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International Professional Development Cooperation Study Tours for Environmental, Social and Sustainable Development for the Indian Mining Sector

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Abstract

The Key Centre for Mines International, University of New South Wales, Sydney Australia undertook professional development mining education and cooperation training study tours for overseas government fellows and groups as well as private mining companies from 1988 – 2010. During the technical environmental development short courses at the university and visits to Australian mines and government offices, the programs also covered important social and sustainable aspects as well as relevant briefings on government mining law and regulations, industry's best practice and community engagement. Details are presented for two major successful international cooperation Indian projects, a World Bank mine environment program in 2004 for state government officials and a TATA Steel Limited coal and iron mine executives and managers training program in 2010.

Keywords: *Professional development, cooperation, mine environment, social responsibility, sustainability, India*

1. Introduction

From 1988 - 2010, the Key Centre for Mines International (KCMI) of the School of Mining Engineering (SOME), University of New South Wales (UNSW), Sydney Australia (Katz, 1996) were involved in mineral resource capacity building and institutional strengthening in Asia and elsewhere. This involved professional development mining

education and cooperation training programs for international senior government officials and industry managers so they would be in a better position to participate in responsible and sustainable mineral development. Most of the projects were procured from international development agencies (UNDP, AUSAID, World Bank and Asian Development Bank) and managed and presented by the KCMI staff and outside experts in the field. Many of these projects were best practice mine management training that included important environmental, social and sustainable development components. This paper will present the details of two major KCMI cooperation study tour projects for the support and the development of the Indian mining sector:

- The 2004 India Ministry of Environment and Forests (MoEF) World Bank mine environment training program for government officials and
- The 2010 Tata Steel project for industry mine managers and executives that were follow ups of previous similar training projects in 2002, 2004 and 2009.

The study tours were a relevant mix of short courses at the UNSW and mine inspections of coal and iron ore mines in NSW and West Australia (WA) and State Government and Industry offices briefings (for example Katz 2008).

2. Methods and Results

2.1 World Bank Indian Mine Environment Training 2004

In March of 2004 the KCMI was contacted by MWH Global, Denver USA to undertake an international cooperation training program to expose key Indian staff members to best practice socially responsible sustainable outcomes. The KCMI training team was led by Professor David Laurence (UNSW, SOME) and was designed to help position each program participant to be more effective regulators and to have the technical resources to ensure environmental protection is being achieved with the utilization of the latest advances in environmental strategies for responsible and sustainable future outcomes (Laurence, 2011).

Forty program participants from regulatory and implementing agencies including MoEF, the Mining Industry, Central and State Pollution Control Boards and Authorities and Resource Institutions that previously participated in-country training at the Centre of Mining Environment (CME), Indian School of Mines were selected and led by Professor Gurdeep Singh of the CME (Singh, 2019). The participants were a very diverse group with different backgrounds and interests. The course was run as generic as possible with the plan that the participants had common interests in most topics and there was excellent active and proactive participation. In the field the mining company people reacted more to the mine site visits and the government people more to the state mining and environmental presentations. Details of the education and training program from June 17th – 25th 2004 follow:

2.1.1 Week 1 - Short courses

Courses covered the effective socially responsible and sustainable development of the environmental act, regulations, controls and mitigation with an overview of the mining industry. Mine permitting policy and environmental laws compliance auditing is described as well as the environmental base case of a mining project – data compilation, analysis, and database management. Environmental management plans (EMPs) policy and monitoring is presented as well as economics, mine planning, best practice and compliance auditing as follows:

1. *Environmental Management and Regulation of the Mining Industry*

- Environmental Policies, Regulations, and Standards
- Characterizing the Environmental Base Case of a Mining Project – Data Compilation, Analysis, and Database Management
- Designing for Closure – Mine Closure Planning
- Decommissioning, Reclamation, and Rehabilitation
- Environmental Problem Analysis and Development of Mitigated Measures
- Sustainable and Responsible Project Development – Environmental Clearances for a new Mining Project
- Development of Environmental Education and Training Programs
- Social and Environmental regulation of the mining industry
- Effective mine permitting policy and regulatory structures
- Regulation of mining in Australia and the USA
- Incorporation of environmental standards into environmental clearances and permits
- Environmental and social impact assessment - Australian Case Studies
- Environmental Management Plan Policy and Overview – EMP Subcomponents: Spills, Storm water, Groundwater, Air, and Wastes
- Mine Project Environmental Monitoring Program Development and Implementation
- Environmental Economics and Mine Planning

2. *Best Management Practices*

- Social Economics and Indigenous Population Impacts
- Ecological Sensitivities and Considerations
- Integration of Best Management Practices (BMPs) into the Mine Plan
- Best Management Practices – Environmental Monitoring to Evaluate BMPs
- Best Management Practices and Environmental Considerations for Small Mining
- Best Management Practices – Dust Suppression, Water Treatment, Erosion Control, Technology Research & Development
- Case Studies: Implementation of BMPs in India
- Practical Exercise - Developing a BMP

- Environmental Controls from Planning to Implementation
- Environmental Problem Analysis and Development of Mitigated Measures
- Indigenous Populations Resettlement
- Best Practice Mine Reclamation Planning, Mine Closure and Site Remediation Practices
- Environmental Monitoring at a Mining Operation (Sampling, Analysis, Data Interpretation, and Determination of Compliance)

3. Environmental Auditing and Compliance

- Environmental Compliance Auditing – Government Versus Self-Auditing
- Cost Effective Environmental Compliance Auditing

2.1.2 Week 2 – Mine site visits and briefings

- *Blue Circle limestone quarry near Marulan NSW*

The participants reviewed state-of-the-art mining methods, dust control programs, environmental monitoring programs and Best Management Practices (BMPs) related to erosion control, re-vegetation of disturbed areas, soil preservation and impact on the surrounding National Parklands. The mine operations were also observed from the nearby Bungonia Gorge Lookout where the negative visual impact on the Gorge Park also includes waste rock dumped from the quarry into the Gorge. In regard to social impact the village of Bungonia has been against the mining from early days of the operation.

- *Woodlawn Mine and Collex Bioreactor, near Goulbourn, NSW*

This facility will receive up to 400,000 tons of residual waste per annum and will produce around 25 megawatts of green electricity. Aside from producing green electricity from waste it is also undertaking mine rehabilitation works and progressing with innovative and sustainable wind farm, aquaculture and horticulture projects at the site. At the lead – zinc mine site, the participants were introduced to state-of-the-art, innovative sustainable development of the mine pit by converting the operation into bioreactor systems. Socially responsible rehabilitation programs of the tailings and evaporation dams utilizing environmental monitoring programs and BMP related to erosion control, re-vegetation of disturbed areas, and soil preservation were also demonstrated.

- *NSW Department of Mineral Resources – Environmental Section, Orange, NSW*

The participants were briefed on the State exploration and mine environment regulations where the State is environmentally and socially responsible for all mineral development policy issues.

- *Cadia Copper Gold Mine near Orange, NSW*

Cadia Hill Gold Mine operates under numerous consents granted by various Government Departments, which include:

- Department of Land & Water Conservation (Water License)
- Department of Mineral Resources (Mining Lease)
- Department of Urban Affairs & Planning (Developmental Consent)
- National Parks & Wildlife Service (Aboriginal & Wildlife)
- Fisheries (Fishing Impact)
- NSW Heritage Council (Heritage issues & Cemetery Relocation)
- Environmental Protection Authority (Pollution Control License and Noise Control License)
- Local Councils (Minor Development Consents)
- NSW Dam Safety Committee (Dam Management)
- Mid Western Health Service (Cemetery Relocation, Sewerage Plant)

This mine operates under approximately 20 different types of permits allowing various activities to be carried out. These consents require over 500 conditions that have to be met. Overseeing environmental matters is the Environmental Department, which has 5 full-time staff. As well as dealing with compliance matters, this Department advises other Sections on environmental management, addresses community liaison and educational issues and is responsible for property management (farms and houses) to maintain the property assets and operate in a respectable way with the community. Two of their core roles are monitoring and re-vegetation. Many aspects of the environment are monitored including:

- Creek, stream flow and ground water quality
- Soil, vegetation and aquatic biology
- Blast vibration and dust

Re-vegetation involves stripping, stockpiling and progressive replacement of topsoil. Each year, between 10,000 and 20,000 trees are planted on the site with survival rates exceeding 90%. Also important in re-vegetation is the control of undesirable pests, both animal and plant to ensure desirable end results for site rehabilitation. Some fencing of retired woodland areas (as opposed to other grazed woodland areas) will also allow regeneration.

Cadia Hill Gold Mine will not be satisfied unless it is an industry leader in social and environmental issues. The participants were fully exposed to this modern, company led - self regulatory and comprehensive model mining and responsible environmental procedures and processes including up to date and developing and evolving sustainable environmental management systems, environmental monitoring programs and Best Management Practices.

- *NSW Environment Protection Authority Department of Environment and Conservation – Bathurst Office*

The participants were briefed on the New South Wales State mine approval and licensing procedures and penalty provisions where the State is responsible for all mineral development issues.

2.2 Tata Steel India Training 2010

In 2001 the KCMI made contact with Tata Steel India, during the India MINVEST conference in Goa, in regard to their education and training needs for their mineral exploration and mining managers and as a result several professional development training programs / study tours were initiated, developed and successfully implemented in 2002, 2004, 2009 and 2010 with short courses at the UNSW School of Mining Engineering and in field visits to selected coal and iron ore mines in NSW and West Australia. A KCMI mission to Tata Steel India headquarters for meetings with senior executives and inspections with mine managers of their coal and iron mines took place in 2005 to promote further programs. After requests for follow up training, in 2011 a special mineral exploration program was arranged by the KCMI with short courses at the James Cook University, Townsville and mine visits to Queensland and West Australia. These training programs may have made an important contribution to the development of a corporate social responsibility culture in Tata's operations (Rahman and Singh, 2019). The details of the programs short courses and mine visits that have important social, environmental and sustainable components for the ten Tata Steel senior exploration and mine managers was undertaken from August 30th to October 18th 2010 follow:

2.2.1 Week 1 / 3 - Short courses

- *Mine Slope Stability – open cut mines*

The course content considers that stable slopes in an open cut mine or quarry is of great concern to the safety of the operations and contributes to a more socially responsible and sustainable environmental development of the management of the work site.

- *Strata Control – underground mines*

Strata control refers to controlling the strata to maintain environmental stability around the mine openings underground where operations are or will be taking place. Strata control is the science of utilizing various sustainable development techniques to prevent or control failure of the strata around mine openings.

2.2.2 Week 4 - Coalmine visits and final day virtual reality safety training

- *Australia Coal Industry Research Lab (ACIRL) Coal Preparation Plant, Maitland, NSW*

A research visit to a coal preparation plant that undertakes the cleaning and processing of the coal for final transport after mining was arranged before visits to the following underground and open pit mines.

- *Ashton Coal Mine, Camberwall, NSW*

An inspection tour of the Ashton coal operations included a long wall extraction underground workings, their open cut mine and coal plant. The community support program invests into socially responsible projects and local initiatives with the potential to make a positive difference and make an important contribution to maintaining and creating strong and sustainable communities.

- *Doncoal Tasman Mine, Maitland, NSW*

Underground board and pillar coal mine inspected with discussion of environmental, health and safety procedures.

- *BHP Billiton Mt. Arthur coal mine near Musselbrook, NSW*

After inspecting the modern technical operations of the Mt Arthur open pit coal mine, one of the largest in NSW, that produces thermal coal used for power generation from the mine lookout, briefings were made on their sustainable communities project that sets out to determine the positive and negative cumulative social and environmental impacts of mining on the local community and opportunities for the mine to address these impacts via community investments and collaboration.

- *Virtual Reality Safety Training, SOME, UNSW*

Virtual reality training demonstrations were made at the advanced visualization laboratory for sustainable mine hazard awareness and safe working practices. One module used to immerse students in site environments is a simulated coal burst that allows the viewer to experience the event and then explore the aftermath.

2.2.3 Week 5 - Huntley bauxite and Rio Tinto Pilbara iron ore mine visits

- *Alcoa Bauxite Mine near Pinjarra, WA*

A short visit was made to the alumina refinery one of the largest in the world. An inspection tour of the Huntley mine and a visit to the local community of Pinjarra demonstrated sustainable environmental problems of surface mining and rehabilitation over a large nature area.

- *Rio Tinto Chanar Mine, Paraburdoo, WA*

After the mine manager's induction a tour of the Chanar iron ore mine which is a conventional open pit operation using truck and shovel mining with drilling and blasting. This was followed by a visit to the processing gravity separation, crush and screen plant and the ore train loading site. Health and safety issues were reviewed in this very hot, dusty and windy environment. Rio Tinto has a sustainability strategy with the goal to achieve consistent, high-quality social and environmental performance and to increase stakeholders' knowledge through meaningful disclosures and transparency. This may involve free, prior and informed consent (FPIC) from the Indigenous People in the area before future development.

- *Rio Tinto Operation Centre, Perth, WA*

Following the Pilbara mine tour a visit was arranged to the Operation Centre at Rio Tinto Head Offices in Perth that demonstrates the importance of incorporating

visualisation and collaboration tools to provide real-time information to optimise the mining, maintenance and logistic social and sustainable activities.

2.2.4 Week 6 – Short Course

- *Mine Technology Management*

The course covers sustainable mining technologies and innovations for responsible resource development and management of innovations, which improve safety, reduce environmental and social impacts and enhance productivity.

2.2.5 Week 7 – Short Course

- *Mine Ventilation*

Underground mines of all sizes require a formal, planned and environmentally and socially responsible sustainable flow of fresh air for the health and safety of the mineworkers.

3. Conclusions

Socially responsible and sustainable concepts are now being introduced in all areas of mineral development and the mining industry, government and the public have identified this as being an important and essential component of mining processes, systems and policies. Professional development education and training programs best outcomes require a combination of relevant technical courses and briefings and practical on – site training as demonstrated in the World Bank and Tata Steel India examples. Components of study in these programs included important sustainable environmental and community socially responsible subjects. There is an important task for the international cooperation mining education and training institutions, especially in developing counties where the impact of mining is an important issue, to provide these necessary subject inputs into their teaching and refresher programs (Katz, 2020), so that future mineral exploration and mining managers will be in a position to take on the socially responsible and sustainable mining development leadership that is most urgently required in countries like India (Bhushan and Banerjee, 2015).

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