

SUSTAINABLE MINING AND GEOINFORMATION

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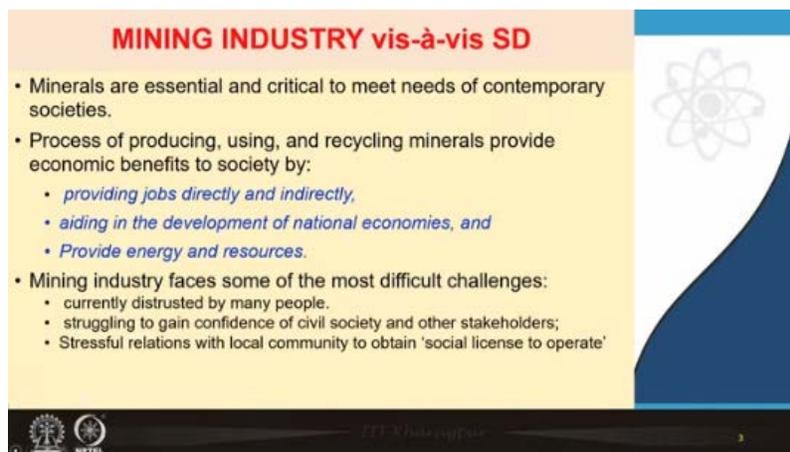
Department of Mining Engineering

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Week – 10

Lecture 46: Challenges Towards SD In Mining Industry

Welcome, students, to today's lecture on the NPTEL online certification course on Sustainable Mining and Geoinformation. Today is lecture number 46, and we are going to discuss the different challenges in implementing and achieving sustainable development in the mining industry. We will be covering the key challenges for implementing the concept of sustainable development in the mining industry. As we have discussed earlier, the mining industry or mineral industry, particularly minerals, is essential and critical to meet the needs of contemporary society. So, the process of production of minerals, use of minerals, and recycling of minerals provides economic benefits and services to society, and these processes, which are the mining industry, provide jobs directly and indirectly. They help develop the national economy. They provide energy and resources to society. So, these are the beneficial aspects of the mining industry. But the mining industry also faces some of the most difficult challenges from society.



MINING INDUSTRY vis-à-vis SD

- Minerals are essential and critical to meet needs of contemporary societies.
- Process of producing, using, and recycling minerals provide economic benefits to society by:
 - *providing jobs directly and indirectly,*
 - *aiding in the development of national economies, and*
 - *Provide energy and resources.*
- Mining industry faces some of the most difficult challenges:
 - currently distrusted by many people.
 - struggling to gain confidence of civil society and other stakeholders;
 - Stressful relations with local community to obtain 'social license to operate'

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In today's environment, many people do not trust the mining industry. They think that the mining industry is detrimental to society's interests. The mining industry has caused a lot

of environmental degradation to the natural environment, to the physical environment, to the biological environment, and the ecosystem. So, the mining industry in general is facing a lack of trust. It does not enjoy the confidence of civil society or other stakeholders, such as the community, environmental activists, etc. So there is an uneasy and stressful relationship between the mining industry and the local community. For these reasons, the mining industry, when it wishes to open a new mine, normally finds it very difficult to obtain the social license to operate. And we have discussed previously that with sustainable development, if the mining industry tries to implement the sustainable development or the concept of sustainable development in its planning, execution, and operation, then it will be beneficial for the industry, and it will be beneficial for the community.



MINING INDUSTRY vis-à-vis SD

- Nine world's large mining companies initiated project **Mining, Minerals and Sustainable Development Project (MMSD)** to establish pathway to implement sustainable development in mining industry.
- International Institute for Environment and Development undertook MMSD project on behalf of the mining companies.
- **Four broad objectives** of MMSD project to:
 - Assess global mining industry readiness to transition to SD.
 - Deliver mineral supply in ways compatible to sustainable development,
 - Propose key elements for improving the sustainable framework parameters for mining industry.
 - Build platforms for engagement, communication, networking among all stakeholders in the mining sector.

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It will also help the mining industry obtain the social license to operate and continue to have the confidence of society. So, if the mining industry tries to implement the sustainable development concept, it will be beneficial to the industry and society as well. So, we have discussed the historical development of the concept of sustainable development. So, when the concept of sustainable development came about, it became very important that the mining industry adapt itself to sustainable development, which is now the common goal of the country and society across different sectors. Now, the mining industry also has to implement and adopt it so that it can achieve sustainable development. With this background, nine of the world's largest mining companies initiated a project called the Mining Minerals and Sustainable Development Project, MMSD. It was a study report. So, this study report tried to establish a pathway to implement sustainable development principles in mining industries across the world. This was the first attempt that was made. This study was executed by the International Institute of Environment and Development. This institute undertook the MMSD project

on behalf of these large mining companies. There were four broad objectives of the MMSD project. The objectives were to assess the readiness of the global mining industry to transition to sustainable development in the mining sector.

Then, the mineral supplies will be delivered across the mineral supply chain in ways that are compatible with the principle of sustainable development. The third objective was to propose key elements for improving the sustainable framework parameters for the mining companies. And lastly, the fourth objective was to build platforms for engagement, communication, and networking among all stakeholders in the mining sector. Remember that these were the objectives of the MMST project, which was being undertaken on behalf of the large mining companies. And remember that these large mining companies are operating not in one country. They are operating in several countries. They are operating on different continents. So, they are dealing with the socio-economic environment, legal environment, cultural environment, and different setups across different countries. So now, when the mining industry tries to implement and adopt the sustainable development concept, what are the imperatives? What is needed? Without some conceptual background and framework, how can you implement something? So that understanding is very essential, the understanding of the concept, Then you have to develop some framework parameters, you have to develop some policy guidelines, and you have to develop some operating procedures. So, all these things are required if you want to implement any new concept in a mining company. So, what are the imperatives or the necessities? First, it is a robust framework for sustainable development based on an agreed set of broad principles.

SD of MINING INDUSTRY- IMPERATIVES

- A robust framework for sustainable development based on an agreed set of broad principles;
- Understanding of the key challenges and constraints facing the industry in different regions;
- Understanding of the actions needed to overcome the challenges;
- Process for responding to challenges that respects the rights and interests of all involved, set priorities.
- Propose institutions and policy instruments to ensure minimum standards of compliance, and responsible voluntary actions; and
- Verifiable measures to evaluate progress and foster consistent improvement.

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Remember, several companies have mines in several countries across several continents. So, there are some common principles everyone has to agree on, and only then can it be

implemented. Then understanding of the key challenge and the constraints faced by the mining industry in different regions of the world so the constraint and difficulties and problems of the mining sector, it is not same across countries. In one country you have some problems, in other country, other continent, you have different type of problems. So, you have to understand, what are the difficulties the mining industry are facing through different regions. Then once you identify the problems, what are the remedial actions that needs to be taken to overcome these challenges that is being faced by the mining industry. Now, when you suggest remedial action or when you implement remedial action, the process of responding to these challenges by this remedial action should respect the rights of the people, to respect the rights of the society, or all stakeholder rights. So, you have to prioritize what should be met first. You have to propose institutions and policy instruments so as to ensure standards compliance. There may be some regulatory compliance which is mandatory in nature, and then the company may go beyond the regulatory compliance through voluntary actions. So, we have discussed in the previous classes that there may be two mechanisms. One is the regulatory mandatory requirement that has to be complied with. And then the company can go in a voluntary way, much more than the regulatory mandate. That will give them benefit acceptance. So, what are those policy instruments?

Who will be implementing and monitoring? So, the institutions also have governance structures. Then, verifiable measures to evaluate progress and foster consistent improvement once you develop the policy instrument. You have the governance structure ready, institutional mechanism is ready. Now, it is implemented, and then you can evaluate. What is the procedure for the evaluation of sustainable development implementation ? Those should be verifiable, and you can compare the sustainable development implementation in one mine with that of another mine, in one company with that of another company. So these are the necessities or imperatives before the sustainable development principle can be implemented by the mining company. Now, when they were developing these principles, they considered four areas broadly. We all know that one is the economic sphere, another is the social sphere, then the environmental sphere, and then the governmental sphere. So, these are the four pillars, as I have discussed. So these are the four pillars they have considered. So, an economic sphere that maximizes human well-being. That is the objective of any developmental project. Then, ensure efficient use of natural resources. The mineral resources, as well as our physical resources and environmental resources like air, water, soil, groundwater, and everything else. Identify and internalize environmental and social costs. If the mining

industry is degrading the environment and has an adverse impact on society, then these things should be quantified and internalized so that when we calculate the cost of mineral production, these costs should be added. Then maintain and enhance financial health of the enterprise.

SD OF MINING INDUSTRY- CONSIDERATIONS

Economic Sphere

- Maximize human well-being.
- Ensure efficient use of all natural resources.
- Identify and internalize environmental and social costs.
- Maintain and enhance the financial health for viable enterprise.

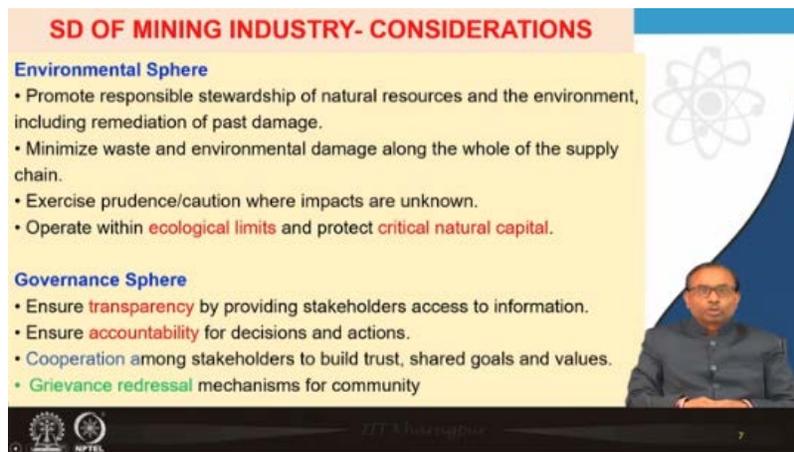
Social Sphere

- Ensure fair distribution of costs and benefits of development for all.
- Respect and reinforce fundamental rights of human beings, social and economic freedoms, and personal security.
- Ensure that depletion of natural resources will not deprive future generations through replacement with other forms of capital.

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So, the company should be financially or economically sound, then only the mining company can run; otherwise, if it is not financially healthy, it will not survive. So, if you come to the second pillar or social sphere, that is to ensure fair distribution of the cost of development, or the cost of mining, and the benefit of mining for all. Then, we must respect and reinforce the fundamental rights of human beings, including social and economic freedom, security, and liberty. So, these are because you know that mining companies often work in developed countries and poor countries. So, there are a lot of allegations that mining companies are exploiting the resource, and they are not giving the benefits to the local people. So, for this, it is very important that the mining companies respect the human rights of the local community and give them benefits. This is very important from that point of view. To ensure that the depletion of natural resources will not deprive future generations through replacement with another form of capital. We have discussed that when we are mining or extracting natural resources, they are being depleted. So, how can we leave sufficient natural resources for future generations? There is the compensatory capital idea that if you are losing one form of capital like the physical resources or natural capital, then if we can develop or compensate the community with other forms of capital like social capital, human capital, and infrastructure, then we can say that this will help in the sustainable development. In the environmental domain, promote responsible stewardship of natural resources and the environment. So, the company should promote how natural resources are conserved and

the environment is protected while mining. This has to be the goal of the mining company. So, minimize waste and environmental damage along the whole supply chain.



SD OF MINING INDUSTRY- CONSIDERATIONS

Environmental Sphere

- Promote responsible stewardship of natural resources and the environment, including remediation of past damage.
- Minimize waste and environmental damage along the whole of the supply chain.
- Exercise prudence/caution where impacts are unknown.
- Operate within **ecological limits** and protect **critical natural capital**.

Governance Sphere

- Ensure **transparency** by providing stakeholders access to information.
- Ensure **accountability** for decisions and actions.
- Cooperation among stakeholders to build trust, shared goals and values.
- **Grievance redressal** mechanisms for community

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Starting from exploration to mining, to mine closure, to mineral utilization, and through the whole chain, we have to see that the generation of waste should be minimized, and environmental damage should be minimized. Exercise prudence or caution where impacts are unknown. Then operate within the ecological limit and protect critical natural capital. This is the most important point in the environment domain, that whatever the developmental project or the mining project, it has to be within the ecological limit. And our critical natural capital, like air, water, soil, and biodiversity, has to be protected. Because mining is a temporary activity. We cannot afford to damage or lose our critical natural capital, which will be essential for future generations as well. That is why this is a very important point. The last domain is the governance domain. Ensure transparency by providing information to stakeholders and accountability for decisions and actions, particularly if somebody is engaging in corruption and other things. So, accountability has to be fixed. Cooperation among all the stakeholders, the society, the community, the regulatory agency, and the company, so that there is trust, there is a shared goal, and shared value for better implementation of sustainable development. And lastly, a grievance redressal mechanism for the community. So, these are the imperatives that the mining company has to remember, or when the study was taking place, these were thought to be very, very essential for the mining company. Now, when the company or the mining industry tries to implement sustainable development, these are the basic guidelines. Now, what are the challenges when you try to implement sustainable development? The biggest challenge to implement sustainable development in the mining industry is the difficulty of linking the concept of sustainable development to the financial success of the company, the financial health of the company, or profit.

CHALLENGES FACED BY MINING INDUSTRY

- Biggest challenge to implement SD in Mining is difficulty of linking concept to SD to financial success.
- Investment by MI towards society, environment, governance will reduce its profitability.
- MI struggling to find ways to maintain balance between economic health vis-à-vis SD measures.

There are many sustainable development concerns:

- Labour health and safety costs,
- Mine closure and post-closure costs, and
- Civic Society expectations for social services community services and benefits.

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In plain terms, it is the profitability. So, profitability versus sustainable development. We know that, for sustainable development, the mining industry has to invest in society, the environment, and governance. However, all these investments or expenditures will reduce the profitability of the mining company. In the mining industry, they are struggling to find ways to maintain balance between the economic health of the company and expenditure or investment for sustainable development measures. There are many sustainable development concerns like labour health issues, labour safety issues, mine closure, and post-closure environmental costs, civil society expectations for social services, community services that will be provided by the mining company to the local community, and the project-affected persons. So, there are some key challenges to implementing sustainable development. We will discuss some of the key challenges inherent to the mining industry when we think of implementing sustainable development. So, the first thing is the land. As you know, mining is one of the many types of land use, and there may be potential competitive land uses, including agriculture, forestry, etc. Now, when you do mining, we have to acquire the land. So, what is the best use of land? The government has to establish a land use plan, considering whether mining is the best possible land use alternative or not. In any case, if we are mining, we have to acquire the land, so there are issues, such as difficult issues like compensation, resettlement, land claims, local people, protected areas, and ecological zones. These are the challenges. And, sometimes, particularly when the mining is going on in a protected area, or ecological zone, you have to always think which one is better, whether it is important to extract the mine because that mineral will be useful for the economy and for the country or whether, you want to protect the protected area or the ecology or the ecological zone, biodiversity etc. So, that time, wise trade-off may be necessary and the decision on these

trade-offs can be made by negotiation among all stakeholders, state government, central government, the civil society, local community.

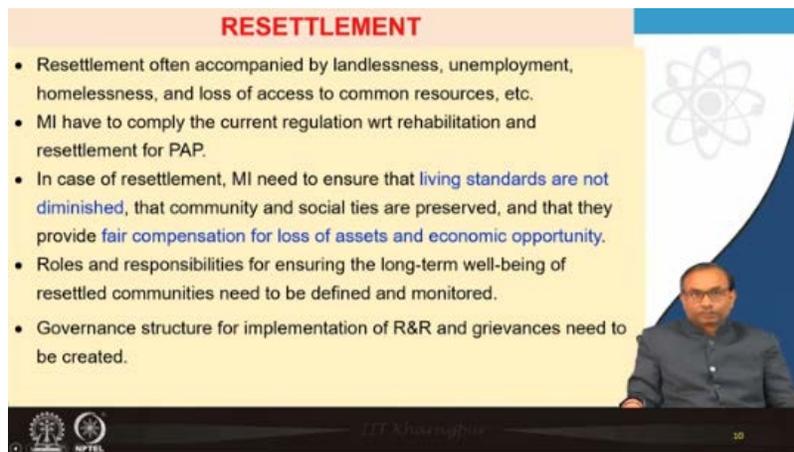
LAND FOR MINING

- Mining is one of many competing land uses. Potential competitive land uses including traditional uses like agriculture, forestry etc.
- Often, lack of planning to identify best possible use of the land.
- Problems around issues such as *compensation, resettlement, land claims* of local peoples, and *protected areas*.
- Mining face serious challenges in land acquisition and management.
- Most appropriate use of land is best decided within an *integrated land planning framework* that evaluates competing interests between *national and local levels*, for example, or between *mining and conservation*.
- *Wise trade-offs* necessary; decisions on these can be made by negotiation among all stakeholders.
- Decision making will be effective under transparent legal, policy framework regarding compensation schemes of PAPs, governance structure, arbitration mechanisms.

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So there has to be a platform in which all these stakeholders can meet, exchange ideas, and the best possible option should be taken. Whether it is done at all the time is a different question. Now, decision-making in such cases will be effective under a transparent legal policy framework regarding compensation for the project-affected persons, governance structure, and arbitration mechanism. So all these things are very, very important, or these are the challenges or the infrastructure you have to provide, and only then can we make all these decisions. The second challenge for mining is the resettlement. If land is acquired, there may be involuntary displacement of the people. So resettlement is often accompanied by landlessness and unemployment. So, there is homelessness and loss of access to natural resources. Now, the mining industry has to comply with the current regulations regarding the rehabilitation and resettlement of the project-affected persons. They have to ensure that living standards are not diminished. In the case of resettlement, the living standards of the communities that are resettled should not diminish; rather, they should be improved. And they have to provide fair compensation for loss of assets and for loss of economic opportunities. Now, for this resettlement, the roles and responsibilities for providing long-term well-being to the resettled communities need to be defined and monitored. And for that, the governance structure is important. Very, very important. And a governance structure for the implementation of this resettlement and rehabilitation rule, grievances need to be addressed. The next challenge is when mining is happening in the protected area. Protected areas are essential for the conservation of key ecological, social, and structural values. The government has notified some of the ecological zones, which are ecologically fragile zones. So if the mineral is located there, do we have to go for the mining from

there, or do we have to conserve the ecological zone? That is why a broader discussion on mining in protected areas, including trade-offs, is necessary.

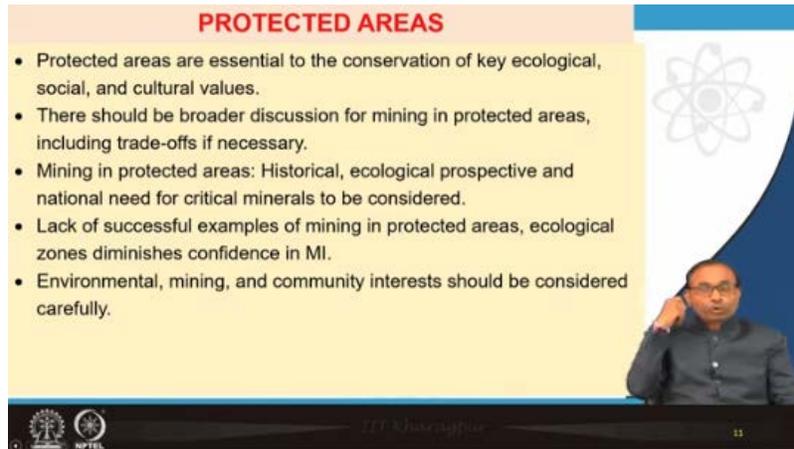


RESETTLEMENT

- Resettlement often accompanied by landlessness, unemployment, homelessness, and loss of access to common resources, etc.
- MI have to comply the current regulation wrt rehabilitation and resettlement for PAP.
- In case of resettlement, MI need to ensure that **living standards are not diminished**, that community and social ties are preserved, and that they provide **fair compensation for loss of assets and economic opportunity**.
- Roles and responsibilities for ensuring the long-term well-being of resettled communities need to be defined and monitored.
- Governance structure for implementation of R&R and grievances need to be created.

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PROTECTED AREAS

- Protected areas are essential to the conservation of key ecological, social, and cultural values.
- There should be broader discussion for mining in protected areas, including trade-offs if necessary.
- Mining in protected areas: Historical, ecological prospective and national need for critical minerals to be considered.
- Lack of successful examples of mining in protected areas, ecological zones diminishes confidence in MI.
- Environmental, mining, and community interests should be considered carefully.

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So, the historical ecological perspective and the national need for critical minerals need to be assessed by the government and by society. It has also been seen that there is a lack of successful mining examples in protected areas or ecological zones, which diminishes the confidence of the system. Environmental mining and community interest should be considered carefully when you are planning for mining in the protected area. The next key challenge for mining concerns the local community. So, inequitable distribution of benefits and costs within the local community may cause social resistance and tension. Ensuring improved health, economic, and educational activities during and after mine closure requires proper planning and creation of schemes and projects. In the past, land was often acquired for mining projects without the explicit consent of local communities and tribal people. Many instances of uneasy relationships between the mining industry and the local community have been seen because of these problems. The community demands direct and sustained benefits from the mineral wealth, and the mining industry

has to provide development services to the community to maintain its social license to operate. The relationship between the mining industry and the community has to meet the community's expectations. This is a big challenge for the mining industry while it implements sustainable development. The next thing is the environment in the mining area. The mining industry generates a huge quantity of waste material: solid waste, liquid waste, overburden, tailings, mine drainage water, etc. These waste materials degrade the physical and biological environment and the ecosystem. Developing ways of internalizing the cost of land reclamation, the cost of water treatment, and the cost of re-establishing biological diversity is to be done when we calculate the unit cost of mineral production.

CONCERNS OF LOCAL COMMUNITIES

- Inequitable distribution of benefits and costs within communities may cause social upheaval and tension;
- Ensuring improved health, education, economic activity during and after mines closure requires proper planning, creation of schemes and projects.
- In past, land was often acquired, without explicit consent of local community, tribal peoples.
- Decision-making processes appropriate to the cultural circumstances of local community must be respected.
- Many instances of uneasy relationship between MI and local communities.
- Community demands for direct, and sustained benefits from mineral wealth.
- MI may have to provide development services to community to maintain their social licence to operate.

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MINING AND ENVIRONMENT

- MI generates huge quantities of waste (solid, liquid) and degrades physical and biological environment.
- Developing ways of internalizing the costs for land reclamation, water treatment, re-establishing biological diversity.
- Improving both impact assessment and environmental management systems, and doing effective planning for mine closure.

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Improving both impact assessment and environmental management systems and implementing effective mine closure are essential for protecting the environment in the mining area during and after mining. So, a special challenge is the mining waste. Mining waste produces large volumes of waste, OB, tailings, and acid mine drainage. These are the constant sources of pollution: air pollution, water pollution, land and soil pollution,

and the long-term impact of the mining waste disposal are critical problems for the mining industry, as they are a constant source of safety and health hazards for the community. So, mine closure planning is a key challenge, a big challenge for the mining industry for achieving sustainable development. The mining industry should prepare a proper environmental mine closure plan and implement it to manage the environmental degradation due to mining. Most mine closure planning now focuses only on the environmental aspect, but apart from the environmental aspect, there are also social and economic aspects that are critical components. When it prepares the mine closure plan, it now has to give sufficient attention to the social and economic aspects so that the sustainable development principle can be implemented in the mining industry. Now, some of these challenges we have discussed, and there are some remaining challenges in the mining industry, as well as for implementing sustainable development. These are a loss of biodiversity. We know that the loss of forest, loss of flora, fauna, and biodiversity is a reality in the mining industry. So, how can biodiversity loss be minimized? That is a challenge. Artisanal and small-scale mining: Now, these mining regulations can be implemented and monitored by large mining companies. But there are many small-scale mines, artisanal mines.

MINING WASTE

- Mining produces large volumes of waste (OB, tailings, acid mine drainage etc.).
- Wastes are a constant source of pollution (air, water, land etc.)
- Long-term impacts of the mining waste disposal are critical problems of MI.
- Constant source of safety and health hazards for the community.

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MINE CLOSURE PLANNING

- MI must plan for proper environmental mine closure to manage environmental degradation due to mining.
- Most mine closure planning now focuses only on environmental aspects of closure.
- Integrating social and economic aspects is a necessary step to transform mining investment towards sustainable development.



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OTHER CHALLENGES

- Biodiversity loss
- Artisanal and Small-Scale Mining
- Access to Information
- Governance and Transparency: Roles, Responsibilities, and Instruments for Change.
- Mindset of the industry



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So, for them to implement the environmental regulation, the regulations policy with respect to sustainable development is a big challenge, and they must ensure that they also implement sustainable development, which is a big challenge. Then, governance and transparency. Institutions, their roles and responsibilities, and access to information. These are also very, very important for sustainable development. These may not be available in all mining, all mines. So, how to create this governance structure? How to create separate departments so that they look after the sustainable development? That is also a big requirement and a big challenge. And lastly, I should say the mindset of the industry. So, still now, the mindset of the industry is that you know the company, we are a mining company, we want to extract the minerals and sell them, so that we want to have a profit. But what is the impact on the environment? What is the impact on society? And how we see the environmental regulation or any regulation that will come with respect to sustainable development? How can we implement these regulation so that we can live in a better environment and ecosystem in the mining area, as it was available before the mining? Our critical natural resources, like air, water, soil, groundwater, and

biodiversity, which are basic resources necessary for our survival, should not be damaged because of the mining activity, which is a temporary activity. Mining is a short-term activity. For a short-term activity to earn some more profit incrementally, we cannot afford to damage our ecosystem, damage our environment, or damage our Mother Earth, because these resources are very essential for our survival and the survival of our future generation. So the industry has to look at this as an opportunity so that they can leave a better ecosystem in the mining area.

When they close the mining operation, they should try to leave a better ecosystem for the community, the state, the country, and the people. So this is very, very important. This is the summary of the sustainable development that we have to leave a better earth when we pass away from this place. So, this is the summary that in this lecture session, we have covered the key challenges for implementing the sustainable development concept in the mining industry, and most of the presentation material has been taken from this source. You can see this source, it is available in the public domain. So, this is a brief introduction to today's lecture. Thank you for your very patient hearing.

SUMMARY

This lecture session has covered the key challenges for implementing SD concept in Mining Industry.

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