

SUSTAINABLE MINING AND GEOINFORMATION

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Week – 09

Lecture 45: Mine Closure Plan-II

Welcome, student, to lecture 45 of the NPTEL online certification course on Sustainable Mining and Geoinformation. Today's lecture, we are continuing our discussion on the mine closure plan. In the previous lecture, we started the topic of mine closure plan, and today we shall continue the same topic. So, in today's class we will continue to discuss the provisions of the mine closure plan. We shall discuss some key issues regarding the policy of mine closure plan in our country, and then, from the mine closure plan, how some new business opportunities can be developed, which we shall also discuss during today's lecture. So, if you remember last class, we were discussing the various provisions or the content of the mine closure plan. It has been mentioned in the circulars that are issued by the Ministry of Coal and also the Ministry of Mines through the office of the Indian Bureau of Mines. So, we will continue with the other sections of the mine closure plan. In our last class, we discussed section 4; today, we will start from section 5, which is about the economic repercussions of the mine closure.

CONCEPTS COVERED

- Provisions of Mine Closure Plan
- Key Issues on Mine Closure Plans
- New Business Models with Mine Closure

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When the mine is closed, what will be the economic implications? In the community, among the people who are associated with the mining industry. So, let us say the main four points about the economic repercussions of the mine closure are that when a mine

closes, how many people will lose their jobs? Because mining is an economic activity, many people are working in technical and non-technical positions in the administration office. Many people are getting direct employment from the mines. So, obviously, when the mines are closed, some people will lose their jobs. So, we have to quantify how many people will be retrenched because of the closure of the mine, and then if some people are losing their job, what are the compensation that may have to be given to those people who will lose their employment or livelihood because of the closure of the mine. Now this is about the direct jobs, those people who are working in the mine. However, apart from that, because the mine sustains a local economy when it is closed, there will be socio-economic repercussions on the nearby community and society. If the mine is closed, the market will be closed. The suppliers who are supplying various provisions to the mines, those businesses will lose their opportunity. So, there will be socio-economic repercussions because of that. We have to quantify the socio-economic repercussions. Then what are the remedial measures consequent to the closure that the mine is proposing to undertake. It is obvious that when the mine is closed, the complete socio-economic repercussions cannot be taken care of.

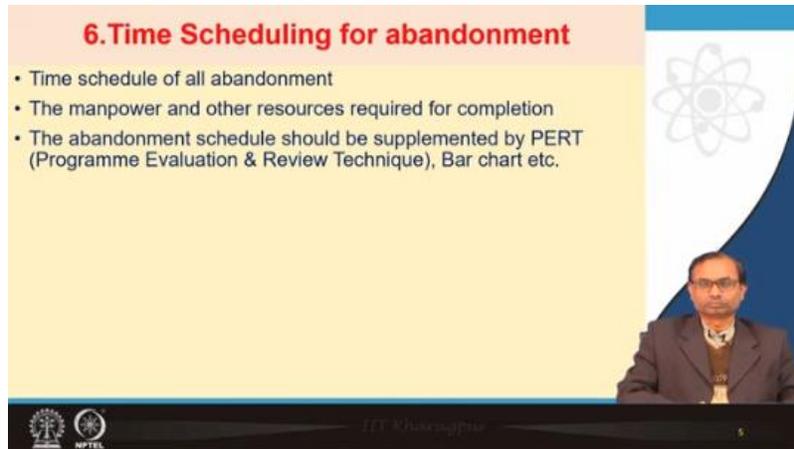
5. Economic Repercussions of Mine Closure

- Manpower retrenchment
- Compensation to be given
- Socio-economic repercussions and
- Remedial measures consequent to the closure of mines

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However, the company, in association with the government, can try to propose certain economic activities so that some sections of society get some benefit even after the closure of the mines. So, those things will be mentioned in the mine closure plan. Section 6 is the time scheduling for abandonment. So, in the closure or abandonment of the mine, we have to suggest a time schedule in terms of how much time duration will be required to close the mine and what manpower and other resources are needed for the completion of the abandonment. The abandonment schedule shall be supplemented by some diagrammatic representations like PERT, bar chart, etc. So, section 7 is the abandonment cost. When a mine is closed or abandoned, what costs will be required for completing the

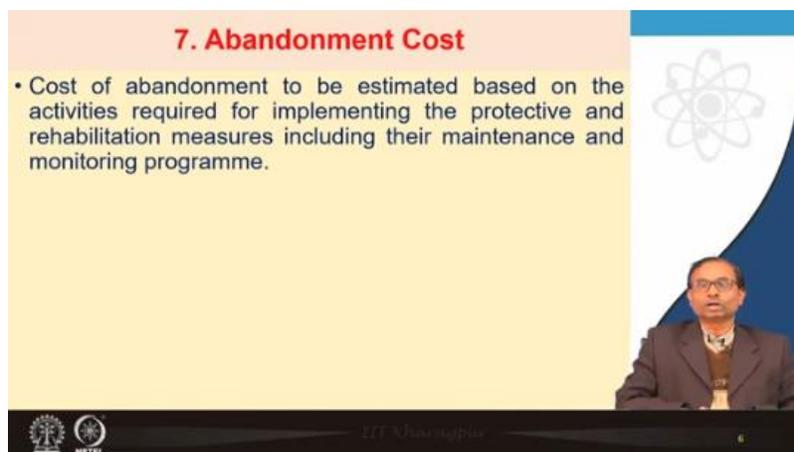
reclamation, the rehabilitation, and the protective measures against hazards? The cost of abandonment is estimated based on the activities that are required to be implemented for the protective and rehabilitative measures, including their maintenance and monitoring program.. So, what are the protective measures? What are the reclamation and rehabilitation measures? Those are already mentioned in the mine closure plan, as well as the cost aspect for implementation of the reclamation, for implementation of the water treatment, soil treatment, land reclamation, for safety, and all these things.



6. Time Scheduling for abandonment

- Time schedule of all abandonment
- The manpower and other resources required for completion
- The abandonment schedule should be supplemented by PERT (Programme Evaluation & Review Technique), Bar chart etc.

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7. Abandonment Cost

- Cost of abandonment to be estimated based on the activities required for implementing the protective and rehabilitation measures including their maintenance and monitoring programme.

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So, cost is required. We have to prepare the abandonment cost, including all these costs. In addition, maintenance and monitoring are also part of the abandonment cost. Section 8, which is very important, covers financial assurance, mine closure, safety measures, environmental protection measures, reclamation treatment—all these are required for mine closure. However, all these measures require certain expenditures, so who will bear those costs? Definitely, as we know, the principle of polluter pays applies. So, all these safety, environmental, and treatment expenditures must be borne by the mining company. As we have already discussed, mines must provide financial assurance or deposit some

calculated, ascertained money. How much money would be required for the abandonment cost, as we have discussed? So, those costs, including abandonment, safety, and environmental protection measures, must be quantified, and that cost must be borne by the company within the active phase of the mine's life. That means if the mine's life is, say, 30 years, the closure cost must be divided for each year during those 30 years.



8. Financial Assurance

Financial assurance shall be submitted in different forms as per Rule 27 of MCDR Rules, 2017.

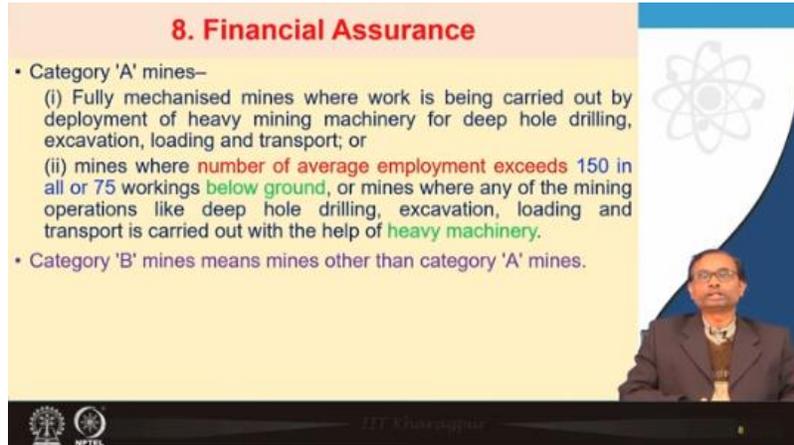
- **Financial Assurance:** Mining lease holder to furnish financial assurance for implementing the progressive and final mine closure plan.
- **Financial Assurance Amount Per Hectare:**
 - For Category 'A' mines: ₹3,00,000 per hectare of the mining lease area used for mining/ allied activities.
 - For Category 'B' mines: ₹2,00,000 per hectare of the mining lease area used for mining and allied activities.
- **Minimum Assurance Amount:**
 - Category 'A' mines: Minimum ₹10,00,000.
 - Category 'B' mines: Minimum ₹5,00,000.

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Actually, every year, the mining company must deposit that money to the designated authority—the Coal Controller Organization (CCO) for coal mines and the Indian Bureau of Mines for metalliferous mines. The annual deposit to the Government of India for mine closure costs is known as financial assurance. It is expected that when the mine nears closure, the mining company will take care of all closure and abandonment costs. But if, for any reason, the company cannot carry out all mine closure measures, who will bear the expenditure, who will execute the closure, and where will the money come from? The money will come from the financial assurance that the company has provided to the Government of India—to the CCO (Coal Controller Organization) and the Indian Bureau of Mines—through annual payments of financial assurance. This financial assurance must be submitted in different forms as per Rule 27 of the Mineral Conservation and Development Rules, 2017. The mining leaseholder must furnish financial assurance to implement the progressive and final mine closure plan. Financial assurance is determined based on the leasehold area in hectares—so it is an amount per hectare. All mines are classified into two categories: Category A and Category B mines.

Category A mines must pay ₹3 lakhs per hectare of the mining lease area used for mining and allied activities, while Category B mines must deposit ₹2 lakhs per hectare for the same. The minimum assurance to be deposited with the Government of India is ₹10 lakhs for Category A mines and ₹5 lakhs for Category B mines. Now, the question is: What

defines a Category A mine and a Category B mine? As per the MCDR, Category A mines are fully mechanized, where work is carried out using heavy mining machinery. This includes deep-hole drilling, excavation, loading, and transport, or mines where the average number of employees exceeds 150 in total (or 75 below ground), or mines where any mining operations—like deep-hole drilling, excavation, loading, and transport—are conducted using heavy machinery. This is the definition of Category A mines. Any mine not meeting these criteria will be classified as a Category B mine. So, we have two categories: Category A and Category B. We have defined Category A mines, and all others fall under Category B. Category A mines must deposit ₹3 lakhs per hectare, and Category B mines must deposit ₹2 lakhs per hectare. The minimum deposit for Category A mines is ₹10 lakhs, and for Category B, it is ₹5 lakhs. The mine leaseholder must open an escrow account in favor of the designated authority.



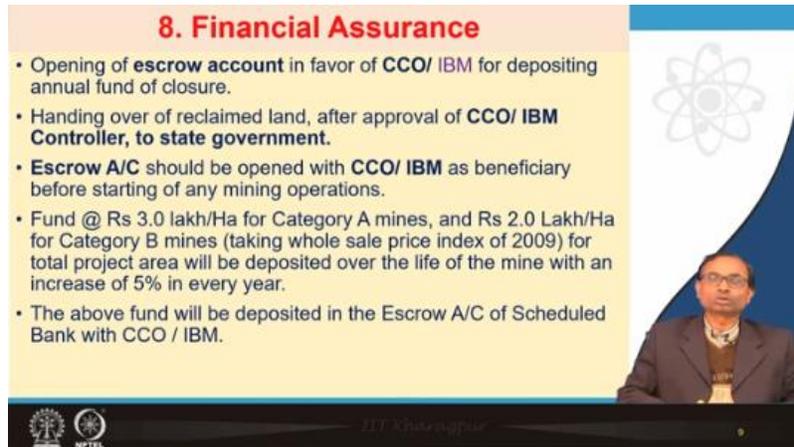
8. Financial Assurance

- Category 'A' mines—
 - (i) Fully mechanised mines where work is being carried out by deployment of heavy mining machinery for deep hole drilling, excavation, loading and transport; or
 - (ii) mines where **number of average employment exceeds 150** in all or 75 workings **below ground**, or mines where any of the mining operations like deep hole drilling, excavation, loading and transport is carried out with the help of **heavy machinery**.
- Category 'B' mines means mines other than category 'A' mines.

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For coal mines, it is the Coal Controller's Organization with its headquarters in Kolkata. For metalliferous mines, the Indian Bureau of Mines has its headquarters in Nagpur. The coal mines have to open an escrow account in favor of CCO in Kolkata, and the metalliferous mines have to open an escrow account in favor of the Indian Bureau of Mines in Nagpur. So, the reclaimed land is handed over to the state government after approval from CCO or IBM. Now, after the mine is closed, after the land is reclaimed, and CCO or IBM accepts that the land has been reclaimed by the mines, the reclaimed land can be handed over to the state government. Now, the escrow account should be opened with CCO or with the Indian Bureau of Mines as the beneficiary before starting the mining operation. So, when we submit the mine plan, the mine closure plan will be a part of it. From the beginning, we have to open the escrow account because, from the very first year when the mine starts, the financial assurance deposit has to be made every year. So, funds at the rate of Rs. 3 lakh per hectare for category A mines and Rs. 2 lakh

per hectare for category B mines shall be deposited. Considering how much the total project area is, money will be deposited in the escrow account. The rate, that is, Rs. 3 lakh or Rs. 2 lakh per hectare, is based on the wholesale price index of 2009. So, that is the base year.



8. Financial Assurance

- Opening of **escrow account** in favor of **CCO/ IBM** for depositing annual fund of closure.
- Handing over of reclaimed land, after approval of **CCO/ IBM Controller, to state government.**
- **Escrow A/C** should be opened with **CCO/ IBM** as beneficiary before starting of any mining operations.
- Fund @ Rs 3.0 lakh/Ha for Category A mines, and Rs 2.0 Lakh/Ha for Category B mines (taking whole sale price index of 2009) for total project area will be deposited over the life of the mine with an increase of 5% in every year.
- The above fund will be deposited in the Escrow A/C of Scheduled Bank with CCO / IBM.

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So, in the first year, we deposit Rs. 3 lakh, considering the 2009 base year, but then if your mines start in some other year, let us say 2015 or something, then we have to add an interest of 5 percent to compensate for the base price of 2009. For 2010, it will be Rs. 3 lakh plus 5% of Rs. 3 lakh, like that. So, the above fund will be deposited in the escrow account of the scheduled bank with CCO or IBM. Money in the escrow account is to be deposited every year after the commencement of the mining activity in the land allocated for the mine. In case of failure to deposit the annual assurance amount in the escrow account, the mining permission can be withdrawn by the CCO or IBM. As far as progressive mine closure is concerned, it is carried out every year. Now, as per the provision, reimbursement of 50% is allowed after every five years, subject to all the provisions of the progressive mine closure plan being fulfilled, and which needs to be certified by the approved institute. A third-party institute will provide a certificate after verification that the mine has carried out all the measures as per the progressive mine closure plan. Some of the approved institutions like CMPDI, ISM Dhanbad, IIT Kharagpur, NIRI, Central Institute of Mining and Fuel Resources, etc., have to provide the certificate. The certificates have to be accepted to the satisfaction of the Indian Bureau of Mines or CCO.

8. Financial Assurance

- Money in the Escrow Account is to be deposited every year after commencement of any activity in the land for the mine.
- In case of failure to deposit the annual amount in the Escrow Account, the mining permission can be withdrawn by IBM/CCO.
- Reimbursement of 50% is allowed after every 5 years subject to the actual mine closure plan claims certified by approved institutes and to satisfaction of IBM/CCO.
- The Final reimbursements will be made after fulfilling of all activities as per Final Mine Closure Plan and certified by CMPDI/ IBM and accepted by CCO/ IBM.



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However, for the final mine closure plan, the final reimbursement will be made after fulfilling all activities as per the final mine closure plan, which will be certified by CMPDI for coal mines and the Indian Bureau of Mines for metalliferous mines and accepted by CCO or IBM. Only then will reimbursement for the final mine closure plan be made possible. 9: The certificate signed by the lessee to the effect that the closure plan complies with all statutory rules, regulations, orders made by the central or state government, statutory organizations like DGMS, CPCB, IBM, or any court that have been taken into consideration and where any specific permission is required, the lessee will approach the concerned authority to get the permission. The lessee should give an undertaking to the effect that all the measures proposed in the mine closure plan will be implemented in a time-bound manner as proposed in the mine closure plan. Lastly, the mine leaseholder has to submit all the plans, including photographs, satellite images, any report on a compact disc, any study report, and everything else they have to submit along with the plan. All the necessary documents, plans, and reports have to be submitted to the authority. Authority means, for metalliferous mines, it is the Indian Bureau of Mines, and for coal mines, it is the CCO office. So, these are the main provisions of the mine closure plan. Now, a little bit about the abandonment of mines. When you close or abandon mines, what are the key provisions mentioned for abandonment?

9. Certificate

- A certificate signed by lessee to the effect that the closure plan complies all statutory rules, regulations, orders made by the Central / State Government, statutory organizations, court etc. have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities.
- Lessee should also give an undertaking to the effect that all the measures proposed in this closure plan will be implemented in a time bound manner as proposed.



10. Plans, Sections etc.

- The Mine Closure Plan should be submitted depicting photographs, satellite images on compact disc etc.



Abandonment of Mines

Key Provisions under Mining Regulations:

- **Prohibition on Abandonment**
 - Abandonment of a mine is **prohibited** during the lease period without prior written permission from the authorized officer
- **Notice of Intention**
 - Mining lease holder must submit notice in **Form D 90 days** before the intended abandonment.
 - Notice must include plans and sections showing:
 - Work completed in the mine.
 - Measures for protecting the abandoned site, environment, and access.



Abandonment of a mine is prohibited during the lease period without prior permission from the authorized officer. A mining lease holder who wishes to abandon the mine must submit a notice in Form D at least 90 days before the intended date of abandonment. The notice must include plans and sections showing completed work in the mine, measures required for protecting the abandoned site, and environmental protection measures to

restrict public and animal access to the mine site. The authorized officer can prohibit abandonment or grant approval with specific conditions. Even for mine abandonment, a final mine closure plan must be submitted and approved by the competent authority. A certificate from the authorized officer is required, confirming compliance with protective, reclamation, and rehabilitation measures. Work must align with the approved closure plan or its modifications. When calculating abandonment costs, what are the cost components? Activities such as barbed wire fencing, dismantling or demolition of structures, site cleaning, rehabilitation of mining machinery, physical and biological reclamation, landscaping, biological reclamation of overburden dumps, post-closure environmental monitoring for three years, supervision charges for three years, power costs, and water costs. All these will be part of the abandonment cost. Calculate the costs at this stage by assessing each activity. Using this, you determine the abandonment cost, though these aspects have been generalized.

Abandonment cost

- **Cost to be estimated based on:**
 - Activity such as barbed wire fencing
 - Dismantling of structures/ demolition and cleaning of sites
 - Rehabilitation of mining machinery, physical/ biological reclamation
 - Landscaping
 - Biological reclamation of OB dump
 - Post-environmental monitoring for 3 yrs
 - Supervision charges for 3 years
 - Power cost

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Abandonment of Mines

- **Authority's Decision:**
 - Authorized officer can Prohibit abandonment.
 - Allow abandonment with specified condition.
- **Final Mine Closure Plan**
 - Abandonment requires a **final mine closure plan** approved by the competent authority.
 - Certificate from the authorized officer needed:
 - Certifies compliance with protective, reclamation, and rehabilitation measures.
 - Work must align with the approved closure plan or its modifications.

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When discussing financial assurance for Category A and Category B mines, the rates are ₹3 lakh per hectare for Category A and ₹2 lakh per hectare for Category B. This is how

abandonment costs are calculated. Now, key issues regarding mine closure in India. Technical aspects include dismantling structures, removing tailing material, implementing environmental protection measures, decommissioning mining machinery, and installing safety measures. These are the technical aspects of mine closure. However, mine closure also impacts society, communities, socio-economics, and cultural aspects. Existing mine closure legislation lacks provisions to adequately address socio-economic and cultural concerns. Insufficient attention is paid to transitioning communities from mining-dependent livelihoods to a post-mining economy. When mining ceases, how will these communities adapt? They were dependent on the mining ecosystem and economic system. Post-closure, what will their economic status be? Where will they access economic services? This challenge is not adequately reflected in current mine closure policies. Diversifying the post-closure economy by promoting sustainable livelihood opportunities tailored to the local environment should be encouraged. This is a weak link in current mining regulations.

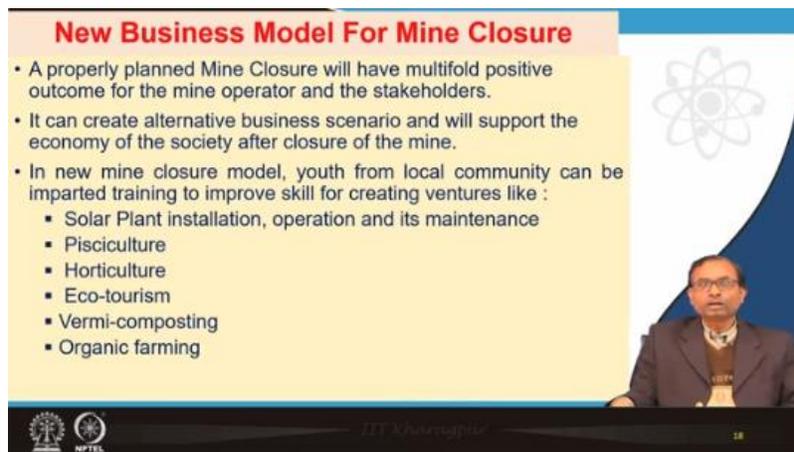
Key issues in Mine Closure in India

- The current policy on Mine Closure focuses on **technical aspects** like dismantling building structures, removing tailing materials, and decommissioning mining machinery.
- Existing mine closure legislation lacks provisions to adequately address the **socio-economic and cultural aspects**.
- Insufficient attention to transitioning the community from mining-dependent livelihoods to a post-mining economy.
- Diversifying the post-closure economy by promoting sustainable livelihood opportunities tailored to local should be encouraged.
- Land restoration should aim to resume agriculture, horticulture, pisciculture etc. and to revive the region's biodiversity with minimal landscape alteration.

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How can this be incorporated into future policy? Land restoration or reclamation should aim to resume agriculture, horticulture, pisciculture, etc., and revive regional biodiversity with minimal landscape alteration. Mine closure entails significant expenditures, but companies should view it as an opportunity. Properly planned closure can yield multiple positive outcomes for operators and communities, creating alternative business models and supporting post-closure economies. In a new mine closure model, local youth can be trained to enhance their skills. With company or government incentives, they can establish ventures, such as installing solar plants on post-mining land. Solar plant installation and maintenance can generate energy for sale to the grid, creating revenue. Pisciculture or horticulture can utilize water-filled pits for fish farming or fruit-bearing plants, providing income sources. Ecotourism in reclaimed open-cast mines with

vegetation and water bodies is an option. Other opportunities include vermicomposting, organic farming, and installing water treatment plants.



New Business Model For Mine Closure

- A properly planned Mine Closure will have multifold positive outcome for the mine operator and the stakeholders.
- It can create alternative business scenario and will support the economy of the society after closure of the mine.
- In new mine closure model, youth from local community can be imparted training to improve skill for creating ventures like :
 - Solar Plant installation, operation and its maintenance
 - Pisciculture
 - Horticulture
 - Eco-tourism
 - Vermi-composting
 - Organic farming

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Installation of water treatment plant, which will supply clean water to the community, to the municipality, to anyone, because you have a storage space where water will be storing. If you treat, if you install a treatment plant, that water can be used for drinking or it can be used for some other industrial uses also. Because in Indian condition, in arid and semi arid regions we have water scarcity, water availability is a big problem. So, if you have a pit, where water is stored, then that stored water can be used as a commodity for revenue generation, or it will also help recharge the groundwater. Plantation over the backfield area can fulfill the most desired objective of the forest cover and not only forest cover, it will also help in the carbon dioxide sequestration and mitigation of climate change. This carbon dioxide sequestration if you can demonstrate, and register under the required climate legislation they can be also source of revenue in terms of carbon credit also. New business model for mine closure: Mine that is not properly closed can be a source of various liabilities, such as the potential risk to human life, animal life, and a potential hazard. Mine closure should be treated as an opportunity for the mine operator to properly close the mine and leave no room for any accident. Land is a scarce resource, so proper mine closure will provide an opportunity to reclaim the land up to the desired land use so that it can be used optimally. It will be beneficial to society, the reclaimed land can be returned to the owners of the land, or it can be returned to society for beneficial use.

New Business Model for Mine Closure

- Installation of small-scale water treatment plants to supply clean water.
- In arid and semi-arid regions of India, quality water availability is a major issue. The constant growth of population along with mining activities has put pressure on the availability of surface water and ground water for the nearby communities.
- The use of open-pits and quarries, which remains after backfilling, may be used for storage of water and will help the nearby society to fulfill its water demand along with recharging of the ground water strata.
- Plantation over backfilled area can fulfill the much-desired objective of Carbon Sequestration and mitigating climate change.



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New Business Model For Mine Closure

- Mine that is not properly closed can be a source of various liabilities such as potential **risk of human life, animal life and a potential hazard**.
- Mine closure should be treated as an opportunity for mine operator to **properly close the mine and leave no room for any accident**.
- Land is a scarce resource. Proper mine closure provides opportunity of reclaiming degraded land and utilizing to its optimum use.
- **Reclaimed lands can be returned to rightful owner** or society for beneficial use.
- Proper closure improves **aesthetic value** of mining area and creates good public perception about mining. To help company in obtaining Social License to Operate.
- Mine closure plan can ensure that ecosystem in the area can reach its premining level and may even exceed it because of the careful planning and proper execution.



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Proper closure also improves the aesthetic value of the mining area, and it creates a good public perception of the mining. Good aesthetic, after the reclamation and the good public perception, will help the company to obtain a social license to operate as a mining company. So, mine closure plan that can ensure that the ecosystem in the area reaches the pre-mining level or it can be even better than the pre-mining level. With careful and effective mine closure planning and execution, we can achieve better ecosystem quality after post-mining. So, this will help in the public perception, this will help in creating a good image for the mining industry. So, this is the end of the class. In today's lecture, we have discussed the economic repercussions of the closure of the mine, we talked about the financial assurance, the abandonment cost, key issues in the mine closure, and new business models with the mine closure. These are the references from which this lecture have been created. With this, our mine closure topic is complete. So, last class and today's class lecture 44 and lecture 45, we completed the topic of mine closure. So, next class we will discuss some other topics related to sustainable development. So, I thank you for being very patient in this class. Thank you very much.

REFERENCES

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SUMMARY

This lecture session has covered the following:

- Economic Repercussions of closure of mine
- Financial Assurance
- Abandonment Cost
- Key issues of Mine closure in India
- New Business Models with Mine Closure

