, MEM and Geological Institute, Belgrade University, Military Geography Institute, Seismological Institute as major members or contributors
  - Planning
  - Cost estimation
  - Establishment of a partnership with a foreign institute which may assist this as an international collaboration project
  - Completion of geological mapping including geological sections: Geological Institute
  - Information gathering via geophysical surveys such as seismic surveys
  - Information gathering via drilling surveys
  - Preparation of Digital Elevation Model: Military Geography Institute
  - Preparation of mineral resource information: MEP, MEM and Geological Institute
- Framework projects
  - Scanning of existing data (geological maps): Geological Institute, Belgrade University
  - Development of data portals (development of easy access tools for a wide range of 3D



geo-science data databases, and corporate databases such as a vital bridge for modelers to connect the corporate databases and 3D modeling packages): Belgrade University, MEP and the Geological Institute

- Development of 3D archive system: Belgrade University and MEP
- Evaluation of 3D geological modeling software, viewers and so on: Belgrade University, MEP, Bor Copper Institute
- Design and development of 3D modeling datasets (using the results GEOLISS): Belgrade University, Geological Institute, foreign institute
- Development of a retrieval system: Belgrade University
- Population project
  - Case studies in best practice for different geological environments (areas, structures ages, etc.): Belgrade University, Geological Institute, MEP
  - 3D digital enhancement for geographical and geological maps and geological sections using DEM: Geological Institute and Military Geography Institute

Establishing a committee such as a cross-government group is crucial for proceeding with this project. So, it may need institutional change through legal reform. At the same time, it is important to enhance skills and increasing geological engineers especially at the Geological Institute. From a technical point of view, it is also crucial to start this challenging approach as a collaborative project, inviting experts from advanced international institutes or organizations to help maintain international standards for geological information management, and undertake the framework projects effectively. Fortunately, the GEOLISS project, which is designed to standardize geological data, is being conducted in Serbia with an international organization, IUGS, and the key members of the GEOLISS project are making a great contribution toward the development of 3D data structure, designing, and programming. The project should last at least 5 years.

**【End of Draft Final Report】**

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