

## **IMPACT OF URANIUM MINING ON WOMEN'S HEALTH IN TRIBAL BELT**

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### **Introduction**

Over the past 200 years, industrialization has been responsible for increasing pollution and leading to increased degradation of air, water and land resources. Exploitation of natural resources has devastating effects upon environment, people's health, quality of life; particularly for women and children. They are exposed to toxic substances present in the environment which make them susceptible to various and serious health problems (Chelala, 2011). Women have always been passive participants in development yet they are the key agents of sustainable and health development strategies. Women have actively played a significant role in protecting the environment. They have contributed actively in identifying the environmental problems and planning activities to gear up the sustainable development of their communities (Chelala, 2011). Women from the rural area and marginalized communities are always socially excluded and have suffered the ill-effects of development, pollution and environmental destruction (Devi, 1994).

Mining is inherently an unsustainable and harmful activity for the human health, biodiversity and environment. It leaves the negative consequences upon the society and environment to bear. Mineral extraction is done for the industrial and economic development of the country. Mining is boon for few peoples but for the indigenous and relatively backward communities' uranium mining has become a curse. Since 1991, with the emergence of economic reforms, liberalization and globalization, the concerns for the unsustainable use of natural resources and environmental damages came into forefront. Mining industry is perceived as dirty polluting industry and unsustainable activity concerning exploitation of natural resources (forest, land and minerals), damaging the natural environment and habitat, and depriving the tribal communities residing in these areas (Mohanty & Goyal, 2012).

### **Uranium mining - a threat to Sustainable Development**

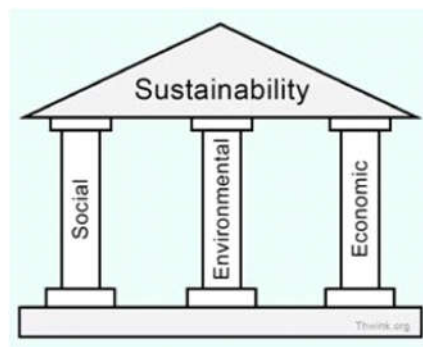
The national interest of accumulation of wealth and power through access of resources in the world market (resource security) and extending national security with the help of nuclear power have exploited their own land and people. Uranium extraction has led to

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environmental degradation and the sustainability of the ecosystem remains highly questionable. Sustainable development includes the social and economic development during every stage of the life cycle of uranium mining- exploration, mine planning, construction, mineral extraction, mine closure and post-closure reclamation and rehabilitation (Mohanty & Goyal, 2012).

The sustainability of mining stands on three pillars - social sustainability, environmental sustainability and economic sustainability. Environmental sustainability is the most important of all as the other two depend on it. Figure 1 shows the pillars of sustainability which was proposed by Herman Daly (1990). According to Daly, the maintenance of natural capital is for (i) Renewable resource: rate of harvest should not exceed the rate of regeneration (sustainable yield), (ii) Pollution: rate of waste generation should not exceed the assimilative capacity of the environment (sustainable waste disposal) and (iii) Non-renewable resources: depletion of non-renewable should require comparable development of renewable substitute for resources. Hence, environmental sustainability is the rated of renewable resource harvest, pollution creation and non-renewable resource depletion which if cannot continue indefinitely then it is not sustainable. Therefore, sustainability includes clean healthy environment to live in, satisfactory level of economic well-being and robust level of social fulfilment (Thwink Org., 2014).



**Figure 1- Pillars of sustainability Source: (Thwink Org., 2014)**

### **Hazard from Uranium Mining**

Uranium is a radioactive ore and is unstable, a non-renewable resource, and readily soluble in water (Bersimbaev & Bulgakova, 2015). Uranium is mined to get the fuel for the power plants and for the purpose of national interest. Uranium under the earth is secure but becomes dangerous when extracted. Uranium ore emits radon gas through breakdown of uranium in soil and rocks leading to potential health threats (Simon, 2018). Inhalation or injection of fine dust particles and radon gas is dangerous. Radon is a radioactive gas that occurs as an indirect decay product of uranium; the building materials of residential house

can lead to high level of indoor radiation which can lead to radiation induced cancer (Bersimbaev & Bulgakova, 2015). The radioactive decay of uranium results in alpha or beta particles emission from nucleus and it also emits gamma radiation which increases health hazards. Health risk is posed by heap of uranium ores, processed byproducts as slurry and sludge, tailing and evaporation ponds and also through the left-over rocks. Tailings can contaminate the groundwater source through porous separation layer, erosion by wind and seeping rainwater and also through lack of tailing covering.

Uranium is extracted for production of nuclear energy and nuclear weapons. There are different ways to extract uranium from nature- through open pits, underground mining and in-situ leaching technique where a solution is injected in underground uranium deposits to dissolve it and then it is extracted. During milling and processing, uranium oxide (U<sub>3</sub>O<sub>8</sub>) is extracted from the ore to form yellow cakes which have about 90 per cent of uranium oxide. The conventional methods generate substantial amount of mill tailing waste having one per cent of unstable portion whereas in-situ leaching the unstable portion is in the ground. The radioactive components of mill tailing contains thorium-230 and radium-226 having half-life of about 75,000 and 1600 years respectively and also other heavy metals like manganese and molybdenum. Both the mining methods lead to hazard as the uranium decay product can be inhaled and consumed as it contaminates air, soil and water. It leaches the aquifer and contaminates the ground water (IEER, 2011).

### **Effect of Uranium Mining**

Studies have shown that uranium may affect reproduction, fetal development, increased risk of leukemia and soft tissue cancers (IEER, 2011). Uranium may be associated with genotoxicity effects, strange sleeping sickness, birth defects in foetuses and infants, lungs cancer and radon increase the frequency of chromosomal aberrations in blood lymphocytes (Bersimbaev & Bulgakova, 2015). Most of uranium mining regions belong to aboriginal and indigenous communities. They are underprivileged and marginalized hence they are always suppressed and dominated by others. The spillage of radioactive uranium wastes from dumping grounds has poisoned the air, water and soil. This has amplified the dangers for the entire ecology. The people of Jharkhand have been told not to consume products of their own field and consume water from source but they have not provided reasons for it.

Uranium mining increases the vulnerability towards women. According to Kaisha Atakhanova from Kazakhstan, board member of Eco Forum noted that there is 100 uranium mines, operating since the past 50 years. About 200 million tons of radioactive waste was generated to produce 60,000 tons of uranium. The low radioactive waste has polluted the water resources, air and soil. The uranium tailing is used by children as playgrounds. A lot of

adverse health impacts have emerged and there is a lack of epidemiological data, even being of a highly classified nature. People are not informed of the impact of radiation, and there is no investigation carried on. There was an urge from such groups to the United Nations so that their environment could be a radiation free zone. The mining industry sets up but does not have any temporary or permanent solutions for the cleaning of uranium mining tailings (Atakhanova, n.d.).

Likewise, incidents are happening throughout the world such as Navajo (North America) and Iraq, where extraction and deployment of uranium have resulted into birth epidemics and have traumatized the indigenous communities that are hired or forced to dig up uranium from their own land. Uranium, being a metal can be used both for survival and even the destruction. For example, nuclear medicines and the nuclear bomb. Yet, the linkage between uranium and cancer-causing health impacts have remained secret knowledge held by the ruling classes. It was never told to the miners working in the mines nor the community residing near the mine area or the uranium waste disposal site. Hence, the unaware miners became the carriers of uranium dust to their families.

During the year 1949 to 1989, Semioalatinsk region of Kazakhstan was used for nuclear weapon testing for Soviet army which had repeatedly exposed the local residents to radiation. The radionuclides contaminated the atmosphere and environment leading to acute and chronic radiation exposure. Kazakhstan has 12 per cent of world's uranium resource, and mining and milling activity has polluted the environment. The radiation exposure rate of those residing in the area are very high, ranging from 3.1 to 8.1 mSv/year. Soil contamination is about 300000 Bq/m<sup>3</sup>, air contamination ranges between 5 to 2349 Bq/m<sup>3</sup> and indoor concentration ranges from about 6000- 12,000 Bq/m<sup>3</sup> (Bersimbaev & Bulgakova, 2015).

### **Initiative of Women against Uranium Mining**

Similarly, the region of Nebraska ripe is facing a battle between the environmental advocates and the energy corporations to protect the water resources. Thousands of uranium wells are located within the Lakota Treaty Territories at Crow Butte Uranium Mine. Uranium is extracted using in-situ leaching techniques where water is injected under high pressure into aquifers to extract uranium which is then converted into yellowcake. About 700,000 pounds of uranium is mined every year and then shipped to Canada to be sold in open market. The Crow Butte Resource had applied for the renewal permit and expansion of site. Uranium mining uses water for its extraction and processing, it can cause contamination of surrounding water bodies which becomes difficult to restore. The locals have come across rise in illnesses and premature deaths among neighbourhoods, and the wells were

tested for high radiation, arsenic and lead. In 2008, one woman from the organization filed an application to the Nuclear Regulatory Commission to dismiss the permit renewal of the uranium mine belonging to Crow Butte Resource (CBR). Later, the organisation named Sisterhood along with others such as Clean Water Alliance to start educational events to create awareness among families and communities about dangers of uranium mining. Women mentioned that the "culture of silence" continues in the community despite of educating them. They feel scared and worried to complain openly. Individuals have been forced through family members to choose between their jobs or to raise their voices against water contamination. There is other renewable way to generate energy apart from nuclear source but no way to filter radiation. It is the responsibility of state to protect the public safety and security while handling the dangerous and toxic materials thereby reducing the risk factor (Towfighnia, 2015).

### **Effect on Women due to Uranium Mining**

Women are directly and indirectly exposed to uranium mining. The prolonged exposure of low dose of radionuclide increases the long-term effects. Living in the contaminated environment, using contaminated water sources for cleaning, consuming and washing clothes are some of the ways women are exposed to radiation and radioactive contamination. There is stigma attached due to exposure from radiation and many of the young girls residing in such locations are not preferred for marriage alliances (Pandey, 2014).

Women residing in the vicinity of mine sites and disposal sites have developed health issues. Many have faced disruption of menstrual cycle, inability to conceive, spontaneous abortions and others have suffered stillbirths and miscarriages, even the child is born with defects as encephalitis. Uranium poisoning is spreading regardless of gender, workers or communities and regional or nation borders. It has entered the entire ecosystem and food chain (Pandey, 2014). The range of health hazards among women varies from simple to fatal ailment. Women constantly get exposed to respiratory illness and become victims of skin diseases, tumours, cancers morbidity (breast, skin and lung cancer), terminal illness (leukaemia and thalassaemia), experience malfunctioning of various sensory organs, have long term impact on their reproductive health thereby giving birth to physically and mentally deformed children (Nayak & Mishra, 2005).

### **Material and Methods**

Jharkhand has rich mineral resources and forests, having a presence of rich biodiversity and home to marginalized tribal communities. The mineral development has both positive and negative effect on the economy and people. Mining has impacted the environment and the socio-economic and cultural life of the tribal communities in a negative way. East

Singhbhum district is the major uranium production centre of Jharkhand. The Singhbhum Thrust Belt (STB) of Singhbhum Copper Belt (SCB) comprises of mines such as Jaduguda, Bagjanta, Narawaphar, Turamdih, Bhatin, Banduhurang and Mohuldih (Subramanian & Chattopadhyay, 2006). With existing as well as emerging mines, one side employment were created and facilities were provided while on the other side it has created threats for the locality by generating lots of hazardous waste through uranium mines and dumping the toxic waste into the open tailing ponds. Mining in Jaduguda was started in 1967. These ores are of low grade as compared to other countries like Canada, Australia and Kazakhstan, yet it was explored rather than buying in open market at the name of national interest (Pandey, 2014). This has spread impact of radiation across the air, water, soil and plants.

The main object of this paper is to study the impact of uranium mining on the health of tribal women residing around the mine and tailing areas in Jharkhand. The mineral development has an interface with development, welfare of tribal communities, issues of environment and sustainability. The paper is based on primary as well as secondary data sources including the responses of women located in Jaduguda and Turamdih, Jharkhand, along with other published and unpublished research papers, print and electronic media. In-depth interviews were conducted with 5 women each from Jaduguda, Talsa and Turamdih village.

### **Radiation Exposure**

Uranium mining has potential threat to human health and adverse effect on aquatic life and animals. Mining countries operate under strict restrictions yet these operations do release toxic elements into the atmosphere such as radon gas, mine dust and slurry containing heavy metals which contaminate the soil and water. The exposure through uranium is still a contested topic.

Uncontrolled radiation exposures enter into the body through inhalation, ingestion or absorption through skin. Environmental pollution through uranium contaminates the food chain, drinking water and creates critical exposure pathways. Ingestion of contaminated food (grains, vegetables and fruits), animal products and water lead to deterministic health risks. Most of the local population are involved with rearing of livestock and growing crops. Surface dust enters into the human body via inhalation, ingestion or dermal contact with uranium ore which further gets deposited in bones and soft tissues of the brain, heart and liver. Dermal exposure happens when uranium powder or metal comes in contact with skin mostly seen among those working in mine sites, mills and waste disposal areas. Inhalation is the primary exposure for individuals and communities at risk. Contaminated air and dust

from mining and milling, remediation sites and activities, combustion of coal and workers clothing, hair and skin are common sources of exposure.

In Jaduguda, Talsa and Turamdih village, houses are located close to the uranium tailing pond. The villagers are unaware of the facts about radiation due to mining. This led to an increased threat of radiation related morbidity. Local population belonged to tribes predominately of Santhal and Ho tribes. The respondent mentioned that:

*"We are not acquainted of the radiation exposure but we have seen many families sufferings due to unidentified disease on children, women and workers".*

### Health Issues among Women

The residents suffer from a number of diseases such as congenital deformities, sterility, spontaneous abortions and cancers. Many women suffering from radiation related health abnormalities are treated as socially outcasts. According to Jingi Birulee, a woman who was born with conjoined middle and ring fingers on both hands as shown in figure 2. faced isolation and rejection as all her friends got married. She was left alone with this deformity. But she also feels that not marrying and having children proved better since her friends were humiliated and dragged out of their inlaws homes as she could not bear children and was termed as baanjh (sterile). Spontaneous abortions and miscarriages became common in Jaduguda (Pandey, 2014).



**Figure 2- Women with conjoined middle and ring fingers. Source: (Pandey, 2014)**

Mrs.Sooko Hembrom (name changed) from Turamdih village suffered from infections during her pregnancy, where she developed white spots on the body. She was unaware of the reason behind this infection. She mentioned that

*"Other women have also suffered such skin infections during their pregnancy".*

Mrs.NimoMurmu (name changed) from Talsa village suffered a miscarriage twice in 2014 and 2016. Few other women in the village also suffered miscarriages and stillbirths.

Such reproductive health issues are kept hidden and women feel they are incapable to conceive. According to respondents:

*"(Mere me kuch kami haiisliyemaimeragarbhnahihorahahai, meramaasiksamay me nahihotahai) I lack something within that is why I am unable to conceive. I often suffer irregular menstrual cycles".*

Women are exposed to slow radiation as the mine workers and labourers take their clothes to be washed at home and their wives and daughters wash clothes in contaminated ponds. According to Sanghmitra Gadekar, a nuclear scientist and editor of AnuMukti Journal, several of the women have been reported to have deformities (Pandey, 2014). Women respondents were hesitant to disclose such information regarding their reproductive health. Yet they mentioned about miscarriage/ pregnancy loss/ spontaneous abortion. One of the respondents mentioned that:

*"My neighbour had suffered a miscarriage twice".*

In the study villages incidences of miscarriages and stillbirths have become a common phenomenon. Women feel this as a stigma and curse from their god. There is no such thing called anti-radiation protective measures (Bersimbaev & Bulgakova, 2015) the poor tribal, marginalized population are paying the huge cost of national interest and nobody cares about them (Pandey, 2014).

Anamika Oraom, a 16 year old of Dungridih village, Jaduguda suffers from a malignant tumor on her face. Many such females cannot walk and talk due to physical deformity. According to Namita Sores, she suffered three miscarriages before giving birth to a child with physical deformities. Villagers had a superstitious belief that there was a forest area around the tailing pond which was marked as 'cursed' and infested by 'evil spirits'; and that any women passing through the area was believed to be affected by an evil gaze and hence suffered a miscarriage. Later, they became aware that, these health issues are due to mining operations. Between 1998 and 2003, 18 per cent of women suffered a miscarriage/ stillbirth, 30 per cent reported conception problems and most women complained of fatigue and weakness. The doctors are not able to diagnose the diseases prevalent in this region (Sen, 2020).

The in-depth interview revealed that many women suffered from health iniquities. According to Dura Soren (name changed), a 29 years old woman, she suffered with black patches and white sores on her whole body. Similarly many other women suffered from white patches and other types of skin issues. Kanjal Murmu (name changed), 20 years old, suffered miscarriages every three months of pregnancy for 10 years. Similar cases of



miscarriages, after 3 to 6 month of conception, have been reported. Dihlai Karmanar (name changed), 45 years old, suffered from paralysis.

Kavya Bhagat (name changed), a 20 year old, was born mentally disabled. Women have been born with diformities such as multiple fingers, fingerless, some young women became handicapped, either their hand/leg got twisted are within 5 years of birth or whole body gets disformed from birth. Later, it become stigma for women and a hindrance for their future. They live with this burden and also becomes socially excluded. Raine Murmu (name changed), 15 years old, had a tumor on the left hand since birth, which gradually grew bigger in size and aches. Smitra Sardar's (name changed) child died after 3 days of birth.

### **Position of women in mining industries**

Mining is the most hostile sector and patriarchal industry. India's mining sector has larger negative impacts on the tribal and dalit women. Mining activities have taken place in the forest and tribal region which degrades the status of tribal women to a life of deprivation. Women are considered unfit to work in mines for hard labour, and thus are prohibited to enter underground mines. They are often employed for administrative or menial lower rank activities like sweepers, cleaners or attendants in mining offices. The women literacy level in the mining region is poor which makes them more vulnerable and to remain in exploitative forms of labour in mining and prevent them to access skilled employment. Communities displaced by the mining projects, rehabilitation programs of government and industries have overlooked women for providing livelihood and throws them out of their economic activities. Employment eligibility in mining companies have always remained for the husband, father, brother, son or any male relatives of the household. Very few displaced women have been absorbed in small private or unorganised sector, having no work safety measures, which in turn makes them more susceptible to serious health hazards and exposed to sexual exploitation. Many women displaced by mining who live in mining areas are seldom employed in mines as scavengers of mining. They constantly face harassment from the mining companies, politicians and police for helping out this meagre form of earning. There is a distinct difference in the wages of men and women as majorly women in mines stated are employed in unskilled or low skilled jobs when compared to men. In the mining region of Maharashtra, Andhra Pradesh, Jharkhand and Odisha, mostly women are being employed as daily wage labourers or bonded labourers for head loading, stone breaking, cleaning and other forms of daily wage labours. Women are working on the mercy of petty contractors without any safety or security. Efforts are hardly made to train women for skilled activities, Women are prohibited to apply for professional courses in

mineral sciences or engineering. About 30-40 per cent of the workforce in organised mining sector belong to women which has been reduced drastically. Hence women living in the mining communities eke out their livelihood by illegally scavenging on the tailing and waste dumps and often are harassed by company guards, local mafias and the police. Displaced women in coal mines or gold or iron ore or bauxite mine have not been provided any employment opportunity (MAC, 2003).

Mining industry is male dominated, women participation being minimal. Before 1990s, women participation has been discouraged in the mining sector or constrained by legislations (African Minerals Act of 1991) and have prevented women from working underground. Women are not prohibited from working at mines above ground. South African Mining Charter, 2002 ensured 10 per cent of total workforce should have women by 2009. With the mechanization of mining industries, opportunities for women participation are increasing. Over the years, the working culture is changing worldwide. Women can be seen in senior executive and management positions. Gender equality is evolving in mining sector as well, although many challenges still persist.

### **Obstacles for women in mining sector**

Women working in the mines are exposed to hazardous substances without safety and suffer from several occupational illnesses like respiratory problems, silicosis, tuberculosis, leukemia, arthritides and reproductive problems. These can also create vulnerable situations for their children if they carry them to mines, exposing them to high levels of dust and noise pollution. Mining companies do not provide any creches facilities or attendants to look after their children. Poor working condition of mining industries have never been reported in any audits and no punitive actions have been taken against them. Women working in mines mostly work as seasonal workers and keep shifting occupations as mine workers and agricultural labourers. Mining companies take advantage over providing minimum wage to women based on irregularity of attendance. Mine workers often get trapped in the vicious cycle of a mine labourer for generations. Despite of many protective policies towards women, yet they live under exploitation and discrimination, and are pushed into contractual labour with lack of work safety and employment security. Women rights have been denied and they do lack equal employment opportunities in many such sectors (MAC, 2003). Women often face challenges that could be identified as difficulties operating in a male dominating culture, legislation, retaining skills, talent and experienced female to develop and guide other women to higher leadership roles. A collaborative approach between mining companies and communities, institutions like universities and organization dedicated to advancement and inclusion of women in mining are the need of the hour.

### **Double Vulnerability of Women**

Vulnerability is defined as the susceptibility towards harmful exposures to environmental stress and social change. Women experience double discrimination due to their gender (being a woman), and stigma associated with their health. Often they experience gendered vulnerabilities and discrimination being a member of a specific caste and ethnic group. They have little control over resources, decision making ability and have low status compared to men. Many women get married at a early age which make them susceptible to reproductive health morbidity and mortality. Though in tribal society women are treated with equality yet they do not have any control over ancestral property, access to education and nutritional needs. Women conceive at the age of 16-20 years in remote villages. Even they are unable to access good health care facilities. In the case of Jaduguda and Turamdih, women face health related issues, they have least accessibility to healthcare centres and most of them think that the diseased are a curse on them. When they are unable to conceive and face spontaneous abortions, they feel stigmatized. They work in agricultural fields as laborers and get exposed to contaminated water and radioactive dust particles.

The tribals, being uneducated, can not understand the economic and political interest of outsiders. They welcome everyone whole heartedly and are being victimized at present in their own lands. Most of the tribals are denied of the economic opportunities and property rights. The tribals have never thought of any protests for their rights. They are still facing issues of inclusion in and exclusion from the larger development paradigm.

Women on the other hand are the socially excluded section of the society. Tribal women are doubly vulnerable, as they belong to the marginalized sections and are less literate. They are included in various religious and cultural activities while they are excluded from access to health and education based on their social status and backwardness. They are pushed to the margins of the society by virtues of their inadequacy in life skills, education, living standard and poverty. It pulls them away from the mainstream opportunities and access to power. When tribals try to avail their benefits through the welfare schemes, again they have to face challenges in terms of identity crisis in availing reservation primarily as women and then as scheduled tribe.

Nuclear power has always been identified with risks and uncertainties. The expansion of India's nuclear energy programme has brought resistance across the nation. Women activists in India have come up with surveys, handing out pamphlets, forming communities, contacting journalists and staging protests. In India, women participation in Anti Nuclear groups is at a nascent stage. Though, women have tried protesting with hunger strike at the Kudankulam nuclear power plant, their voices have been suppressed by the

authorities(Doshi, 2016).

### **Conclusion**

Mineral extraction leaves a strong environmental footprint; it destroys the land, contaminates surfaces, ground water, air from toxic materials, destructs the habitat and affects human health. Mine waste is an alternation source of destruction that contaminates the air, water and soil with toxic elements. Mining project development happens in the remote and backward regions inhabited by the indigenois communities. It affects the environmntal health and socio-economical life of the people residing in the mining areas. Mining and development need to be sustainable and should not compromise the needs of both the present and future generation. The need includes of poor and marzinalized people.

Women have always been victimized by the increase in mining development in their backyards. Women should be well educatedand made wellawareof the harmful affects of uranium radiation, so that they can adopt precautionary measures to protect themselves as well as their families. Basic infrastructure should be provided by the government and mining companies so that they do not have to use contaminated water and food materials around the affected area.

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