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The Human Cost of Climate Change: Lessons from Nepal

By Dr. R.C. Khuntia &
Dr. Partha Sarathi Das

The recent Himalayan disaster in Nepal is a grim reminder of the compounding human and economic costs of climate change. For India-which shares mountain ranges, fragile glaciers, and vital river systems with Nepal-the tragedy serves as an urgent wake-up call. India must act now to build infrastructure resilience, protect vulnerable workers under International Labour Organization (ILO) standards, and meet its Sustainable Development Goals (SDGs).

On August 26, 2026, severe flash floods devastated Nepal's Rasuwa, Nuwakot, Dhading, Gorkha, and Tanahun districts along the Nepal-Tibet border. High in the mountains, a massive 200,000-square-meter block of glacial ice and rock broke off and crashed into the valley below. The friction-induced melting generated seismic signals equivalent to a magnitude 5.2 earthquake.

The resulting surge tore through the Bhotekoshi and Trishuli rivers, affecting over 84,000 people, including 32,000 children. Over 1,350 lives were lost-with bodies swept hundreds of kilometers downstream into India-and nearly 5,000 people remain missing. It marks the region's deadliest disaster since the 2015 earthquake.

While Nepalese Prime Minister Balendra Shah pointed directly to climate change, experts emphasize that human activity exacerbated the damage. Unplanned road construction, rapid deforestation, and unsustainable farming stripped natural slope defenses. Scientists warn that rising temperatures fuel Glacial Lake Outburst Floods (GLOFs), while a warmer atmosphere holds more moisture, triggering severe cloudbursts.

This tragedy exposes severe structural gaps across the Himalayas. Roads, bridges, and flood barriers built for past weather patterns cannot withstand modern climate extremes. Meanwhile, early warning systems remain absent in remote mountain valleys.

Nepal, a minimal contributor to global emissions, bears a disproportionate burden of climate change driven by industrial emission trends elsewhere. Nepalese leaders are rightly demanding faster international climate finance disbursements tailored specifically for mountain and agrarian societies.

For India, this catastrophe carries dangerous parallels. India's average temperature has risen by 0.7°C since 1901, leaving over 600 million people facing severe water stress. The recent Himalayan flooding echoes the 2013 Kedarnath disaster, where cloudbursts killed over 6,000 people, as well as the 1998 Odisha Super Cyclone, which claimed over 10,000 lives and exposed critical gaps in early warning systems.

Similar extreme events are escalating across India. Flooding in Kerala, Odisha, Assam, and Bihar routinely displaces millions, while shifting monsoons threaten food security. Melting Himalayan glaciers threaten downstream states like Uttarakhand, Himachal Pradesh, Punjab, Uttar Pradesh, and Bihar with destructive GLOFs. Meanwhile, coastal states face land loss from saltwater intrusion, and urban centers endure intensifying heat waves.

The human cost of climate change is felt heavily through lost productivity and compromised health. According to ILO estimates for the G20, over 23 million working-life years were lost globally per year between 2000 and 2015 due to environment-related hazards.

In India alone, extreme heat exposure in 2024 resulted in an estimated 247 billion potential labor hours lost-representing $194 billion in income losses, according to the Lancet Countdown 2025 India Data Sheet. Agriculture accounted for 66% of lost hours, with construction accounting for 20%. Globally, a 2024 World Economic Forum report projects that climate-intensified disasters could cause 14.5 million deaths and $12.5 trillion in economic losses by 2050, driven primarily by heatwaves reducing labor productivity.

To protect its citizens, India must act on five key priorities:

* Deploy Advanced Early Warning Infrastructure: Expand high-resolution satellite monitoring and automated hydro-meteorological sensors across vulnerable Himalayan river basins.
* Upgrade Infrastructure Codes: Enforce higher elevation and clearance parameters for roads, bridges, and hydropower facilities in flood-prone zones.
* Adopt ILO Safety Frameworks: Integrate heat stress protocols, social protection, and insurance coverage for outdoor workers into national safety laws.
* Align DRR with SDG Targets: Ensure disaster risk reduction and infrastructure projects explicitly support Sustainable Development Goals to protect marginalized communities.
* Establish Transboundary Governance: Institutionalize joint ecological monitoring, real-time data-sharing, and emergency response mechanisms with neighboring countries like Nepal.

The tragedy in Nepal proves that climate disruptions respect no political borders. As India charts its path toward a resilient future, using the SDGs as a compass and ILO guidelines as a mandate will be essential to protect workers, communities, and ecosystems.

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ORISSA TIMES

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The recent Himalayan disaster in Nepal is a grim reminder of the compounding human and economic costs of climate change. For India—which shares mountain ranges, fragile glaciers, and vital river systems with Nepal—the tragedy serves as an urgent wake-up call. India must act now to build infrastructure resilience, protect vulnerable workers under International Labour Organization (ILO) standards, and meet its Sustainable Development Goals (SDGs). On August 26, 2026, severe flash floods devastated Nepal's Rasuwa, Nuwakot, Dhading, Gorkha, and Tanahun districts along the Nepal-Tibet border. High in the mountains, a massive 200,000-square-meter block of glacial ice and rock broke off and crashed into the valley below. The friction-induced melting generated seismic signals equivalent to a magnitude 5.2 earthquake. The resulting surge tore through the Bhotekoshi and Trishuli rivers, affecting over 84,000 people, including 32,000 children. Over 1,350 lives were lost—with bodies swept hundreds of kilometers downstream into India—and nearly 5,000 people remain missing. It marks the region's deadliest disaster since the 2015 earthquake. While Nepalese Prime Minister Balendra Shah pointed directly to climate change, experts emphasize that human activity exacerbated the damage. Unplanned road construction, rapid deforestation, and unsustainable farming stripped natural slope defenses. Scientists warn that rising temperatures fuel Glacial Lake Outburst Floods (GLOFs), while a warmer atmosphere holds more moisture, triggering severe cloudbursts. This tragedy exposes severe structural gaps across the Himalayas. Roads, bridges, and flood barriers built for past weather patterns cannot withstand modern climate extremes. Meanwhile, early warning systems remain absent in remote mountain valleys. Nepal, a minimal contributor to global emissions, bears a disproportionate burden of climate change driven by industrial emission trends elsewhere. Nepalese leaders are rightly demanding faster international climate finance disbursements tailored specifically for mountain and agrarian societies. For India, this catastrophe carries dangerous parallels. India's average temperature has risen by 0.7°C since 1901, leaving over 600 million people facing severe water stress. The recent Himalayan flooding echoes the 2013 Kedarnath disaster, where cloudbursts killed over 6,000 people, as well as the 1998 Odisha Super Cyclone, which claimed over 10,000 lives and exposed critical gaps in early warning systems. Similar extreme events are escalating across India. Flooding in Kerala, Odisha, Assam, and Bihar routinely displaces millions, while shifting monsoons threaten food security. Melting Himalayan glaciers threaten downstream states like Uttarakhand, Himachal Pradesh, Punjab, Uttar Pradesh, and Bihar with destructive GLOFs. Meanwhile, coastal states face land loss from saltwater intrusion, and urban centers endure intensifying heat waves.

The human cost of climate change is felt heavily through lost productivity and compromised health. According to ILO estimates for the G20, over 23 million working-life years were lost globally per year between 2000 and 2015 due to environment-related hazards. In India alone, extreme heat exposure in 2024 resulted in an estimated 247 billion potential labor hours lost—representing $194 billion in income losses, according to the Lancet Countdown 2025 India Data Sheet. Agriculture accounted for 66% of lost hours, with construction accounting for 20%. Globally, a 2024 World Economic Forum report projects that climate-intensified disasters could cause 14.5 million deaths and $12.5 trillion in economic losses by 2050, driven primarily by heatwaves reducing labor productivity. To protect its citizens, India must act on five key priorities:

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ORISSA TIMES

Economic Progress, Social Displacement: The Human Cost of Coal Mining in Odisha

Dr R C Khuntia,
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Odisha's coalfields lie at the heart of India's development and energy ambitions. They power the country, support large industries and generate considerable revenue for the state exchequer. However, beneath this veneer of progress lies a disturbing human story: the dispossession of land losers—predominantly Adivasi families—whose homes, agricultural fields, water sources, forests and cultural landscapes are steadily being transformed into mining sites. Odisha is India's most coal-rich state and possesses approximately one-fourth of the country's total coal reserves, estimated at more than 20 billion tonnes. The state's major coal-producing regions are the Talcher coalfield in Angul district and the Ib Valley coalfield in Jharsuguda and Sundargarh districts. Most of the coal in these regions is extracted by Mahanadi Coalfields Limited, a subsidiary of Coal India Limited, along with captive mining blocks operated by public-sector and private entities. Although coal remains an important contributor to Odisha's economy and public revenue, the continuing expansion of mining raises a critical question: who is paying the real price of development? For many households, mining has meant the loss of ancestral land, food security and traditional livelihoods. It has also undermined self-sufficient rural life, increased dependence on uncertain wage labour and contributed to migration and inadequate rehabilitation. The consequences extend beyond the loss of income to declining agricultural productivity, environmental degradation, health problems and the disruption of traditional livelihoods, social relationships and community institutions. This article examines how coal mining has affected the socio-economic conditions, traditional livelihoods, health conditions and quality of life of displaced families in Odisha, and why development must be pursued through justice, participation and genuine livelihood restoration. The displaced population includes both Adivasi and non-Adivasi households. Major indigenous communities living in and around Odisha's coalfields include the Kisan, Munda, Oraon, Kharia, Gond and Bhuyan communities. These groups have traditionally depended on agriculture, forests, livestock, common lands and local water resources for their survival. Displacement has altered the traditional structure of village life. Joint and extended families have often become fragmented, while younger members have migrated or sought employment outside the resettlement areas. The weakening of neighbourhood ties, customary institutions and community support systems has increased social insecurity among displaced households. The loss of common resources due to mining is particularly damaging. A family may own little private land but depend heavily on forests and common lands for food, fodder, fuel and seasonal income. Once these resources are taken over for mining, families face a decline in livelihood opportunities and become increasingly dependent on cash income. Research has found that the erosion of forests, commons and sacred landscapes has weakened both the livelihoods and the cultural and spiritual ties of Adivasi communities. Before mining began, agriculture was the main source of household livelihood and security. Families cultivated paddy and other crops, reared livestock, and supplemented their income through the collection of forest produce, agricultural labour and small rural enterprises. After displacement, many families lost access to cultivable land and common-property resources. A study of the Ib Valley region reported that the proportion of landless displaced households increased sharply—from 56 per cent before displacement to 92 per cent after displacement in the sample studied. Coal dust and wastewater from mining operations contaminate surrounding farmland, reduce soil fertility and lower crop yields, making cultivation increasingly unviable. The transition from farming to wage labour has made families more dependent on uncertain cash incomes. While some households have obtained employment in mines or related activities, others have been pushed into casual labour, petty trade, transport work, construction and migration. Mining has increased the incomes of some households, particularly those that have received permanent employment or compensation. However, these gains have not been distributed equally. Families with formal land records, better education or stronger access to project authorities are generally better positioned to secure compensation and employment. A NITI Aayog study of Mahanadi Coalfields projects found that household incomes in several mining-affected villages increased after the projects began. However, this improvement must be considered alongside the loss of land, declining agricultural productivity caused by the acquisition of cultivable land, rising living costs, increasing dependence on market purchases and unequal access to permanent employment. Higher cash income does not necessarily translate into improved well-being. In the past, households produced part of their own food and collected fuel, fodder and forest products at little or no monetary cost. After relocation, these necessities often have to be purchased, making families more vulnerable to inflation, debt and interruptions in income.

Displacement is often described as a one-time event, but its effects may continue for decades. Families may be moved from established villages to resettlement colonies where houses are provided, but agricultural land, employment opportunities, transport, schools and healthcare facilities remain inadequate. In one documented resettlement experience in the Ib Valley region, water was supplied for only a short period each day. Children had to travel several kilometres to attend school, and the settlement lacked convenient access to market facilities. Many land losers experience delays in receiving compensation, rehabilitation benefits and employment promised under project agreements. An Amnesty International report on coal mining in India, including the Basundhara-West mine in Odisha, raised concerns regarding land acquisition, rehabilitation and environmental impacts. Cash compensation alone cannot guarantee a secure future. Once the money is spent, families without alternative land, skills or stable employment may fall into debt. The situation is especially difficult for women, elderly people, landless labourers and households whose customary rights have not been formally recorded. Health problems reported in Odisha's mining regions include respiratory diseases such as tuberculosis, chronic bronchitis, asthma and other lung disorders, as well as cardiovascular and kidney-related problems, eye irritation, skin diseases, illnesses caused by unsafe water and psychological stress resulting from forced displacement and the loss of livelihoods. Evidence from Talcher and other coalfield areas indicates that respiratory illness is among the most common health problems reported by residents of mining villages. These problems include persistent coughs and colds, breathlessness, wheezing, asthma attacks, bronchitis, respiratory-tract infections, tuberculosis and other serious lung diseases. Dust particles in the air and on homes and agricultural fields irritate the eyes and skin of communities living near coal mines. Many have reported eye allergies, redness, burning, watering and persistent eye irritation, as well as skin rashes, itching, scabies, dermatitis and other allergic reactions. Long-term exposure to pollution place additional stress on the heart and increase health risks for elderly people and those with hypertension or diabetes. Research on coalfield communities in western Odisha has also raised concerns about possible heart- and kidney-related risks associated with air pollution and environmental contamination. Silicosis is another serious occupational risk for workers exposed to crystalline silica dust during drilling, blasting, crushing and construction activities. Dust exposure, heat and strenuous labour may further aggravate existing health conditions. Inadequate healthcare can worsen these conditions and increase the vulnerability of affected workers and their families. Studies of coal-mining areas in Odisha have reported that pollution of wells, ponds, streams and agricultural land further reduces household income and weakens livelihood security. A baseline study covering mining areas in Talcher and Ib Valley found that the overall quality-of-life index of the sampled households ranged from "very poor" to "poor", reflecting limited access to infrastructure, economic resources and modern amenities. Displacement has had a particularly serious impact on women. Before mining began, women participated in farming, livestock care, the collection of forest produce, agricultural labour, food processing and small home-based enterprises. After land acquisition, many of these activities disappeared. Women's work has increasingly become unpaid domestic labour, while others have entered low-income activities such as basket making, beedi rolling, vending and casual labour. In some resettled communities, women have taken up bamboo work and other home-based activities because one male income is insufficient to support the household. Improving the lives and livelihoods of displaced people requires a rehabilitation approach that goes beyond one-time compensation and the construction of resettlement houses. It must ensure sustainable livelihoods, essential services, social security, community participation and long-term income restoration. It should be designed as a long-term, rights-based livelihood restoration programme that places affected communities at the centre of decision-making. Wherever possible, agricultural families should receive cultivable land or equivalent livelihood assets, while the customary rights of Adivasi, forest-dependent, landless and other vulnerable households must be formally recognised and protected. Employment guarantees should be linked to actual vacancies in mining and non-mining sectors and supported by demand-based skill training, certification and placement assistance. Special attention must be given to women through self-help groups, producer collectives, food processing, livestock rearing, agro-enterprises and access to credit and markets. Resettlement sites must provide safe drinking water, schools, health centres, roads, drainage, transport and other essential services. Long-term income restoration should be promoted through small enterprises, climate-resilient agriculture, vocational training and diversified livelihoods. Regular health and environmental monitoring, including publicly accessible information on pollution and disease, should be made mandatory. Social audits, time-bound grievance redressal and transparent disclosure of rehabilitation commitments must ensure accountability. Gram Sabhas and displaced families should have meaningful representation in planning, implementation and monitoring committees. In addition, CSR programmes should be strategically aligned with community priorities and focus on livelihood promotion, women's empowerment, education, healthcare, skill development, water security and local enterprise development. Only such participatory, inclusive and accountable rehabilitation can transform displacement from a source of prolonged poverty into an opportunity for dignified and sustainable development. The real success of a coal project is not only the amount of coal extracted or electricity generated. It is whether displaced families secure better housing, dignified employment, improved health, quality education and a stronger future for their children. This kind of transition requires planning before displacement begins. Affected families should be treated as partners in development, not obstacles to extraction. Their rights, knowledge and priorities must shape decisions regarding land, forests, water, employment and rehabilitation.

THE KALINGA CHRONICLE

Economic Progress, Social Displacement: The Human Cost of Coal Mining in Odisha

Dr R C Khuntia



Odisha's coalfields lie at the heart of India's development and energy ambitions. They power the country, support large industries and generate considerable revenue for the state exchequer. However, beneath this veneer of progress lies a disturbing human story: the dispossession of land losers—predominantly Adivasi families—whose homes, agricultural fields, water sources, forests and cultural landscapes are steadily being transformed into mining sites.

Odisha is India's most coal-rich state and possesses approximately one-fourth of the country's total coal reserves, estimated at more than 20 billion tonnes. The state's major coal-producing regions are the Talcher coalfield in Angul district and the Ib Valley coalfield in Jharsuguda and Sundargarh districts. Most of the coal in these regions is extracted by Mahanadi Coalfields Limited, a subsidiary of Coal India Limited, along with captive mining blocks operated by public-sector and private entities. Although coal remains an important contributor to Odisha's economy and public revenue, the continuing expansion of mining raises a critical question: who is paying the real price of development?

For many households, mining has meant the loss of ancestral land, food security and traditional livelihoods. It has also undermined self-sufficient rural life, increased dependence on uncertain wage labour and contributed to migration and inadequate rehabilitation. The consequences extend beyond the loss of income to declining agricultural productivity, environmental degradation, health problems and the disruption of traditional livelihoods, social relationships and community institutions. This article examines how coal mining has affected the socio-economic conditions, traditional livelihoods, health conditions and quality of life of displaced families in Odisha, and why development must be pursued through justice, participation and genuine livelihood restoration.

The displaced population includes both Adivasi and non-Adivasi households. Major indigenous communities living in and around Odisha's coalfields include the Kisan, Munda, Oraon, Kharia, Gond and Bhuyan communities. These groups have traditionally depended on agriculture, forests, livestock, common lands and local water resources for their survival.

Displacement has altered the traditional structure of village life. Joint and extended families have often become fragmented, while younger members have migrated or sought employment outside the resettlement areas. The weakening of neighbourhood ties, customary institutions and community support systems has increased social insecurity among displaced households.

The loss of common resources due to mining is particularly damaging. A family may own little private land but depend heavily on forests and common lands for food, fodder, fuel and seasonal income. Once these resources are taken over for mining, families face a decline in livelihood opportunities and become increasingly dependent on cash income. Research has found that the erosion of forests, commons and sacred landscapes has weakened both the livelihoods and the cultural and spiritual ties of Adivasi communities.

Before mining began, agriculture was the main source of household livelihood and security. Families cultivated paddy and other crops, reared livestock, and supplemented their income through the collection of forest produce, agricultural labour and small rural enterprises.

After displacement, many families lost access to cultivable land and common-property resources. A study of the Ib Valley region reported that the proportion of landless displaced households increased sharply—from 56 per cent before displacement to 92 per cent after displacement in the sample studied. Coal dust and wastewater from mining operations contaminate surrounding farmland, reduce soil fertility and lower crop yields, making cultivation increasingly unviable.

The transition from farming to wage labour has made families more dependent on uncertain cash incomes. While some households have obtained employment in mines or related activities, others have been pushed into casual labour, petty trade, transport work, construction and migration.



Mining has increased the incomes of some households, particularly those that have received permanent employment or compensation. However, these gains have not been distributed equally. Families with formal land records, better education or stronger access to project authorities are generally better positioned to secure compensation and employment.

A NITI Aayog study of Mahanadi Coalfields projects found that household incomes in several mining-affected villages increased after the projects began. However, this improvement must be considered alongside the loss of land, declining agricultural productivity caused by the acquisition of cultivable land, rising living costs, increasing dependence on market purchases and unequal access to permanent employment.

Higher cash income does not necessarily translate into improved well-being. In the past, households produced part of their own food and collected fuel, fodder and forest products at little or no monetary cost. After relocation, these necessities often have to be purchased, making families more vulnerable to inflation, debt and interruptions in income.

Displacement is often described as a one-time event, but its effects may continue for decades. Families may be moved from established villages to resettlement colonies where houses are provided, but agricultural land, employment opportunities, transport, schools and healthcare facilities remain inadequate.

In one documented resettlement experience in the Ib Valley region, water was supplied for only a short period each day. Children had to travel several kilometres to attend school, and the settlement lacked convenient access to market facilities.

Many land losers experience delays in receiving compensation, rehabilitation benefits and employment promised under project agreements. An Amnesty International report on coal mining in India, including the Basundhara-West mine in Odisha, raised concerns regarding land acquisition, rehabilitation and environmental impacts. Cash compensation alone cannot guarantee a secure future. Once the money is spent, families without alternative land, skills or stable employment may fall into debt. The situation is especially difficult for women, elderly people, landless labourers and households whose customary rights have not been formally recorded.

Health problems reported in Odisha's mining regions include respiratory diseases such as tuberculosis, chronic bronchitis, asthma and other lung disorders, as well as cardiovascular and kidney-related problems, eye irritation, skin diseases, illnesses caused by unsafe water and psychological stress resulting from forced displacement and the loss of livelihoods.

Evidence from Talcher and other coalfield areas indicates that respiratory illness is among the most common health problems reported by residents of mining villages. These problems include persistent coughs and colds, breathlessness, wheezing, asthma attacks, bronchitis, respiratory-tract infections, tuberculosis and other serious lung diseases.

Dust particles in the air and on homes and agricultural fields irritate the eyes and skin of communities living near coal mines. Many have reported eye allergies, redness, burning, watering and persistent eye irritation, as well as skin rashes, itching, scabies, dermatitis and other allergic reactions. Long-term exposure to pollution place additional stress on the heart and increase health risks for elderly people and those with hypertension or diabetes. Research on coalfield communities in western Odisha has also raised concerns about possible heart- and kidney-related risks associated with air pollution and environmental contamination.

Silicosis is another serious occupational risk for workers exposed to crystalline silica dust during drilling, blasting, crushing and construction activities. Dust exposure, heat and strenuous labour may further aggravate existing health conditions. Inadequate healthcare can worsen these conditions and increase the vulnerability of affected workers and their families.

Studies of coal-mining areas in Odisha have reported that pollution of wells, ponds, streams and agricultural land further reduces household income and weakens livelihood security. A baseline study covering mining areas in Talcher and Ib Valley found that the overall quality-of-life index of the sampled households ranged from "very poor" to "poor", reflecting limited access to infrastructure, economic resources and modern amenities.

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Improving the lives and livelihoods of displaced people requires a rehabilitation approach that goes beyond one-time compensation and the construction of resettlement houses. It must ensure sustainable livelihoods, essential services, social security, community participation and long-term income restoration. It should be designed as a long-term, rights-based livelihood restoration programme that places affected communities at the centre of decision-making.

Wherever possible, agricultural families should receive cultivable land or equivalent livelihood assets, while the customary rights of Adivasi, forest-dependent, landless and other vulnerable households must be formally recognised and protected. Employment guarantees should be linked to actual vacancies in mining and non-mining sectors and supported by demand-based skill training, certification and placement assistance. Special attention must be given to women through self-help groups, producer collectives, food processing, livestock rearing, agro-enterprises and access to credit and markets.

Resettlement sites must provide safe drinking water, schools, health centres, roads, drainage, transport and other essential services. Long-term income restoration should be promoted through small enterprises, climate-resilient agriculture, vocational training and diversified livelihoods. Regular health and environmental monitoring, including publicly accessible information on pollution and disease, should be made mandatory. Social audits, time-bound grievance redressal and transparent disclosure of rehabilitation commitments must ensure accountability. Gram Sabhas and displaced families should have meaningful representation in planning, implementation and monitoring committees.

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Image

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Dust particles in the air and on homes and agricultural fields irritate the eyes and skin of communities living near coal mines. Many have reported eye allergies, redness, burning, watering and persistent eye irritation, as well as skin rashes, itching, scabies, dermatitis and other allergic reactions. Long-term exposure to pollution place additional stress on the heart and increase health risks for elderly people and those with hypertension or diabetes. Research on coalfield communities in western Odisha has also raised concerns about possible heart- and kidney-related risks associated with air pollution and environmental contamination.

Silicosis is another serious occupational risk for workers exposed to crystalline silica dust during drilling, blasting, crushing and construction activities. Dust exposure, heat and strenuous labour may further aggravate existing health conditions. Inadequate healthcare can worsen these conditions and increase the vulnerability of affected workers and their families.

Studies of coal-mining areas in Odisha have reported that pollution of wells, ponds, streams and agricultural land further reduces household income and weakens livelihood security. A baseline study covering mining areas in Talcher and Ib Valley found that the overall quality-of-life index of the sampled households ranged from "very poor" to "poor", reflecting limited access to infrastructure, economic resources and modern amenities.

Displacement has had a particularly serious impact on women. Before mining began, women participated in farming, livestock care, the collection of forest produce, agricultural labour, food processing and small home-based enterprises. After land acquisition, many of these activities disappeared. Women's work has increasingly become unpaid domestic labour, while others have entered low-income activities such as basket making, beedi rolling, vending and casual labour. In some resettled communities, women have taken up bamboo work and other home-based activities because one male income is insufficient to support the household.

Improving the lives and livelihoods of displaced people requires a rehabilitation approach that goes beyond one-time compensation and the construction of resettlement houses. It must ensure sustainable livelihoods, essential services, social security, community participation and long-term income restoration. It should be designed as a long-term, rights-based livelihood restoration programme that places affected communities at the centre of decision-making. Wherever possible, agricultural families should receive cultivable land or equivalent livelihood assets, while the customary rights of Adivasi, forest-dependent, landless and other vulnerable households must be formally recognised and protected. Employment guarantees should be linked to actual vacancies in mining and non-mining sectors and supported by demand-based skill training, certification and placement assistance. Special attention must be given to women through self-help groups, producer collectives, food processing, livestock rearing, agro-enterprises and access to credit and markets. Resettlement sites must provide safe drinking water, schools, health centres, roads, drainage, transport and other essential services. Long-term income restoration should be promoted through small enterprises, climate-resilient agriculture, vocational training and diversified livelihoods. Regular health and environmental monitoring, including publicly accessible information on pollution and disease, should be made mandatory. Social audits, time-bound grievance redressal and transparent disclosure of rehabilitation commitments must ensure accountability. Gram Sabhas and displaced families should have meaningful representation in planning, implementation and monitoring committees. In addition, CSR programmes should be strategically aligned with community priorities and focus on livelihood promotion, women's empowerment, education, healthcare, skill development, water security and local enterprise development. Only such participatory, inclusive and accountable rehabilitation can transform displacement from a source of prolonged poverty into an opportunity for dignified and sustainable development.

The real success of a coal project is not only the amount of coal extracted or electricity generated. It is whether displaced families secure better housing, dignified employment, improved health, quality education and a stronger future for their children. This kind of transition requires planning before displacement begins. Affected families should be treated as partners in development, not obstacles to extraction. Their rights, knowledge and priorities must shape decisions regarding land, forests, water, employment and rehabilitation.

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Promoting PDMC Implementation in Haryana Through Micro Irrigation Training Programs

Dr Partha Sarathi Das, Treasurer, IndiaNPIM, New Delhi



Water scarcity is one of the most urgent threats to rural livelihoods and food security in India. Smallholder farmers, who depend on rainfall and limited irrigation sources, face declining groundwater, erratic monsoons, and rising costs for energy and inputs. To build resilience and ensure sustainable crop production, communities must shift from centralized, input heavy irrigation to locally owned, water efficient systems. With this back drop, MICA, Haryana gave IndiaNPIM, an opportunity to conduct 10 training programs in 10 villages of Jind district of Haryana. The training program aimed to promote farmer adoption of micro irrigation under the RKVY — Per Drop More Crop (PDMC) initiative, for improving water use efficiency and farm incomes. Its core objectives were to promote water conserving practices and advanced irrigation technologies; raise awareness about government subsidies and streamline PDMC portal registration; and encourage crop diversification alongside appropriate modern machinery use. The training programs were designed to equip farmers with the knowledge and skills to adopt micro-irrigation systems—such as drip and sprinkler irrigation—that can save 30–60% of water and boost crop yields by 20–50%.

The Participants and Distinguished Resource Persons

Sponsored by MICADA, Haryana, and organized by IndiaNPIM and R G Foundation, the training programs in 10 villages of Jind and targeted over 1500 enthusiastic farmers, for intensive learning and practical demonstrations.
The training programs also brought together a diverse and highly qualified team of resource persons, each contributing unique expertise to the initiative. The resource panel included government officials, scientists, technical experts, academic professionals, and progressive farmers, ensuring a holistic approach to farmer education and capacity building.

Among the key figures was Shri Attinder Pal, Executive Engineer, MICADA, Jind and Shri Mukesh Kumar, SDO, MICADA, Jind, who played pivotal administrative and technical role in overseeing water management projects and facilitating government schemes like 'Per Drop More Crop.' Their efforts were complemented by Shri Pawan Kumar, Junior Engineer, who managed the technical roll-out and quality monitoring of micro-irrigation infrastructure, working closely with farmers to ensure effective implementation.

The scientific community was well represented by experts such as Dr. B.P. Rana, a retired scientist from Krishi Vigyan Kendra, Jind, renowned for his work in crop management and technology extension. Dr. Subhash Chander from HAMETI, Jind, brought deep knowledge of natural farming and sustainable practices, regularly training both farmers and agricultural officers. Academic voices like Dr. Raveena and Dr. Ankit Gill from Baba Mastnath University contributed insights into plant-water relations, soil science, and sustainable crop production, bridging the gap between research and field application.

Technical expertise was further strengthened by Engineer Karamveer Singh, who led projects on pond rejuvenation, grey water treatment, and the implementation of micro-irrigation projects in different districts of Haryana. Engineer Ravi Kumar from KVK, Jind, provided hands-on guidance in the design and maintenance of micro-irrigation systems, ensuring that farmers could transition from traditional flood irrigation to more efficient methods.

A unique strength of the program was the inclusion of progressive farmers such as Shri Ishwar Singh, Shri Sultan Singh, and Shri Manvir Singh. These individuals have successfully adopted micro-irrigation and natural farming techniques, serving as role models and master trainers for their peers. Their real-life experiences and willingness to share practical knowledge inspired confidence and peer learning among participants.

Collectively, the resource persons ensured that the training program was both scientifically robust and practically relevant. Their combined efforts not only educated farmers on the technical and financial aspects of micro-irrigation but also motivated them to adopt water-efficient and sustainable agricultural practices. The diversity and depth of the resource team played a crucial role in the program's success, fostering a collaborative environment where knowledge was shared, and innovation was encouraged.

Key Highlights and Learnings from the Training Programme

The highlight of the program was its focus on micro-irrigation techniques such as drip and sprinkler systems, which were presented as effective solutions to the region's growing water scarcity. Participants learned about the installation, operation, and maintenance of these systems, as well as the economic and agronomic benefits, including water savings of 30–60% and yield improvements of 20–50%. The training also emphasized the importance of government schemes like the Per Drop More Crop (PDMC), guiding farmers on how to access subsidies and support through the MICADA portal. The agenda was comprehensive, covering topics such as water use efficiency, fertigation, mulching, crop diversification, and the integration of modern agricultural machinery. Sessions were delivered by a diverse panel of experts, including government officials, scientists, and progressive farmers, who shared real-life examples and case studies to make the content relatable and actionable. The participatory approach encouraged open discussions, experience sharing, and hands-on learning, which was highly appreciated by the attendees.

The Impact, Outcomes and Benefits of the Training Programmes

The micro-irrigation training programs conducted in Haryana have made a significant impact on the region's agricultural landscape. Haryana, ranking ninth in India for micro-irrigation adoption, has seen over 130,000 hectares brought under the RKVY "Per Drop More Crop" initiative.

The training sessions were well-received, with 82% of participants stating that the content was new to them and expressing a strong intention to adopt micro-irrigation in their daily farming practices. The programs were praised for their practical orientation, especially in demonstrating the effectiveness of drip irrigation for cotton and horticultural crops.

Feedback from participants highlighted high satisfaction levels, with an average rating of 8.1 out of 10. Most farmers found the training easy to understand, and trainers were commended for their knowledge and clarity. The majority felt that the duration and content of the sessions were appropriate, and 81% reported tangible benefits from attending. Despite these successes, the assessment also identified several challenges. The closure of the subsidy registration portal has prevented many interested farmers from accessing financial support for micro-irrigation systems. Delays in payment release, the need for better post-installation support, and calls for greater departmental involvement and transparency were common concerns among participants. Suggestions for improvement included faster subsidy disbursement, improved material quality, less dependence on company dealers, and the establishment of customer care centers. In conclusion, the micro-irrigation training programs in Haryana have effectively increased awareness, adoption, and satisfaction among farmers, leading to improved water management and agricultural productivity. Addressing operational challenges and expanding support mechanisms will be crucial for sustaining and amplifying these positive outcomes in the future.