MINERAL ECONOMICS AND BUSINESS

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Week 11

Lecture 55 : Critical minerals

Hello everybody, we have a very special lecture today on the critical minerals. We have completed the lectures of the week 11, this is the last in the 11th week. And we will be switching over to mostly the national mineral policy trade and business in the last 5 lectures of the 12th week. But I thought that we should talk also about the very important initiatives taken by the government of India in respect of critical minerals. So, that I will be covering in this particular lecture.

Now what are these critical minerals all about? How do we define them? What is their importance? How they are globally distributed for availability? And the importance given by the government of India

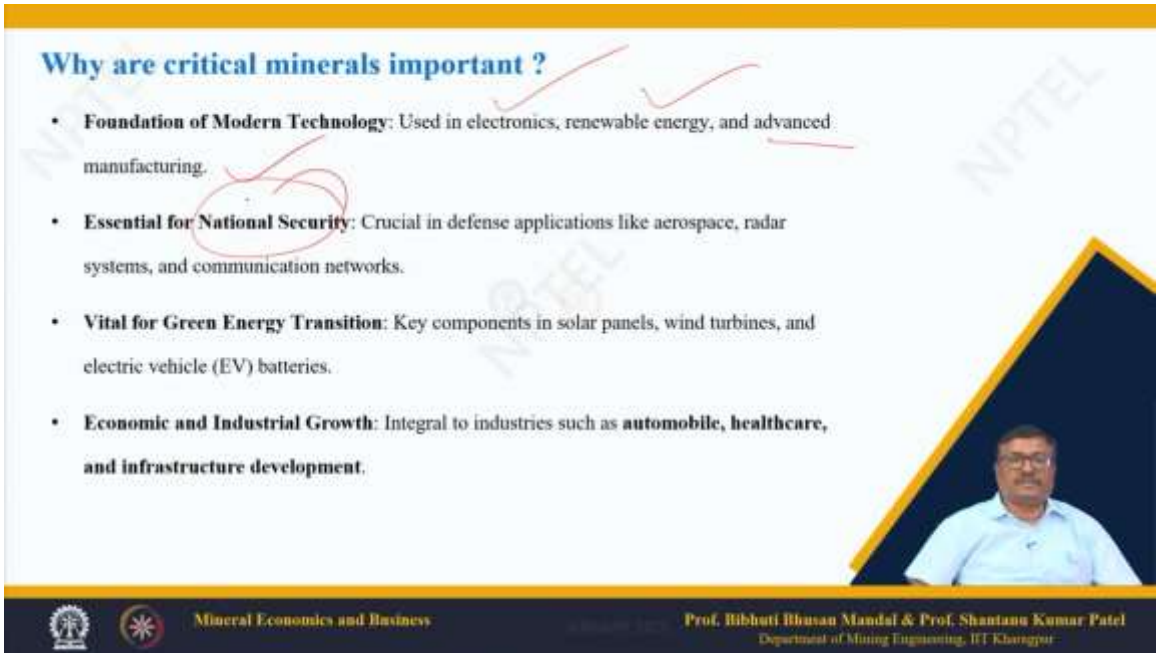
that we will discuss and the establishment of the national critical mineral mission to achieve the objectives of better more mining of the critical minerals contributing

effectively to the development of the nation. How can you define the critical minerals? Now as you see from the definition that they are defined as those which are essential for the economic development and the national security is very very important they have been identified which are directly ah ah required for the economic development and also for the national security. Now the limited availability or say concentrated existence in certain geographical location makes them vulnerable to supply chain disruptions. They are not evenly distributed somewhere in the some part of the globe you see the mineralization is more.

So, unless you have well distributed things or multiple sources. many sources of the of the mineral, it cannot expect a stable supply chain. So, they are subjected to the vulnerability of the supply chain disruption because of their ah heterogeneous geographical distribution. Now the factors, important factors are import dependence in respect of critical minerals, the technical difficulty in the extraction process, the geopolitical risk, today I am having a good relation with country A which has agreed to supply the critical mineral to us. But tomorrow this may not continue because of the geopolitical events.

It can change. And there are of course environmental concerns that is related to the criticality of the minerals. Now, why they are so significant? Because they have become

indispensable in the modern technology, we will easily understand when we discuss further. Their use in different in the critical energy sectors and making their secure supply crucial for the global stability.



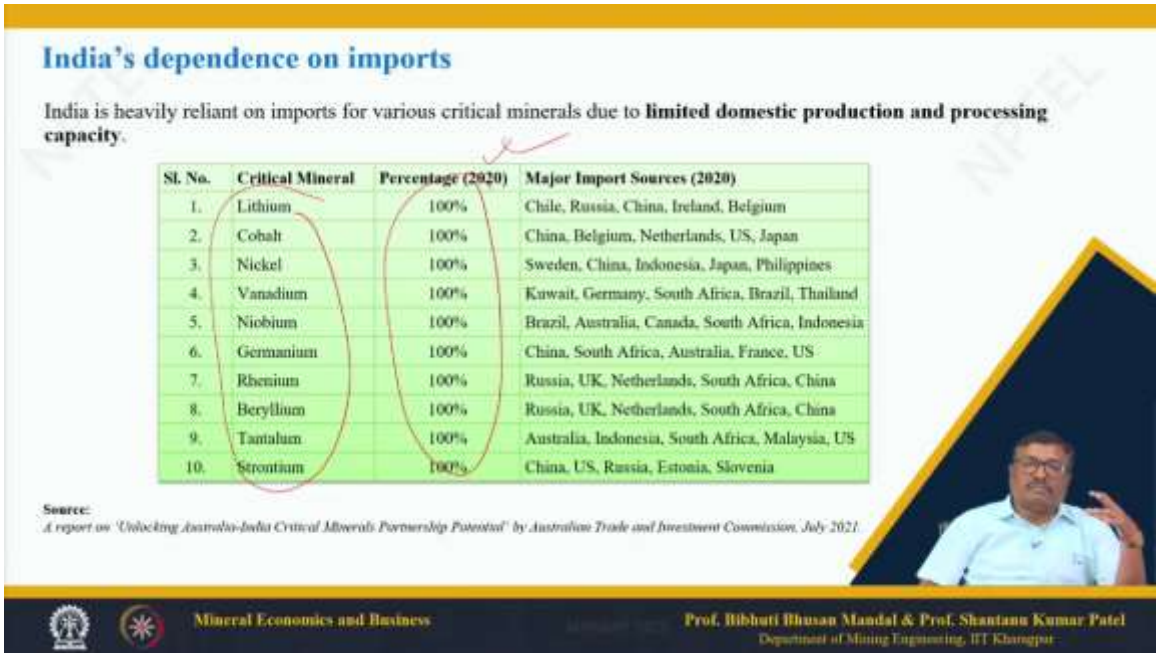
This has become so critical that they have they are indispensable for modern technology, they are used in defence, energy sector and for global stability therefore, they have become critical players. So, why they are important? I mean let us discuss these things a little bit more details. They are used in electronics, renewable energy, advanced manufacturing process. They are also required for the national security like defense applications like aerospace, radar system, communication network.

They are also vital for our green energy transition, the transition towards green energy like solar panels, the components in solar panels. In wind turbines and electric vehicle batteries. So, when you are transitioning from conventional to non-conventional green energy, there are key minerals or components that require these minerals, which have become critical because all these things are very important today. For overall economic and industrial growth, these minerals are integral to industries like the automobile industry, healthcare industry, or infrastructure development. So, they have become, without any doubt, critical minerals or minerals that are critical for the development of nations.

What is the global distribution of these critical minerals? Now, we can just try to outline the geographical concentration. They are unevenly distributed, as I already mentioned. So, some countries will dominate in their supply. For example, China is the largest producer of rare earth elements, tungsten, and graphite.

Another small country, the Democratic Republic of Congo (DRC), has 70 percent of the world's cobalt reserves. Imagine, 70 percent of the world's cobalt reserves are in the DRC. Now, Indonesia is the leading producer of nickel, which is essential for electric vehicles. Again, in Latin America, Chile, Argentina, and Bolivia are called the lithium triangle. They have 50 percent of the global lithium reserves. Imagine that. So, for electric batteries, you see, we need lithium-ion batteries, and again, you need nickel for EV batteries.

So, it depends on Indonesia mostly, I mean, as the leading producer. And see, a highly politically disturbed country like the DRC, Congo, has 70 percent of the cobalt reserves. They are unevenly distributed, and then you can understand how critical it is to maintain a good and stable supply chain if you want to benefit from all these countries. Our dependence on imports—let us just try to find out. On lithium, cobalt, nickel, vanadium, nervium, germanium, uranium, beryllium, tantalum, and strontium, we had 100 percent dependency in the 2020 report.



We had some byproducts even in copper smelting, but they were later purchased by some other companies. So, our critical minerals or very precious minerals like vanadium or molybdenum production is very low. So, practically, as of 2020, we can say that for all these, we are 100 percent import-dependent. You see how critical this is—unless we have some kind of base, some kind of our own production, our own availability, it is difficult because you have to maintain good connections and business relationships with all these countries which have been listed. as the import sources from where, in 2020, we sourced these critical minerals and for which we are 100 percent import-dependent.

Now, what are these foreign sourcing strategies when we are dependent on others? So, we can do strategic overseas acquisitions—like, you have critical mineral reserves where the business is open, then through your mining companies, you can go for overseas acquisition, do mining there, and bring it to your country. That can be done. Or we can do it through bilateral agreements. For example, we give coal or something to some country, and we get critical minerals in return. We can also have joint ventures and long-term contracts with those countries for supply.

Now also we have other these things the initiatives by the government of India, the Khanis Bidesh India Limited. This is for the acquiring mineral assets abroad, especially for critical mineral. They will try to find out those places where this critical minerals are

available. for and they are not being mined or some resource and reserve which is open for investment there. So, our companies can go and invest there and bring the mine and then bring the critical mineral in our country.

Also NMDC or National Mineral Development Corporation, they explored the partnership with foreign mining firm in respect to mining of critical minerals. Also we have seen some roles played by NALCO and the HCL in this respect. The very important initiative I must say is the establishment of the national critical minerals mission. This is basically based on our recognizing the importance of the critical minerals as I have been repeatedly telling that our government has introduced the NCMM to ensure mineral security for the country.

The mission has an aim to enhance the domestic availability whatever is there start mining provide the facilities and go as far as possible as soon as possible we start the auction process let the mining start as quickly as possible wherever the critical minerals are available. So, that our domestic availability should increase as much as possible. So, we must encourage recycle even if you are importing this material when they become scrap do not throw them away like the lithium batteries you can recycle it may be little costly, but gradually if you develop the technology then you can recycle it. So, that your import dependency decreases and it becomes through recycling it is available in your

own country. And we must also promote through the NCMM the overseas acquisition so that you do mining there and bring the critical mineral here.

Now, the financial commitment to the mission for the government has allocated 16,300 crore for the NCMN to enhance domestic availability, encourage the recycling of critical minerals, and also to promote the overseas acquisition of mining reserves. Also, the PSUs, as I said in the previous slide, will invest another 18,000 crore in various initiatives under the National Critical Mineral Mission. What is the vision? What is their detailed vision? To enhance domestic production, that means, we want to strengthen exploration and mining efforts.

So that we reduce, as I said, reliance on imports, which is a very critical issue. If you fully depend—100 percent—on imports from other countries, anything can happen, and the supply chain will be disrupted. We need to establish advanced facilities for refining and processing critical minerals within India. So that even if you are mining, you should not send the concentrate or those minerals outside for processing and then get the materials back. No, not only production but also the processing of critical minerals—the facilities should be available within the country. That is part of the vision of our NCMM.

We encourage, through NCMM, recycling and the circular economy. That means we are promoting efficient recovery of critical minerals from electronic waste and end-of-life products. So we can recycle and bring them back into the economy. So, we call it a circular economy. Also, the NCMM will try to strengthen global collaboration for sustainable and long-term access to essential minerals abroad.

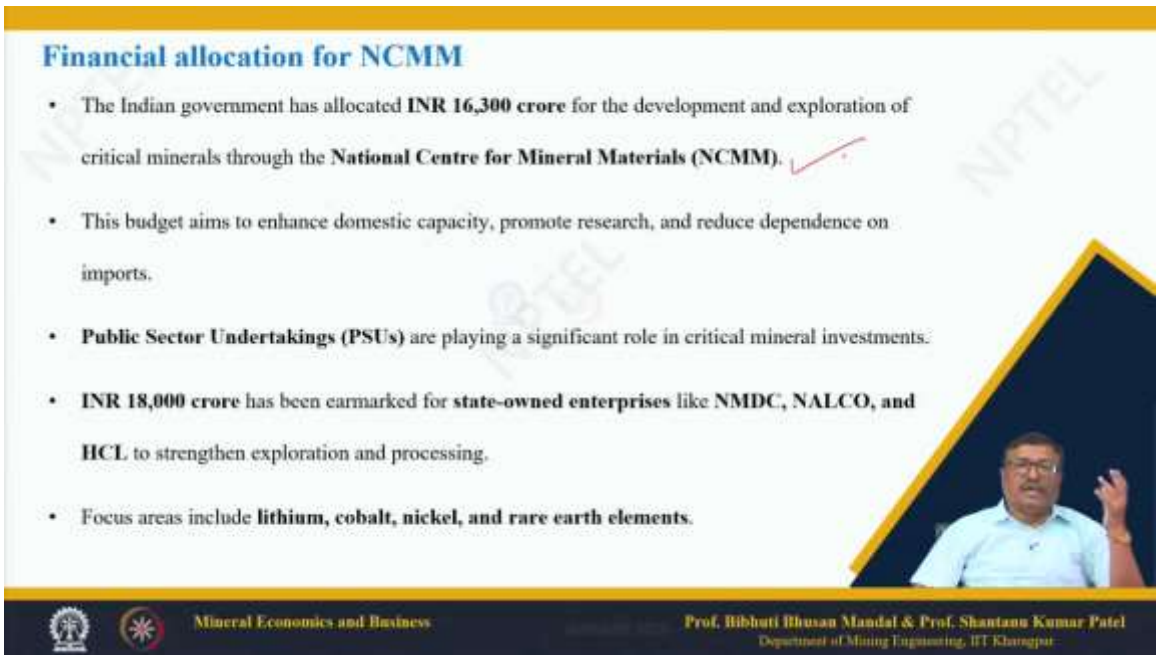
So, how much I mean what are the minerals that has been identified and selected. So, a three stage assessment was conducted to identify minerals criticals to India and considering the global critical mineral strategy what the other countries have done and through inter ministerial consultation. And of course, the empirical evaluation based on the economic importance and supply risk of any mineral, so that they can be termed as critical minerals. So, various ministries and organization including the Ministry of Power, Department of Atomic Energy, DAE, NITI Aayog, they have contributed to identifying the critical minerals as you will see the critical mineral list. So, based on all these 30 minerals were identified for critical like the net import reliance and the resource availability we have identified 30 as critical minerals.

as you can see in the list latest list antimony, beryllium, bismuth, cadmium, cobalt, copper, gallium, germanium, graphite. These things lithium, molybdenum, platinum, nickel, phosphorus, potash all these things and the rare earth elements all these lanthanum from lanthanum to your yttrium all these under rare earth element. all have been ah

identified as critical minerals. Here also you see selenium, silicon, tantalum, tin, titanium, tungsten, vanadium, zirconium all this comes under the critical minerals now. We have identified these things for which we are import dependent or our resource is very poor, we need to explore them where the resource available, whether we can go for acquisitions of mining properties abroad and reduce the import dependency, we can bring the mineral that we mine abroad.

And also ah now the recycling of these material within the country after use. So, that again in in in in in terms of upon import dependency this helps in future. The government has allocated as I said earlier that 16300 core for the development of the an exploration of critical minerals through NCNN. So, the budget aims to enhance domestic capacity, promote research on this and reduce dependence on import this is very important. That means, we have to enhance our domestic capacity production capacity availability from the domestic resources.

And, then promote research because better I mean the wasting of these minerals or I mean that is the very critical. So, we need to utilize them most and the processing should be available in house in our own country. And, overall dependence on imports should be minimized as much as possible. So, the PSUs are also playing significant role in the critical mineral investment as I have shown earlier and again I am repeating that about 18000 crores INR has been earmarked for the state owned enterprises like NMDC, Nalco and HCL to strengthen the exploration and processing of the critical minerals. Now, at the moment other than even though we have listed this 30 critical minerals, but we are giving importance specific importance on lithium, cobalt, nickel and rare earth element.



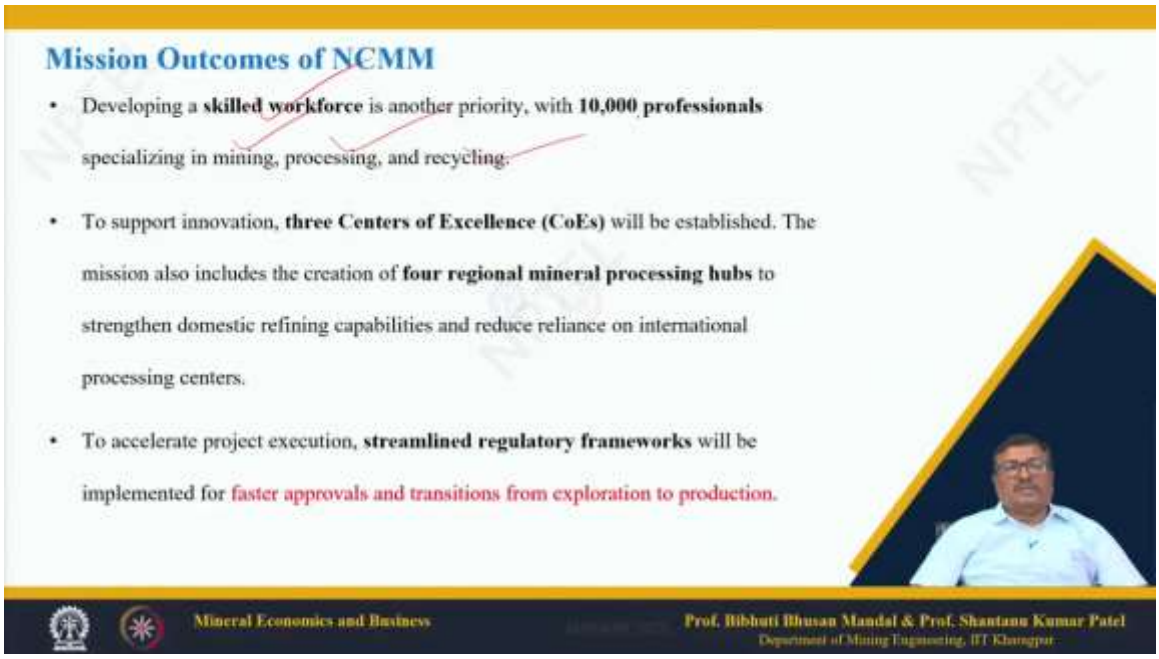
This is focus Critical, entire critical minerals are in focus definitely, but we are giving the country is giving, India is giving special importance, specific importance to lithium, cobalt, nickel and the rare earth element. As far as the mission outcomes, so the NCMM aims to enhance domestic mineral production by the execution of the 1200 exploration projects a big one. And auctioning we have identified that we have critical minerals in 100 blocks. By say 2030 to 3031 fiscal year we should have completed we should we should complete the exploration of 1200 projects exploration projects and we must have auctioned this thing 100 critical mineral blocks.

So, this will first thing this will ensure the domestic availability which is the prime criteria. In at least 15 strategic minerals like the graphite, lithium, potash and there are we must have heard the lithium deposit near Jammu. So, the government is giving importance on that whether we can mine that lithium. It has gone through the auction process repeatedly. Hopefully, we will be solving this problem and we will have our own lithium source.

Now this NCMM also targets reducing the reduction in import dependency by increasing the domestic production and to the level of 10 percent of the annual demand by 2031. and to secure stable supply Indian companies plan to acquire at least 50 overseas mining assets reserves and resources focusing on key battery minerals. this electric vehicle this is creating lot of issues lot of focus on the lithium, nickel, copper, cobalt and

graphite because of the motor the lithium battery And all these your mobile phones they require the lithium ion and there are all batteries are now switching over to lithium. So, there is a huge demand for lithium and the motors they require more cobalt, more copper, nickel these things.

The focus is towards lithium, nickel, copper, cobalt and graphite and we are trying to acquire at least 50 overseas mining assets to meet our requirement in India. We want to develop also skilled workforce that means about 10,000 professionals specializing of mining, processing and recycling of critical minerals. The mission also support innovation by establishing 3 centers of excellence and also 4 regional mineral processing hubs for the specialized in the critical minerals processing. And the to accelerate the project execution there are regulatory frameworks that has been streamlined for faster approval. and transition from exploration to production.



That means expedite the process to critically examine where the bottlenecks are, how fast we can move from the from the exploration projects to the final products . So, it is being very critically ah supervised as to the progress of this mission, so that we can meet the our our our aims our objectives. to reduce the import dependency to improve our domestic supply and also see that the demand that is required I mean that is there in our country is made from our own sources and we reduce the import dependency as minimum as possible as low as less as possible. We want to strengthen the global

partnership and trade agreements with resource rich nations which are already having that. So, that we can develop good partnership and get the minerals from outside sources.

So, and also we will have a national critical mineral stockpile That means if you are having surplus if you are producing more or producing more than what we can could consume then we can have a stockpile that means a reserve. So, that if there is a supply disruption then we can meet this from the stockpile that means there will be reserved a buffer available to the nation. So, that you can continue the steady supply for the development and of the nation using the critical minerals as we have described and discussed throughout the lecture today.

If you want to know something about the recycling programs, then we can say that the pilot projects already India has launched the pilot project for the lithium ion battery recycling So, that by recycling you reduce the dependence on import and also the e-waste processing already financial support has been provided and secondary extraction of the art element. Then we have the end of life product recovery initiative that means the machines or the circuit board and many other electronic or the batteries are already say it is the end of life. So, what we do? term called the urban mining.

It is discarded in many cities towns there towns hundreds of towns of this discarded electronic materials are there and the batteries are discarded. So, what we do that mining

urban mining that is recovery from those things, collecting those discarded electronic boards and the batteries and from there that so that we can recover the critical minerals from those discarded things. So, we call them an urban mining. Now, this extended producer responsibility is to ensure companies recycle the critical minerals.

So, if your company is using these things. So, they are not just simply throwing it away. Can we have a policy to ensure producer responsibility? They can also involve themselves in recycling and make it available in the market again. So, we are also conducting research to improve the efficiency of rare earth element recovery from industrial waste. So, our domestic availability becomes higher than what we have today.

So, what is the future roadmap of our National Critical Mineral Mission? By 2030 and beyond, we want to achieve at least 50 percent of the critical minerals by 2030. We will expand domestic mining capacity through exploration programs, which have been greatly enhanced by the support provided by the National Critical Mineral Mission. As I said, we want to boost recycling of critical minerals and improve the circular economy to recover these critical minerals from waste materials. And we want to develop India's first large-scale lithium refining facility to support battery manufacturing.

This is a short-term future roadmap for the National Critical Minerals Mission. This will help us, as I said, reduce dependency on imports because the National Critical Mineral Mission has approached the problem from many sides and different perspectives. So, no stone remains unturned in achieving our target—to reduce import dependency and make the exploration-to-production process as fast as possible. We will establish different organizations through which we can acquire properties in other countries to source critical minerals. From all aspects, we have—and the Government of India has provided fiscal fund support to all these targets.

Hopefully, with this, we will be able to achieve our targets in the near future. If you want to read something, you can read these things in the Ministry of Mines. We have a specific document available on the National Critical Mineral Mission. There is a June 2023 report

by the Ministry of Mines where you can get the complete list of the critical minerals and associated information, which will be very helpful for understanding critical minerals as a whole. Thank you very much.