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Clean energy transition will be built in mines - and must include women

Ensuring that women are fully represented in the industries that power this transition is not only about equity. It is about building the strongest possible foundation for India's next phase of growth

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India's clean energy transition will require minerals, technology and large-scale industrial capability. It will also require the full participation of the country's talent

Priya Agarwal Hebbar |

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India's clean energy ambitions are often framed as a break from the past — a leap into a greener, more sustainable future. But beneath that vision lies a paradox we rarely acknowledge.

The transition to clean energy will require more mining, not less.

Electric vehicles use two to four times more copper than traditional cars. Solar plants require four to six times more minerals than fossil-fuel plants. Wind power requires nearly nine times more mineral resources per megawatt than gas.

The clean energy transition, in other words, is not a post-mining world. It is a mining-powered world.

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For India — which has committed to 500 gigawatts of non-fossil fuel energy capacity by 2030 — sectors such as mining, metals and natural resources will form the physical foundation of that transition. Materials such as aluminium, copper, zinc and silver will underpin renewable power infrastructure, electric mobility, energy storage and digital networks.

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Yet even as these industries become more central to the future, they remain among the least diverse sectors of the economy.

In India's mining industry, barely 6% of the workforce are women.

At a time when the country is working toward building a \$10 trillion economy and realising the vision of Viksit Bharat by 2047, that statistic highlights a structural gap. Economic growth at scale cannot be achieved while drawing on only a fraction of the available talent pool.

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Increasing female participation in the workforce is not only a social priority; it is also an economic one. Global research consistently shows that closing gender gaps in labour force participation can add significant momentum to national growth.

Historically, mining carried a certain perception — scale, grit and men emerging from underground covered in dust. It was an industry built around physical labour, and by extension, built around men.

But with modern mining, it increasingly looks very different.

Satellite imaging now maps ore bodies from space. Artificial intelligence predicts equipment failures before alarms sound. Heavy machinery can be operated remotely from digital control rooms hundreds of kilometres away. Mines rely on robotics engineers, environmental scientists, geologists and data analysts as much as they do on traditional operators.

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This technological shift has fundamentally altered the skill profile of the sector. The future of mining will depend less on physical labour and more on expertise, precision and innovation — areas where talent is not defined by gender.

Recognising this shift, companies are beginning to redesign their workforce strategies.

At Vedanta, efforts have been made to expand participation by women across core operational roles in mining and metals. This includes women working in underground mining operations, mine rescue teams, aluminium potlines, locomotive operations and power-unit teams — areas that historically saw little or no female representation.

As a result of these changes, women today constitute around 23% of Vedanta's workforce, compared with an industry average of roughly 6%.

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This progress reflects not only recruitment efforts but also broader structural changes — including workplace redesign, technology integration and support systems that allow a wider pool of talent to participate and succeed in industrial environments.

The ambition now is to go further, with a focus on increasing women's participation to 35% across the organisation and, over time, moving toward parity. The logic is straightforward. Companies that unlock 100% of their talent pool will outperform those that operate with half of it.

At a national level, expanding participation in sectors such as mining and metals will be essential to India's long-term economic and industrial goals. These industries supply the materials that underpin infrastructure, manufacturing, renewable energy systems and emerging technologies.

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But the future workforce that will drive this transformation is still being shaped today.

Many young women across India — particularly in regions where mining and metals industries operate — remain uncertain about whether careers in engineering, science and industrial technology are accessible to them.

Addressing this gap requires early engagement. Through Vedanta's community programmes, more than 50,000 girls and young women have participated in STEM-linked initiatives over the past three years, providing exposure to science, engineering and technical careers.

Such initiatives are important because workforce inclusion does not begin with employment. It begins much earlier, with access to education, exposure to opportunity and the confidence to pursue careers that may once have seemed out of reach.

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India's clean energy transition will require minerals, technology and large-scale industrial capability. It will also require the full participation of the country's talent.

Ensuring that women are fully represented in the industries that power this transition is not only about equity. It is about building the strongest possible foundation for India's next phase of growth.

The author is a non-executive director at Vedanta Ltd

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