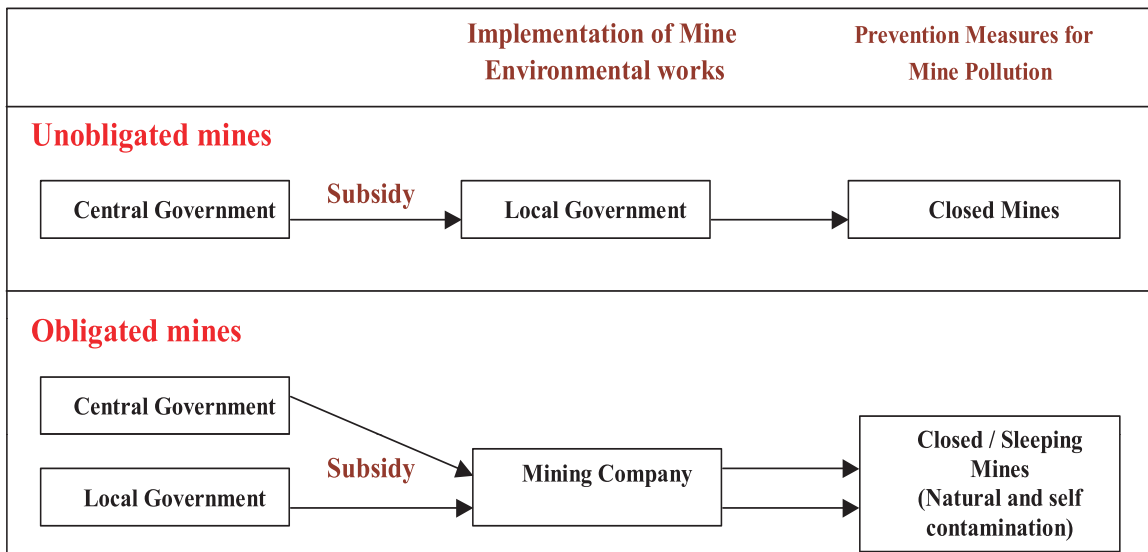
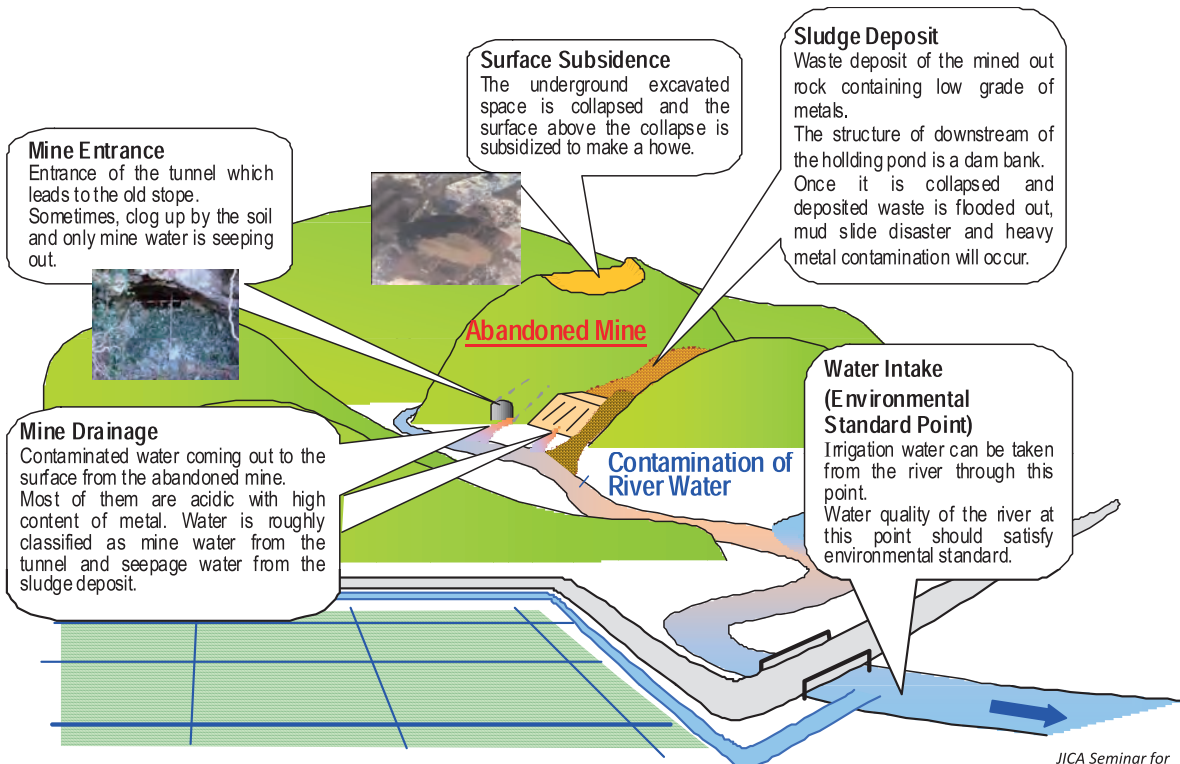


# Management System of Mine Pollution Control for Closed Mines in Japan



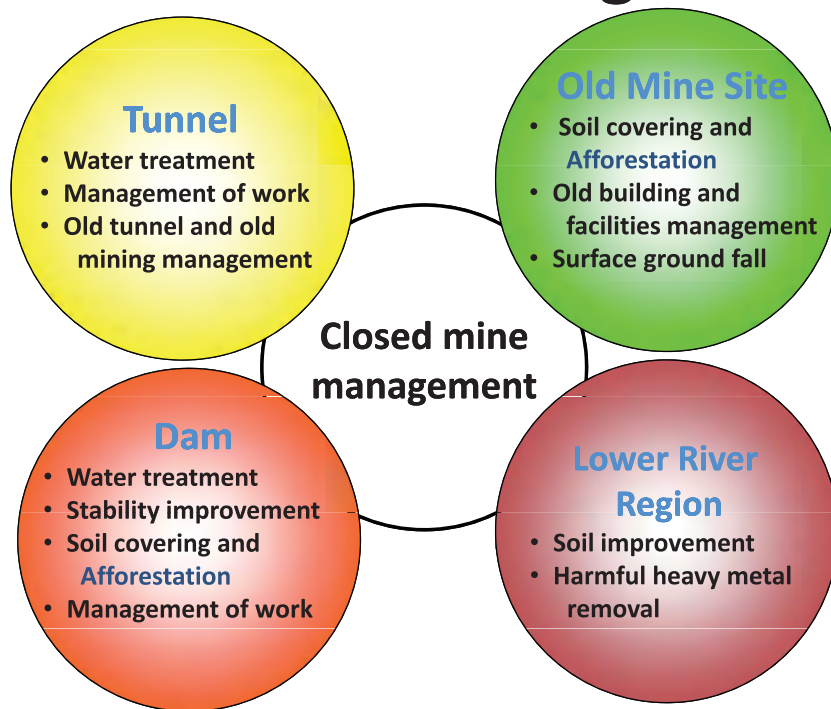
JICA Seminar for Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

## Mine Pollutions beside the Closed Mine



JICA Seminar for Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

# Approach of concerning closed mines management



JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

## An Example of Surface in Closed Mine



Tailings dam (H=85.5m)



Cave and piezometer



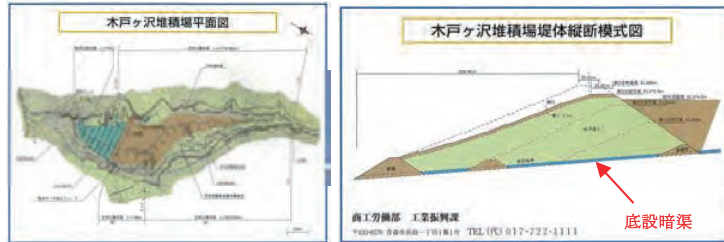
Cave (W=5m, D=4m)

JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

# An Example of Tailings in Closed Mine



Tailings dam and Mine water treatment facility (Aomori Pref.)

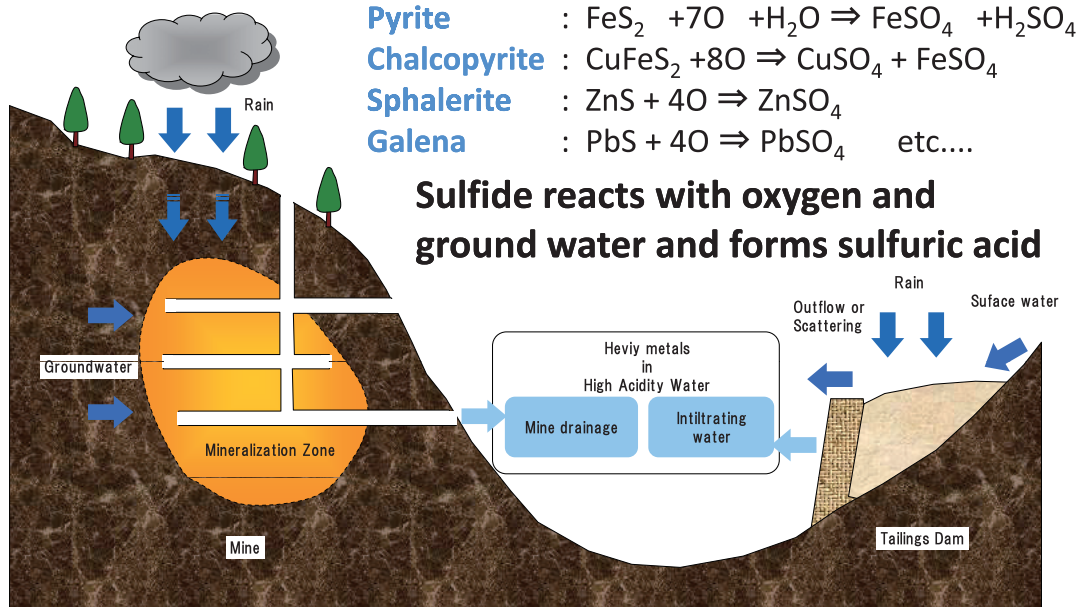


Plan

Section (Aomori Pref.)

JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

## How to generate AMD from the closed and abandoned mine ?



JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

# Standards for discharged water by Japanese regulation

Items	Environmental standard	Industrial effluent discharge limit	Drinking water
Iron(soluble)	-	<10 mg/L	<0.3 mg/L
Copper	-	<3 mg/L	<1mg/L
Cadmium	<0.01 mg/L	< 0.1 mg/L	<0.01 mg/L
Arsenic	<0.01 mg/L	< 0.1 mg/L	<0.01 mg/L
Lead	<0.01 mg/L	< 0.1 mg/L	<0.01 mg/L
Zinc	<0.03 mg/L	<2 mg/L	<1 mg/L
Manganese(soluble)	-	<10 mg/L	<0.05 mg/L
T-Chromium	-	<2 mg/L	-
Chromium(VI)	<0.05 mg/L	< 0.5 mg/L	<0.05 mg/L
Mercury	<0.0005 mg/L	< 0.005 mg/L	<0.0005 mg/L
Selenium	<0.01 mg/L	< 0.1 mg/L	<0.01 mg/L
Fluorine	<0.8 mg/L	< 8 mg/L	<0.8 mg/L
Boron	<1 mg/L	< 10 mg/L	<1 mg/L
Cyanide	N.D.	< 1 mg/L	<0.01 mg/L
Aluminium	-	-	<0.2 mg/L
pH	6.5 - 8.5	5.8 - 8.6	5.8 - 8.6

JICA Seminar for

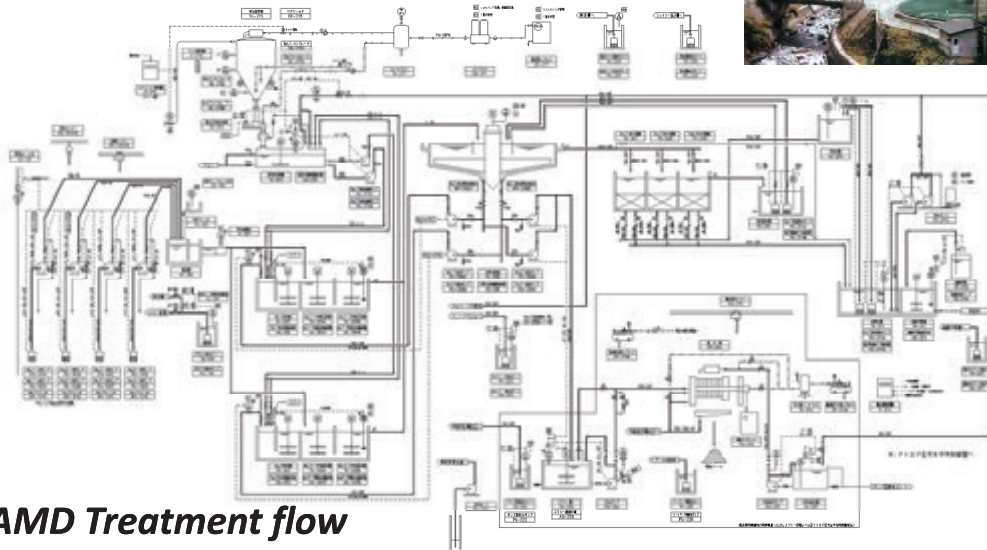
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

## How to control the AMD - choice the treatment type -

Type	Method and input	Remark
<b>Alkaline Chemicals</b>	- Calcium carbonate - Quick Lime - Slaked Lime - Caustic soda etc.	- Powder(Pressure feed truck) - Powder(Bag) (Truck) - Liquid, Suspension(Tank truck)
<b>Neutralization</b>	- General Neutralization - Two-Step Neutralization - NPCS - Reverse-Neutralization etc.	N/R
<b>Flucculant</b>	- Anionic polymer - Cationic polymer - Nonionic polymer etc.	N/R
<b>Sedimentation</b>	- Thickner - Sedimentation Pond	- Dredging of sedimentation sludge of pond
<b>Sludge Disposal</b>	- Dewatering - Cake	- Dam (Truck, Belt conveyer) - Industrial waste disposal(Truck)
	- No-Dewatering - Slurry	- Dam (pump, tank truck) - Industrial waste disposal(tank truck)
<b>Treated Water</b>	- Filtering by Sand Filter	- Tower (by Pressure) - Tank (by gravity)
	- No-Filtering	N/R



# An Example of Flow Sheet for AMD Treatment

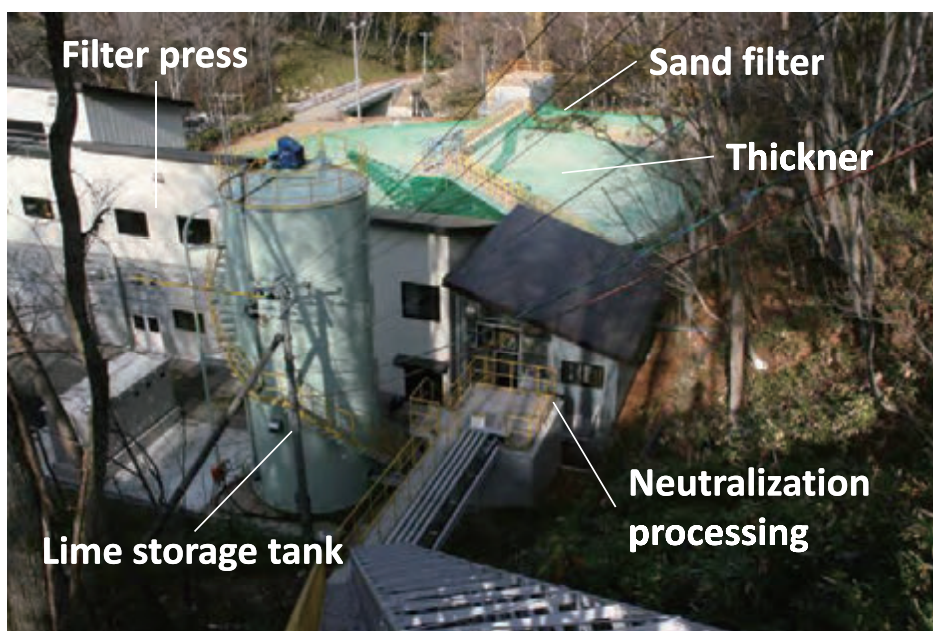


## ***AMD Treatment flow***

***Japanese private companies and consultants in respect to the mining and water treatment area have good experiences for the AMD treatment and the planning***

*JICA Seminar for Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

# An Example of Treatment Facility to improve AMD



*JICA Seminar for Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

# Other Examples of Management for Closed Mines - Reforestation -



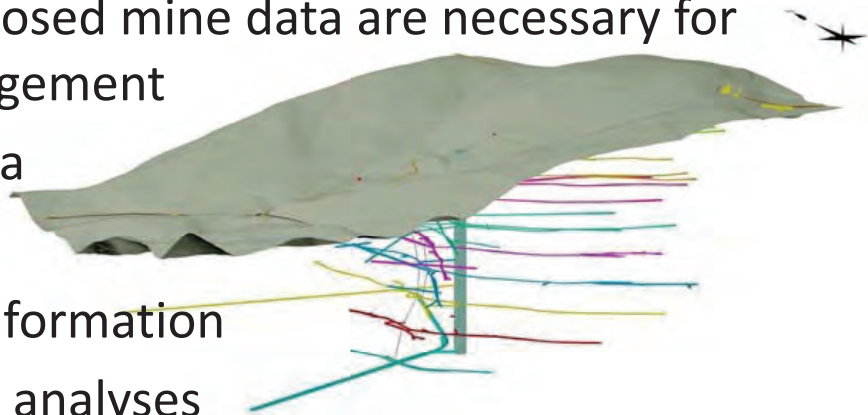
- Soil can be easily eroded by weathering
- Vegetation assists to prevent acid infiltration water
- Landscape would be improved as well



*JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

# Other Examples of Management for Closed Mines - Data configuration -

- Existing closed mine data are necessary for the management
- These data are used for basic information to conduct analyses the prevention of pullutions



*JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

# Overview of Mine Safety

## (1) Safety hazard control to people working

in the mine site.

- \* Roof fall, collapse, flush flood, gas explosion, etc.
- \* Gas and dust, rock waste, tailings, mine water, etc.
- \* Use of machines, etc. and treatment of gunpowder.
- \* Ventilation for health and first aid at disaster.

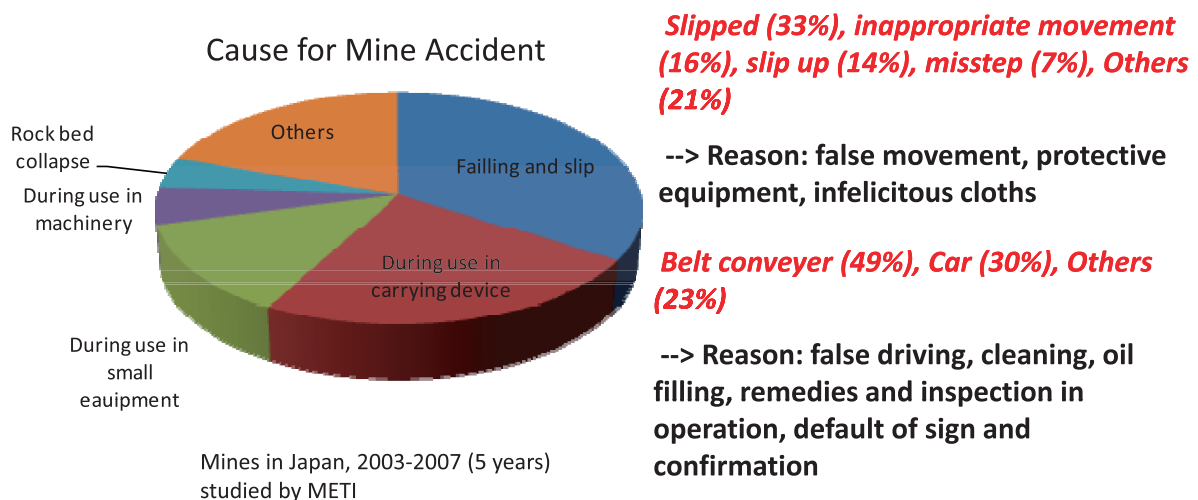
## (2) Protection of mineral resources

## (3) Prevention of mine facilities

JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

# Mine Accidents

## What kind of accident happens in mines?



JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

# Mine Safety: Countermeasures

## Control artificial accident (safety equipment)



Captured from JOGMEC

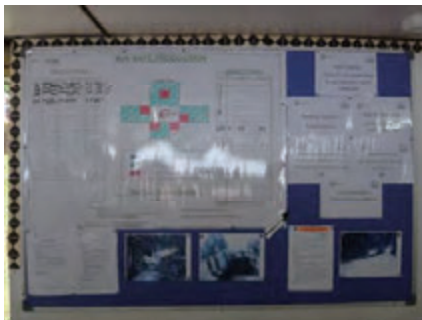


Figures are from JSAA

JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

## Mine Safety Training

**Control  
artificial accident  
(Safety meetings on  
daily and monthly)**



JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013



# Risky Mining and Operation (need improvement for the safety)



*There are no strong pillars, digging only*



*There are no safety fences for facilities*

*Internal references*

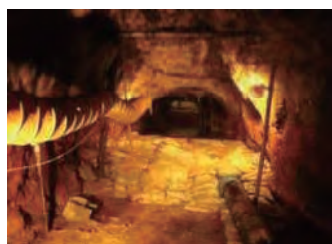
*JICA Seminar for*

*Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

## Mine Safety in Underground Control engineered accidents (for rock falling and inundation in underground)



*After the accident*



*Construction and improvement*



*Internal references*

*JICA Seminar for*

*Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

# Mine Disasters

## Control engineered accidents (for underground and open pit)



*Control ground water and avoid rock falling in the underground by well maintained tunnel systems*

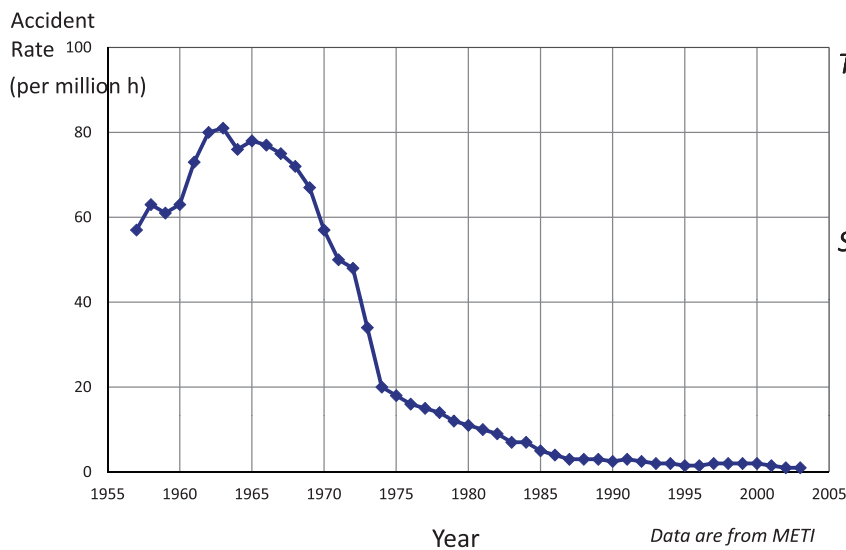


*Control rock falling in the open pit by using monitoring system*

*Internal references*

*JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

## Mine Safety Measures Mining accident rate in Japan (rate per million hour operation)



*The rate of mining accident has been degraded from mid of 70's  
Safety managements are well controlling in the related company and government from the 70's*

*Data are from METI*

*JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013*

# For Conduct of the Sustainable Mining

*Key points of view are summarized as follows;*

- To respect regulations
- To respect social and environmental responsibility
- To establish total management systems in respect to the mining including closure
- To keep profits for the all



## Issues of mine environment in the developing and industrializing Countries

*Following considerations would be needed to be solved for the issues,*

- To adjust regulations for the mining and mine environment
- To learn and develop concerned person's skill for the analysis of mining and the environment
- To gain the opportunities for the upskilling
- To gather experiences for the above
- etc....

# JICA Strategy in Mining Sector

*The strategy is able to assist the improvement in the issues through the schemes*

I

**Infrastructure and  
Regional Development**

II

**Policy Support and  
Legal System  
Development**

III

**Mineral Resource  
Management**

IV

**Mine Safety and  
Environmental  
Measures for Mines**

JICA Seminar for  
Data Collection and Confirmation Study on the Mine Environment and Safety in the African Area, 2013

