第４章　JICAにおける今後の協力可能性

４－１　JICA協力の位置づけと方向

ルーマニアの環境の現状は、経済の停滞に伴いその負荷が減少したために全体としては清浄化しつつある現象が生じており、今後の経済が再生と発展すれば、1970～1980年代の環境汚染状態に逆戻りする可能性を残している。再度環境汚染状態に戻らないためには、1999年４月に提示した「国家持続可能開発計画」を実現させることが必要である。

しかし、経済の復興とともに環境への負荷が増大することは明らかであり、旧態の機器を使用できない状況とすれば、更新時に低公害の機器を供給することが必要である。このような状況下での環境への協力は極めて有効であり、日本の得意としている環境への負荷の少ない（低公害型）機器の選定もあり得る。

特に、鉱山公害は大気質、水質、騒音、土壌等多岐にわたっているが、特に鉱廃水が周辺環境ばかりでなく、河川へ流出した場合、下流側へのインパクトも大きく、かつ、地下水及び土壌中に定置された場合、長期にわたっての影響が大きい。さらに、国際河川への移流・拡散した場合には、再度、国際環境問題にも発展する可能性が大きい。

また、多くの鉱山は、休山あるいは閉山が差し迫った問題となっている。鉱害対策の先便は稼働中に実施する必要がある。稼働鉱山であれば予算の配分が図れ、技術者及び機器も確保され、電気、用水等の供給、設備のメンテナンス等も容易である。一方、閉山後の処置として、公害対策のための義務者・存在者は国有鉱山の場合は国となるが、閉山後の場合稼働鉱山の人員、施設等の利用は格段に不利・不便となる。したがって、鉱山閉山後の鉱害対策も含め、稼働中に計画・実施する必要がある。

ルーマニアの鉱山は比較的小規模な鉱山からなり、日本の各鉱山の規模に類似している。また、坑内堀りが主流であり、鉱害対策に多くの経験を有する日本の役割は、ルーマニアでも十分発揮されるものと考えられる。

４－２　日本の協力可能性が高い領域、低い領域

鉱山鉱害対策としては大気質、水質、騒音・振動、地盤沈下、景観、動・植物等と多岐にわたっているが、金属鉱山では特に水質・粉塵（大気質）の負荷が大きいといえる。また、鉱害対策としての工程は調査・計画、施工、モニタリング（事後調査）のプロジェクト・サイクルからなる。

モニタリングはEU等の援助が徐々に成果を出すものと推定されるが、鉱害対策の調査、計画及び施工は日本の技術協力の可能性が高い領域と考えられる。ただし、EU事務所の提言及び鉱物資源庁（NAMR）等の意向も含め、国際援助機関の査定に応じられるために、調査・計画はレベルの高い内容と精度を必要とする。

なお、分析・モニタリング等の基礎技術については、ルーマニアのレベルは相当高いものと判断され、日本の協力は比較的低い領域と推定される。

また、対象が稼働中の鉱山ではあるが、閉山を目前としていることもあり、対策のための資金は鉱山の操業から得られなくなるため、鉱山の技術者の再雇用も含め、他の財源を検討する必要がある。鉱山の跡地利用を検討する必要がある。この点についても、多くの鉱山で跡地利用が試みられている日本の役割は大きいものといえる。

４－３　具体的協力案と対応方法

具体的協力案を資料－１に示す。案件の概要を以下に示す。

（1）案件の概要

具体的協力案件の内容を以下に示す。

援助重点分野	鉱山環境
開発課題	環境問題の低減対策及び鉱山跡地利用
協力プログラム	ルーマニア環境保全支援技術協力プロジェクト
投入形態	開発調査
案件名	（和）ルーマニア鉱山環境汚染防止計画調査 （英）The Study on Master Plan of Mine Pollution Control in Romania
相手国機関名	（和）経済通商省鉱物資源総局及び鉱物資源庁 （英）Ministry of Economy and Trade, Directorate General of Mineral Resources and National Agency of Mineral Resources
背　景	1989年12月の市場経済化以降も鉱山開発における環境対策がないがしろにされてきており、特に鉱廃水対策は不十分であり、2000年１月／３月にバイアマーレ地域で発生したシアン化合物等を含む廃さいの流出事件は国際河川への大規模流出事件となり、欧州全体の問題となった。ルーマニア政府は鉱山環境を重要課題にあげているが、十分な技術的水準に達していない。今後の鉱山開発における環境保全技術協力プロジェクトを強化する一環として、本プロジェクトがある。
我が国援助方針との整合性	ルーマニアの環境保全支援技術協力プロジェクトの強化するために、対策の遅れている鉱廃水処理対策問題について技術協力を行う。また、閉山後の鉱山の土地利用（観光坑道、農業、等）を計画し、地方の再開発、雇用促進を図る。
上位目標	鉱山開発における持続性開発と環境保全対策の支援を目標とし、鉱山閉山後も有効な土地利用を図る必要がある。
案件目標	①　案件に対応した鉱山の選定 ②　環境汚染の現状調査と汚染機構解析 ③　環境負荷低減対策のマスタープラン（M／P）作成 ④　鉱山閉山後の土地利用の計画 ⑤　技術移転
成　果	①　鉱山鉱山経営のなかに環境保護対策を組み込んだ開発 ②　鉱山閉山後の雇用促進及び地域振興策としての鉱山観光の可能性 ③　鉱山開発における環境配慮指針の作成 ④　技術移転
調査対象位置	バイアマーレ及びデバ地区

（2）対応方法

カウンターパートとしての相手国機関は、経済通商省鉱物資源総局（DGMR）及びNAMRである。また、技術的バックアップのために技術委員会を設置し、参加委員として環境行政、研究機関、鉱山会社である農林水環境省、環境保護署（ＥＰＡ）、国立環境調査開発研究所（ICIM）、水資源公社（Apele Romane）、大学（ブカレスト工科大学）、鉱山会社（RMIN、MINVEST）を選任する必要があると考えられる。

また、跡地利用検討会を設け、観光省、地域の行政機関、商工会議所（民間代表）等を参加願い、多角的に検討することが必要と考えられる。

資料－1

APPLICATION FORM FOR JAPAN'S DEVELOPMENT STUDY PROGRAM

Date of entry: month November year 2003

Applicant: the Government of Romania

1. Project digest

(1) Project Title: The Study on Master Plan of Mine Pollution Control in Romania

* Enter the project title in English (Spanish or French).

(2) Location (province/county name): Maramures and Hunedoara counties/Romania
(city/town/village name): Baia Mare and Deva
from the metropolis : about 5 to 11 hours' ride/car

(3) Implementing Agency
Name of the Agency: General Directorate for Mineral Resources (DMR) of Ministry of Economy and Trade (MET) and National Agency for Mineral Resources (NAMR)

* Enter the name of the implementing agency including such details as the name of the bureau or department.

Number of Staff of the Agency: 120 persons (DMR-MET) and 100 persons (NARM)
(on a category basis)

Budget allocated to the Agency : ----- (DMR-MET) and ---- (NARM)

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

(4) Justification of the Project

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

- Present conditions of the sector:
National companies of Remin and Minvest operate the active mines located in the Baia Mare and Deva areas, respectively. These mines, which have still high potential of ore reserves, are obliged to operate mining for a long time without appropriate countermeasures against the mining pollution, which mainly consists of air, water and soil derived from mine facilities, including dressing plants, mine wastes dump areas, tailings dams, etc. Two mines located in the Baia Mare area had occurred serious international incidents, which had been spilled wastewater containing cyanides and heavy metals from tailings dams. Therefore, other mines have high potential to occur more serious mine pollution than present condition.

- Sectoral development policy of the national/local government:
The national and local governments carry out the mine pollution control according to the

mining law, but not enough as technical and finance to direct necessary and appropriate mitigate countermeasures for the mine pollution to each mining company and mining site.

And many active mines will be closed in near future due to lack of ore reserves, metal price, etc. Hence, it is important and necessary to make arrangement for the environmental mitigation before mine closure.

- Problems to be solved in the sector:

Further mineral exploration is necessary for obtaining additional ore reserves, and technical problem for the mine pollution control in the sites for carrying out necessary countermeasures are existed.

- Outline of the Project:

Four mines are selected for the implementation of the project as pilot areas for the mine pollution control before mine closures.

Namely, (1) Herja Mine located in the Baia Mare area is lead and zinc mine. It has mine pollution consisting of acid mine water (pH3 to 3.5), containing much heavy metals, and acid water derived from the tailings dam and unstable slop at the part of the tailings dam.

(2) Deva (Certej) Mine located in the Deva area is copper, lead and zinc, gold, and silver mine. It has mine pollution consisting of water contamination due to the tailings dam, which had occurred overflow of wastewater containing much heavy metals and its spill had flowed to the downstream and contaminated to the surface water and sole sediments of the river.

(3) Teliuc Iron Mine located in the Deva area is iron mine. It has mine pollution consisting of water contamination and scattering tailings (fine sand) by wind erosion, containing iron, manganese, etc.

(4) Coranda Mine located in the Deva area is lead and zinc and gold mine. It has a high risk occurring mine pollution consisting of water contamination due to the unstable tailings dam, which is damping tailings containing much sulfide ore and basic water (pH10 to 11) without water treatment.

These mine pollution and high risk of occurring pollution should be carried out the feasibility study including site investigation of the areas, clarification of the mine pollution, examination of necessary appropriate countermeasures (including alternatives of countermeasure), estimation of the project cost, and comprehensive evaluation.

- Purpose (short-term objective) of the Project:

The objectives of the study are shown in the following.

1) To select of mines for the project
2) To clarify the existing mine pollution in the areas, derived from the mining activities,
3) To examine the appropriate countermeasures to minimize dispersion of the

pollutants to the downstream and surroundings,

4) To examine the land use for the mine sites
5) To carry out the Master plan study, and
6) To realize the technical transfer referring to mine pollution control for the Ministry, Agency, local authorities, and mining companies.

- Goal (long-term objective) of the Project:
  The goal is to establish of the sustainable environmental protection in the areas and to relief inhabitants from risk of further mine pollution by controlling and to provide safe water (surface and underground water). Hence, the project, which is implementation of appropriate mine pollution control in the mine sites, is the first step of the mine pollution control. After closed mine in the future, mine sites will be used such as land for tourism, agricultural, waste dump areas, etc.

- Prospective beneficiaries:
  (Population for which positive change is intended directly and indirectly by implementing the project, and gender disaggregated data, if available)
  More than thousands of people are living at the downstream of each mine site.

- Project's priority in the National Development Plan / Public Investment Program:
  The project is nominated as the high priority project in the National Environment Plan.

(5) Desirable or Scheduled time of the commencement of the Project:
  month June year 2004

(6) Expected funding source and/or assistance (including external origin) for the Project:
  The government of Romania and EU.
  * Describe the concrete policies for the realization of the project, and enter the prospects for realization and funding sources.

(7) Other relevant Projects, if any.
  World Bank: Mine closure programme.

2. Terms of Reference of the proposed Study

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

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

(1) Necessity/Justification of the Study:

Mine pollution control and examination of the land use after mine closure.

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

Mine pollution control and examination of the land use after mine closure.

(3) Objectives of the Study:

* Describe the objectives of the study in detail. Also, indicate who will benefit from the study in as much detail as possible, including gender disaggregated data and describe the beneficial effect in terms of quantity. Enter in a concise manner the goal expected to be achieved in the future by conducting the study.
* When the requested study is the only input scheme there is in the cooperation program, enter the same sentences given in the "Objective of the Cooperation Program" in the summary sheet. When more than one scheme is requested including this one, describe clearly the role of the requested study.

The objectives of the study are shown in the following.

1) To select of mines
2) To clarify the existing mine pollution in the areas, derived from the mining activities,
3) To examine the appropriate countermeasures to minimize dispersion of the pollutants to the downstream and surroundings,
4) To carry out cost estimation and evaluation for environmental mitigation, and
5) To examine other land use such as tourism, agricultural, waste dump areas, etc.
6) To realize the technical transfer referring to mine pollution control for the Ministry, Agency, local authorities, and mining companies.

(4) Area to be covered by the Study:

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

The project area consists of two areas, namely Baia Mare and Deva areas.

(5) Scope of the Study:

* Enter in a concise manner using an itemized statement.

The study consists of two stages, including basic (baseline) investigation and feasibility study. The scope of the study in order to perform the above objectives, are shown as below.

1) Basic investigation
   - Baseline survey
     a. Existing data collection and data analysis
     b. Sampling and analyses of water (60*1*2), groundwater (20*1*2), and soil (10*1*3) in the area for generally understanding the mine pollution

*[1]: Total number of samples for measurement in the field and chemical analysis

*[2]: Parameters for analysis : (1) Half of samples: Fe, Mn, Hg, Cd, Pb, As, Zn, Cu, Cr (9 components), (2) Rest

of samples (mainly downstream): Na, K, Ca, Mg, Fe, Mn, HCO3, CO3, pH, Electric Conductivity, Hg, Cd, Pb, As, Zn, Cu, Cr, SS, BOD, COD-Mn, CN (21 components)

*[3]: Parameters for analysis : Fe, Mn, Hg, Cd, Pb, As, Zn, Cu, Cr (9 components)

- Environmental investigation
  a. Interview to inhabitants and organization in the areas (Sample analysis) concerning pollution due to mining activity
  b. Water well investigation
  c. Hydro-geological investigation (Water balance)
  d. Socio-economic Investigation
- Confirmation of the contaminated points in the areas
- Economic analysis

2) Examination of environmental mitigation of the selected mine sites (2 mine sites)
- Detail survey
  a. Sampling and analyses of water (80*1*4) and soil (40*1*4) in the mine site

  *[1]: Total number of samples for measurement in the field and chemical analysis

  *[4]: Parameters for analysis: Fe, Mn, Hg, Cd, Pb, As, Zn, Cu, pH, Electric Conductivity (10 components)

  b. Drilling survey: 3 drills (upper, middle, and lower) at each tailings dam (Total 12 drill holes) : Diameter approx. 80mm, aver. 30m deep, Strainer, and core sampling, indoor analysis using core samples: leaching test chemical analysis (120*1*4), content analysis (120*1*4)

  *[1]: Total number of samples for measurement in the field and chemical analysis

  *[4]: Parameters for analysis: Fe, Mn, Hg, Cd, Pb, As, Zn, Cu, pH, Electric Conductivity (10 components)
- Analysis
  a. Examination of the hydro-geological features and contamination mechanism
  b. Examination by simulation of the surface and underground water contamination
- Examination of cost estimation and evaluation for environmental mitigation
  a. Design of the countermeasures of mine pollution for each mine
  b. Cost estimation for countermeasures of mine pollution for each mine
  c. Evaluation and exanimation of feasibility of the remedial countermeasures
  d. Examination of basic design for land use of the mine sites
  e. Technical transfer including seminars and training in Romania and Japan

(6) Study Schedule:

* Enter the time/period of the study.

The duration of the project will be carried out from June 2004 to December 2005.

(7) Expected Major Outputs of the Study:

Four Master plan reports (M/R) will be compiled and submitted of which content of each report is shown as below.

- Inventory tables and maps of the mine pollution in the Baia Mare and Deva areas,
- Distribution map of the mine pollution in the Baia Mare and Deva areas,
- Geologic and contamination sections of the tailings dams,
- Figures of air and water pollution mechanism,
- Designs of appropriate countermeasures for each mine,
- Result of cost estimation,
- Basic design for land use, and
- Manual (guideline) for appropriate mine closure in Romania.

(8) Possibility to be implemented / Expected funding resources:
The government of Romania and EU fund

(9) Request of the Study to other donor agencies, if any:

* Please pay particular attention to the following items:

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

(10) Other relevant information

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

3. Facilities and information for the Study

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

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

(3) Information on the security conditions in the Study Area:
Security is good.

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

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

No.

(2) Anticipated environmental impacts (both natural and social) by the Project, if any.
No.

(3) Women as main beneficiaries or not.
No.

(4) Project components which require special considerations for women (such as gender difference, women specific role, women's participation), if any.
No.

(5) Anticipated impacts on women caused by the Project, if any.
No.

(6) Poverty alleviation components of the Project, if any.
Direct impact to the poverty alleviation will consist of the implementation of the construction project, and indirect impact will be contributed to formation of the clean environment in the areas.

(7) Any constraints against the low-income people caused by the Project.
No.

5. Undertakings of the Government of (the recipient country)

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

(1) to secure the safety of the Study Team,
(2) to permit the members of the Study Team to enter, leave and sojourn in (the recipient country) in connection with their assignment therein, and exempt them from foreign registration requirements and consular fees,
(3) to exempt the Study Team from taxes, duties and any other charges on equipment, machinery and other materials brought into and out of (the recipient country) for the conduct of the Study,
(4) to exempt the Study Team from income tax and charges of any kind imposed on or in connection with the implementation of the Study,
(5) to provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced in (the recipient country) from Japan in connection with the implementation of the Study,
(6) to secure permission for entry into private properties or restricted areas for the conduct of the Study,

(7) to secure permission for the Study Team to take all data, documents and necessary materials related to the Study out of (the recipient country) to Japan, and,

(8) to provide medical services as needed. Its expenses will be chargeable to members of the Study Team.

6. The Government of (the recipient country) shall bear claims, if any arise against member (s) of the Japanese Study Team resulting from, occurring in the course of or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the member of the Study Team.

7. (The implementing Agency) shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

8. (The implementing Agency) will, as the executing agency of the project, take responsibilities that may arise from the products of the Study.

* In the case that Detail Design Study is requested.

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

Signed:_____

Title:_____

On behalf of the Government of Romania

Date: November 10, 2003