

Occupational Health of Tribal Women in the Informal Sector Supply Chain



DHAATRI

A Resource Centre for Women and Children



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About Dhaatri:

An NGO working for the rights of women and children in India and the protection of the ecological resources and women's knowledge practices. We are a platform to amplify the voices of women, their struggles and demands for gender equality and environmental justice.

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Abstract:

This report focuses on the status of indigenous women from the Yanadi tribe as informal workers in the Silica quartz mines in the southern Indian state of Andhra Pradesh, where large numbers of small scale and informal silica mines operate, with and without licences. The results and observations are an outcome of a series of interactions with the women through workshops, field interviews and a dental camp conducted with local women, on the impacts of working and living in the vicinity of these small scale mines that are ad hoc, scattered and unregulated. The study is set in six villages in Tirupati (formerly SPSR Nellore) district where Silica and quartz mines are reported to be operating. This report is aimed at bringing to public attention, the gendered implications and challenges in the supply chains of extractives for resourcing raw materials for transition minerals like solar and allied industries. The processes of meeting the net zero targets in energy transition which are likely to place snow-balling demands on transition minerals, should also take into account environmental and labour concerns, particularly with regard to women mine workers who bear the brunt of global climate decisions.

Background Information:

Energy transition has been largely focussed on shifting from fossil fuels (oil, gas and coal) to one dominated by renewable energy sources like wind, hydrogen, solar and other alternatives which are notionally believed to be clean and green. This switch in decarbonisation is broadly accepted as sustainable by merely shifting from fossil fuel based technologies to renewables based technologies and trade. Energy transition is vital to saving the planet from the effects of climate change. However, it is also vital that we review current green energy models by tracing the routes of environmental resource exploitation, labour conditions in the entire supply chains across formal and informal sectors and consumption- distribution patterns across social hierarchies as well as the constitutional and international principles of business and human rights.

Under the Glasgow Climate Pact, 197 members signed the climate deal at the COP26, to explicitly reduce coal-based carbon emissions. India being a signatory of the UN Climate Summit, put forward the five elements aka Panchamrit of India's climate action (India's Stand at COP-26, 2022):

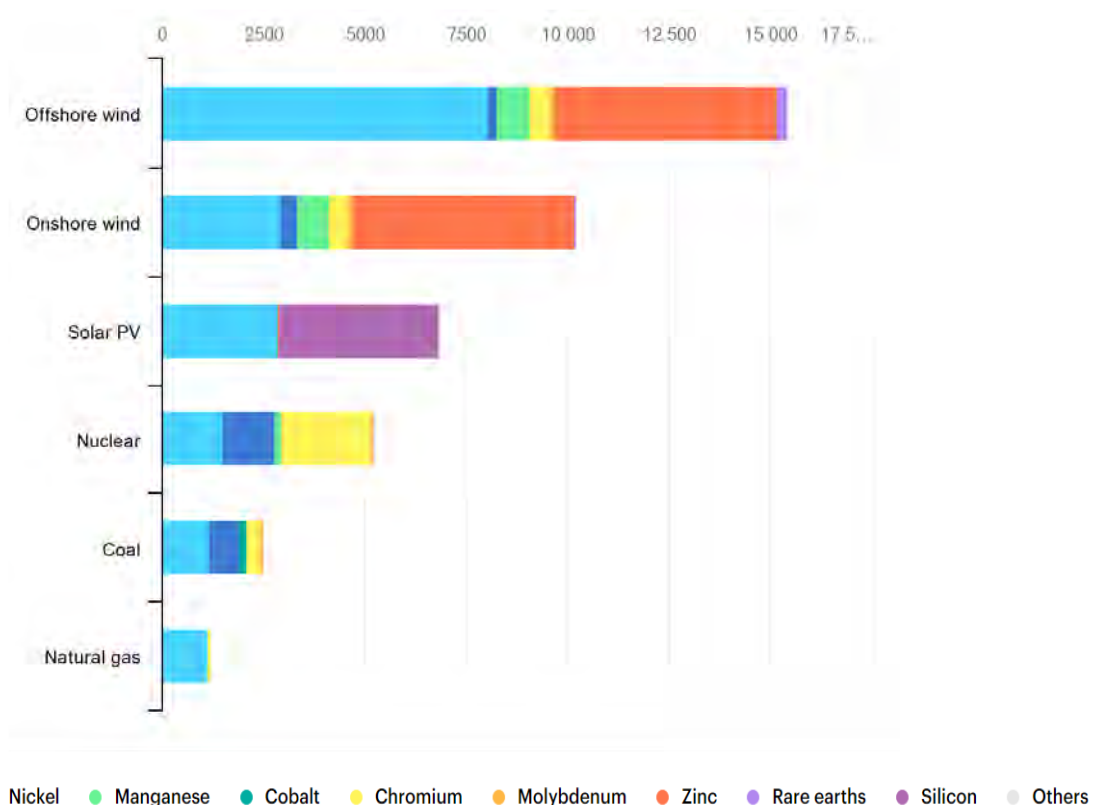
- i. Reach 500 GW Non-fossil energy capacity by 2030.
- ii. 50 per cent of its energy requirements from renewable energy by 2030.
- iii. Reduction of total projected carbon emissions by one billion tonnes from now to 2030.
- iv. Reduction of the carbon intensity of the economy by 45 per cent by 2030, over 2005 levels.
- v. Achieving the target of net zero emissions by 2070.

In order to reach these targets, India has an ambitious roadmap for its energy dependence to shift gears into a mix of fossil fuels and renewable energy. As stated by the Ministry of Renewable Energy, "Keeping in mind the sustainable development goals, India's power generation mix is rapidly shifting towards a more significant share of renewable energy. Today, India is the world's third largest producer of renewable energy, with 40% of its installed electricity capacity coming from non-fossil fuel sources". (Renewable Energy in India, 2022)

Having said this, the question is whether this transition away from fossil fuels and towards renewable energy is happening in a just and 'clean' manner, particularly with respect to being gender just and in protecting the rights of indigenous women. Recent trends of electricity generation from renewables, particularly from solar projects, reveal that the cost of electricity from coal is losing its cost advantage, and the supply of affordable 24x7 electricity from solar and wind with battery storage is becoming a reality. Under such a situation, coal consumption in India is projected to peak between 2030 and 2035, and will possibly start falling thereafter.

Transition Minerals:

Mining for critical minerals such as copper, nickel, manganese, cobalt, aluminium, lithium, zinc and silica is expected to increase dramatically to meet the needs of clean transition. The World Bank states that extraction of energy transition minerals will need to increase five-fold by 2050 to meet the demand for clean energy technologies. This translates to more than three billion tonnes of minerals and metals that will be needed for wind, solar and geothermal power, as well as for energy storage. Electric vehicle production is responsible for 50-60% of the demand for energy transition metals, followed by electricity networks and solar photovoltaics (35-45%), and other technologies (5%) . (teri, 2021)



Minerals used in clean energy technologies compared to other power generation sources (Source: IEA)

Solar power is stated to play a major role in India's energy transition. It has been planned to achieve 350 GW out of the pledged 500 GW of renewable energy capacity in the UN climate Summit through solar power production.

In India, currently more than 80 percent of solar panels and modules are imported, primarily from China. Though India has a solar PV cell manufacturing capacity of 3 GW per year and solar PV module manufacturing capacity of 10 GW per year, India has no manufacturing units for polysilicon, wafer or ingots. In 2021-22, India imported nearly \$76.62 billion worth of solar cells and modules from China alone, accounting for 78.6% of India's total solar cell imports that year. To decrease imports and promote local manufacturing of solar panels, the government has offered a number of incentives. (Observer Research Foundation, 2022)

To envision India becoming *Atmanirbhar* or self-reliant, in the Union Budget 2022, the Government of India announced an allocation of ₹19,500 crore to boost manufacturing of solar modules under the

government's flagship production-linked incentive (PLI) scheme. Manufacturing companies receive incentives over five years post commissioning of solar module plants under the Atmanirbhar Bharat Mission.

Silicon is the prominent element that is utilised in the manufacturing of solar energy parts. As per India's current scenario of dependency on solar technology, in order to achieve non-fossil fuel self-reliant energy goals, mining of silica sand quartz will likely increase in a massive scale in the subsequent years. It is estimated that the silicon requirement in India will increase threefold by the year 2040 (CSEP, 2022).

Overview of Quartz and Silica in India:

Silica, also called silicon dioxide, is a compound of the two most abundant elements in the Earth's crust - silicon and oxygen, SiO_2 . The mass of the Earth's crust is 59 percent silica, the main constituent of more than 95 percent of the known rocks. Silica has three main crystalline varieties and one of them is quartz, as per the Britannica encyclopaedia.

As per the Indian Mineral Year Book, 2020, the term quartz is "often referred to as a synonym for silica. Silica is one of the ubiquitous materials in the earth's crust. Quartz, quartz crystals, quartzite, silica sand, sand (others) and moulding sand are all coined together in one generic name 'silica minerals'. This is because all these commodities are essentially crystalline silicon dioxide (SiO_2) with variations mostly related to their crystalline structure and presence of minor or trace impurities. Silica occurs in several forms giving rise to different varieties".

Legally speaking, as per Govt of India Gazette Notification S.O. 423 (E), dated 10th February 2015, "31 minerals have been declared as minor minerals. Out of these 31 minor minerals, agate, fuchsite quartzite, jasper, quartz, quartzite, sand (others) and silica sand come under a different variety of silica minerals. Minor minerals come under the purview of respective State Governments and they frame the rules for minor minerals" (IMY, 2020). The licensing of silica therefore, vests with respective state governments.



A truck carrying sand near Gudur, Andhra Pradesh

As on 1.4.2015, the total reserves/resources of quartz and silica sand in the country have been estimated at 3,907.95 million tonnes out of which Andhra Pradesh accounts for 236.69 million tonnes i.e, 6% of the country's total reserve (IBM, 2020). As per 2011-12 data, Andhra Pradesh accounted for 43.27 percent of total national production of quartz and 36.74 percent of silica (CAG, 2014).

The consumption rate of quartz and silica sand in India was estimated at 2.79 million tonnes between 2015-2016. Also, the major consumers of these minerals include: glass (41%), cement (28%), Ferro-alloys (10%), Iron and steel (6%), foundry (5%), and the fertilizer industry consumes about 4%. India is one of the leading exporters of quartz in the world. According to the reports generated by OEC (Observatory Of Economic Complexity), India was placed at the second number among top quartz exporting countries of 2017. India exported around \$ 61.5 million worth of quartz, which accounted for 13% of the global quartz export.

As per the Ministry of Commerce and Industry, GoI, India's silica sand and quartz sand export for the year 2021-22 values at Rs. 31,47,02,149.28 and most of its exports are to countries like Qatar, Vietnam, Nepal, UAE and China. India's silica sand and quartz sand import for the year 2021-22 values at Rs. 45,72,77,458.91 and most of the silica import is from the countries Egypt, Saudi Arabia, Australia and Belgium.

The available reserves in the country and the imported quartz, quartzite and silica sand are used in various industries like glass, refractory, foundry, ceramic, cosmetic, electrical, abrasives, paints, etc. The primary use of silica is in the manufacture of virtually all types of glasswares, ceramics and ceramic glazes. Other major uses are in metallurgy, silicon carbide manufacture, chemical & construction sectors and as a natural abrasive. Silica sand is used as a fireproofing material, for sand stowing in mines, soundproofing material and as a filler. It is also used to maintain or increase the permeability of oil and gas-bearing formations; and have its application as a filler in acid proof cements, putty, paints, epoxy and polyester resins. Besides, it is widely used in horticulture as a filtration medium, and for ornamental purposes as well. Silica flour is used as a filler in plastic and rubber products. In India, quartz, quartzite and silica sand are used mainly in glass, foundry, ferro-alloys and refractory industries and also as building materials. (IBM, 2020)

Other than these, silica sand and quartz also has a crucial role to play in the global decarbonization effect. High purity silica and quartz are needed for the high-tech flat glass and photovoltaic cells used in solar panels.

Quartz is ranked to be one of the most lethal minerals existing, killing thousands of people and leaving areas contaminated. Silicosis, lung cancer, kidney disease and immunological problems are caused by exposure to a fine particulate form of quartz. (Mining technology, 2014)

With the growing demand for transition minerals for renewable energy and clean energy technology, the informal supply chain of extraction and processing is reported to be on the increase. In the last mile of this supply chain are the informal women workers and women from local communities whose health, labour rights and social security stand at very high risk. As extraction is expected to expand to meet the demands for production of clean energy technologies, local contractors are likely to take advantage of the demand through small-scale informal mines by upscaling operations without proper statutory mechanisms and legal standards as was reported in the CAG audit of 2014 for Andhra Pradesh (CAG, 2014). Those at risk are anticipated to be poor informal workers and marginal farmers whose lands and labour are likely to be exploited, if adequate regulatory mechanisms are not put into place swiftly. Particularly at risk are tribal, dalit and migrant women from poor communities as they are in the mining sector as daily wage labour in very large numbers. A major concern that needs to be addressed is the definition of green jobs and distribution of benefits across worker-investor-corporate-consumer landscapes of the green economy. While consumers and companies receive several tax concessions and incentives, where do women as last mile informal and invisible labour get their entitlements or even safety standards or concessions met. We present here a field study of women in the Silica mines in Andhra Pradesh.

Study of Yanadi Women Informal Workers in the Silica Mining Supply Chain of Gudur, Andhra Pradesh:

Study Rationale:

Gender disparities in ownership and access to resources, coupled with sociocultural barriers, impoverish women, lower their adaptive capacity and increase their exposure to climatic risk. At present, only 0.01 percent of all worldwide funding supports projects that address both climate change and women's rights. To ensure that climate finance efforts make a difference in building resilience and reducing vulnerability, gender equality and women's empowerment dimensions should be mainstreamed within all climate finance governance structures, programmes and legal frameworks as well as within all spectrums of production, trade and consumption equity and all phases of the project cycles – its design, implementation, monitoring and evaluation. (UNDP, 2016).

We present here the ground level realities for women located in the supply chains of Silica mines where business as usual methodologies of resource exploitation urgently need to be reviewed as the demand side ushers in far more exploitative supply chain practices to upend expenditures and take advantage of green incentives and green markets.



FGD in Ballavolu village

Study Methodology:

This study was undertaken to understand the current situation of Adivasi (Yanadi) and Dalit Women working and living in the silica mining area of Gudur, a region that is reported to have several silica, quartz and mica mines, operating with or without licences. The focus of the study was to identify the occupational health, environmental health and livelihood concerns of women working and living

around these mines. As the last mile stakeholders in the supply chains of transition minerals like Silica which are likely to witness an exponential growth in order to meet the high demands of the renewables markets, the study questions the decarbonisation frame of ‘green jobs’ and ‘green economies’ from a gender equity lens.

Gudur was chosen as the case study as it is a mineral rich area in Silica mining, with a significant Yanadi (tribal) and Dalit population. Field visits were made to six villages to interact with women in the local communities, many of whom also work in the silica, quartz and mica mines. Research methodology included the tools of Focus group discussions (FGDs), individual interviews and a three day workshop with these women led to several problems being shared by the women with regard to their work in the mines and to their community resources that are contaminated by mining operations. FGDs were conducted in 5 out of 6 villages visited and individual interviews were conducted in 6 villages. Interviews were also conducted with male members, local body leaders and health workers. The study sites have 4 villages with silica mines and 2 villages with quartz mines. Women who were either previously engaged in the mining industry or are currently working were chosen for the interviews. A three day workshop was conducted with women from 10 villages.

A dental camp was also organised in these villages to understand the clinical correlation with the impacts of environmental pollution on the health of workers and local communities. A survey of the women who participated in the dental camp was conducted on general and reproductive health issues through a gender impact assessment questionnaire that was developed by Dhaatri. The dental camp and survey were conducted in the villages of Siddavaram, Govindapalli, Ballavolu, Kakuvaripalem, Tiruvengalayapalli and Nernuru that have mines or have a significant number of mining labourers living.

The drinking water sources in these villages were collected and tested for a set of basic parameters to assess the potability of their water bodies, as all the women participants of the study complained of water related health problems.



A woman gets her teeth examined at the Dental camp in Govindapalli village

Dental camp- Methodology:

The oral health assessment was done based on the methods explained in the manual WHO Oral Health Surveys-Basic Methods 5th Edition (2013).

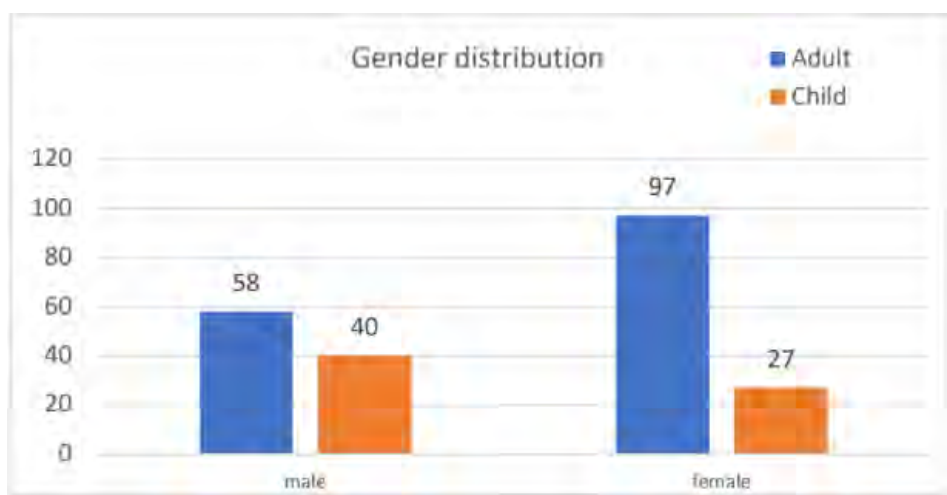
Prior to oral examination, informed consent was obtained from adult participants (age>18yrs) and from guardians/parents of child participants (age<18yrs).

A total of 222 individuals were screened during the dental camp. Among the participants, there was a higher proportion of adult females who received a free dental check compared to males. Conversely, more male children were assessed than female children. It is worth noting that two villages did not have a sufficient number of children present to be assessed.

Distribution of participants:

Village	No. of adult males	No. of adult females	No. of male children	No. of female children
Siddavaram	10	12	0	0
Govindapalli	7	17	18	15
Ballavolu	11	10	0	1
Kakuvaripalem	11	17	9	6
Tiruvengalayapalli	7	15	6	2
Nernuru	12	26	7	3
Total	58	97	40	27

Gender distribution of the participants:



Silica Mining in Andhra Pradesh:

The Andhra Pradesh government, through G.O.Ms.No 34 dated March 2016, issued delegation of powers for issue of minor mineral licences to the state Director of Mines and Geology. The list includes feldspar, silica and quartz minerals. Gudur is an administrative division in the newly formed Tirupati district. The region is rich in mineral resources, and several mining activities are taking place in and around Gudur. The main mineral extracted from Gudur is feldspar, a group of rock-forming minerals that are used in the manufacture of ceramics, glass, and other industrial products. Gudur is one of the largest producers of feldspar in the country, and several mines in the region are engaged in its extraction. Apart from feldspar, other minerals such as quartz, mica, and vermiculite are also extracted from the region.



An abandoned silica mining pit near Ballavolu village. In the background, excavators can be seen at an active mining site.

Latest lease data of the studied villages:

Lease ID no. / name	Village	Extent in ha.	Mineral extracted	Lease period	
				From	To
912040097	Siddavaram	30.352	Silica sand	18/6/04	17/6/2024
912040327	Siddavaram	105.221	Silica sand	37873	45147
912050169	Siddavaram	12.14	Silica sand	16/12/03	15/12/2023
912050326	Siddavaram	52.76	Silica sand	16/7/2005	15/7/2025
912040053	Siddavaram	11.514	Silica sand	38085	45359
912050016	Siddavaram	13.132	Silica sand	15/4/05	14/04/2025

912050179	Ballavolu	8.498	Silica sand	29/8/05	28/8/2025
912040170	Ballavolu	8.523	Silica sand	18/12/04	17/12/2024
912030040	Ballavolu	17.94	Silica sand	31/7/03	30/7/2023
912050039	Ballavolu	16.269	Silica sand	38630	45905
911170735	Ballavolu	4.366	Silica sand	10.05.2017	09.05.37
911210921	Nernuru	4.391	Quartz, Feldspar	20-02-2021	19-02-2041
911210922	Nernuru	2.513	Quartz, Feldspar, Mica	20-02-2021	19-02-2041

Source: Mines and Geology Department, Government of Andhra Pradesh (as on 31.10.2021)

Profile of Villages studied:

Village	Mandal	Total Population (male and female)	Geographical area (in ha.)	No. of houses	Caste composition
Siddavaram	Kota	1285 (641 M and 644 F)	789	379	OC, BC, SC, ST and muslims
Govindapalli	Kota	2656 (1309 M and 1347 F)	4299	664	OC, BC, SC, ST and muslims
Ballavolu	Chillakur	1830 (892 M and 938 F)	1182	555	BC, SC, ST
Kakuvaripalem	Chillakur	1190 (604 M and 586 F)	1188	307	BC (golla, goma), SC (madiga, mala), ST (challa yanadi)
Tiruvengalayapalli	Kommaneturu	784	-	380	BC (golla, oddi, muthrasu), SC (madiga- majority), OC (reddy)
Nernuru	Gudur	1110	-	285	SC (mala), ST (yanadi), OC (kshatriya rajulu), SC (saaku)

Source: Census 2011

Mining operation in study villages as per local community interviews:

Village	Mineral extracted	How long has mining been happening in/ near the village?	Is mining currently operational?	Distance of mines from the village	Social group(s) interviewed that are involved in mine labour
Siddavaram	Silica	20 years	No. Paused due to permit issues	1-3 kms	ST- Yanadi
Govindapalli	Silica	30 years	No. Paused due to permit issues	2 kms	ST- Yanadi
Ballavolu	Silica	30 years	Yes	7 kms	ST- Yanadi
Kakuvaripalem	Silica	25 years	Yes	1 km	ST- Yanadi
Tiruvengalayapalli	Quartz	40-50 years	Yes	20-80 kms	SC- Mala
Nernuru	Quartz	A long time	No. Paused due to permit issues	3-8 kms	SC- Mala

Background of the social groups:

The Yanadis:

Yanadis are one of the most vulnerable Scheduled Tribes of Andhra Pradesh. Through his extensive anthropological study, Edgar Thurston noted that the Yanadis were natives of Sriharikota Island and suggested that they derived their name from the Sanskrit word "Anadi" denoting those whose origin is unknown. Their population according to 2011 census reports is 5, 33,746 in Andhra Pradesh. The total literacy rate among Yanadi's is 35.35 as per the 2011 census.

Their primary source of livelihood traditionally was hunting and fishing with expertise in catching rats and snakes. Since colonial times they were forced to work as bonded labour in the agricultural farms of local landlords. The Yanadis are one of the most vulnerable tribes in the state who have historically suffered dispossession from their forests and wrongfully categorised as a criminal tribe under the Criminal Tribes Act (CTA). Today, they also work as daily wage labour in agriculture, construction and mining activities and barely own any agricultural land. They have also sustained their livelihood and food by dependence on local water sources for fishing.



Women at the FGD in Tiruvengalayapalli village

Through the study, it was noted that the majority of the Yanadis do not own land. In Govindapalli, due to lack of livelihood opportunities and not having land ownership, 60-70% of the people belonging to the Yanadi community work in the silica and quartz mines as daily wage labourers with no formal work registration or identity. In a few villages like Kakuvaripalem, it is reported that some of the Yanadis have lands and pattas. But these lands are reported to either be cultivated by upper caste people where the Yanadis work as agricultural labourers in their own lands or their lands have been grabbed by local mining contractors. Mine labour is predominantly done by the Yanadis and also the SC community.

The Malas:

Mala is a Telugu caste from the Indian states of Andhra Pradesh and Telangana. They are considered as Scheduled Caste (SC) by the Government of India. According to 2001 census data, Malas constituted 41.6 percent (51.39 lakh) of the Scheduled Castes population in the then state of Andhra Pradesh, which also included the present state of Telangana. This caste is the other vulnerable social group working in these silica mines.



FGD in Siddavaram village

The following are some critical findings from the field study:

1. Women's Wages and Working Conditions

From the FGDs and the interviews, it is evident that the mine workers are employed in very unsafe and unprotected conditions, with no facilities either for work safety or for basic needs of water, toilets or washing. The women perform the following tasks at the mine sites: In the case of silica sand mining, the women are involved in digging the sand, sifting the gravels and discarding the remains in the dumping ground by carrying them over their heads. Women working in the quartz mines break the huge rocks into smaller stones and carry them over their heads to the processing area. They get a daily wage of Rs. 250 approximately for any kind of work they do. The women commute to the mining areas in autos or lorries that belong to the mine contractors. Generally, they go to work in the morning around 8 am and they come back at around 5 pm, working for approximately 8-9 hours a day, excluding travel time. The women usually work on all days except for Sundays and they do not have any restrictions on taking leave (on which days wages are deducted). But they cannot miss work as their livelihood is dependent on their day-to-day wages. It is not clear to the women whether the mining operations are legal or illegal. The sites visited by us had some mining operations but it was difficult to correlate the data provided in the Mines and Geology department's reports with the operations on the ground, presumably reflecting the illegal nature of operations. None of the women working in these mines have any proof of registration with the contractors and are not aware of any labour regulations or their entitlements. None of the women interviewed were provided with proper safety equipment by the company necessary for protecting themselves against any possible accidents and health hazards in the mines. Only one woman said that she receives a pair of gloves once a week and one other woman was equipped with safety kits only after she went through a disastrous accident, affecting her eyesight.

2. Access to toilets in mines sites and villages

None of the interviewed women have access to toilets at the mining site. All of them urinate/defecate in the open or they hold-in till they find a toilet or go home in the evening. They all complained of severe discomfort holding their bowels all through the day, especially during menstruation and shared several problems like burning while passing urine, rashes, white discharge, menstrual irregularities, severe blood loss during periods and prolonged periods, hypertension, back pain, body pain, urinary incontinence, loose bladder problems, etc. Controlling urination can cause a number of issues like UTI, formation on kidney stones, etc. Section 20(1) of the Mines Act, 1952 states that- *“There shall be provided, separately for males and females in every mine, a sufficient number of latrines and urinals of prescribed types so situated as to be convenient and accessible to persons employed in the mine at all times.”* Inaccessibility to proper toilet facilities is a violation of the Mines Act, 1952, yet none of these mines follow this labour law. Women also complained that they face intimidation of sexual abuses as male labourers stare at them and make ugly comments when they try to urinate near mine sites. Younger women said they somehow control their urge but older women said they often cannot control themselves, and hence urinate in front of the men for lack of facilities. They try to cover each other as a way of protection as women work in groups, hence it is the women workers’ social agency and not the work site protocols that come to the aid of women.



Blocks of quartz laid out in an open plot to be graded before transportation

Gauramma Gyara, 30, Nernuru

She belongs to the Scheduled Caste Maala community. She is separated from her husband and is living with her mother. Her brother inherited the lands that the family owned and she did not get any. Both Gorovamma and her mother work at the Quartz mines at Chemidti, which is around 7 kilometres from her village. The mines near her village have stopped functioning due to some permit issues. Ever since she was a teenager, she has been engaged in this mining activity as there aren't many choices of livelihood, especially for the Scheduled Caste community in her village. The agricultural lands are also not fertile and most of the land-owners cultivate Casuarina and harvest once in every three years.

She says she's in constant physical pain as she has been working in the mines for almost everyday since the last 13 years. Her eyes and head hurt from breaking rocks. She also shows some of the injuries on her legs and hands. When asked about any safety equipment that the company provides for the workers, she said not only the safety equipment but also the tools used for mining like shovel, crowbars and hammers are not given by the company and they spend out of their pockets to buy them. There are neither toilets nor drinking water facilities at the mine site. Since the time she hit her puberty, she has been experiencing prolonged seizures frequently that sometimes last for around a week. It gets controlled under medication but she cannot afford buying medicines for longer periods of time.

With respect to toilet facilities in the mining affected villages, all the women reported open defecation. They complained that most of the mines are near their habitations, almost till their door-step with huge pits dug up and abandoned in front of their houses. The community has to walk across these mine pits to reach their common spaces for toilets. This has added to the danger especially at night and during the rains when the pits are filled with water and they risk slipping and getting injured or bitten by snakes or insects in these cesspools. In one village, a woman reported that she lost her two year old infant who drowned in the mine pits outside their house, while following the mother to the toilet. The villagers found the dead child floating in the pit only after a whole day of searching. This has caused a sense of anxiety for mothers with children, as even after the incident, the contractor did not landfill the pits, demonstrating the poor political standing of Yanadis in this feudal structure. The fear of reporting such criminal negligence, the women reported, was because of the strangle-hold control that mine owners have in the region. The women now suffer from reduced spaces in their villages for toilet use, as well as safety issues for themselves and their children when they go to the toilet.

Some of the villages reported that earlier there was tree cover in their village boundaries and people also had mango and cashew orchards and the forest department had casuarina plantations as coastal area protection which also served as toilet spaces. But even these have been cut down for illegal mining. The groundwater depletion and intrusion of saline water has degenerated the tree growth, all of which has added to women not having any enclosed spaces for toilet needs either in the village or at the mine sites. Now with trucks plying very close to their houses, the small makeshift enclosures women put up for bathing next to their houses also do not provide adequate privacy and safety.

3. Water Contamination and impacts on workers and communities:

From the individual interviews and the FGDs, it was found that the mine workers are not provided with drinking water at the mining sites by the companies. The women either bring their own water from home or they drink out of the tailing ponds. If not treated properly, the tailing ponds contain toxic elements and heavy metals that have negative impacts on human health. In Siddavaram village, the people reported that the dogs in their village that drink water out of the tailing ponds suffer from health issues like swollen belly and die eventually. Section 19(1) of the Mines Act, 1952 states that-
"In every mine effective arrangements shall be made to provide and maintain at suitable points conveniently situated a sufficient supply of cool and wholesome drinking water for all persons employed therein"

Not providing drinking water to the mine workers is a violation of the Mines Act, 1952. The mine sites are very hot and dry, with high levels of dust. Women complained that they suffer from dehydration both due to lack of water facilities and drinking lesser quantities of water in order to control their bladders.

Women interviewed in all the villages complained universally of drinking water contamination and its resultant health problems. Hand pumps, borewells, ponds and even piped water were reported as

having contaminants. Women complained that colour, taste and odour of drinking water were extremely problematic. They are unable to drink from any of the sources and when consumed, they experience stomach problems, skin rashes, muscle pains, burning in the eyes and throat, hair fall and other symptoms. Some of the adults and children were found to have yellowed teeth and dental problems related to fluorosis and other malnutrition related health issues, apart from lack of dental hygiene and consumption of substances.

In Ballavollu, the quality of water has degraded with time. It has turned salty, red in colour and non potable. There are visible red deposits over the water. The people have been drinking this water for the last 5 years. Due to groundwater depletion by mining, water scarcity is even more acute during summer. So the panchayat supplies water in lorries. Since the last two years, during the COVID pandemic, this has also stopped. They fear that the remaining good quality water also would deteriorate. In the case of Kakuvaripalem, groundwater is scanty in summers. After 20 feet below the ground, the bore water is salty and after 80 feet, it is red in colour. The same was reported in Tiruvengalayapalli.

Other problems related to water were frequent occurrences of cattle deaths. Water contamination has affected the quality of fish, crabs, prawns and other aquatic species, resulting in health problems and income losses, as Yanadis are unable to sell their catch in surrounding towns since people are unwilling to buy fish from mining affected villages. Due to extensive silica mining, sea water intrusion into drinking water bodies was reported. Sea water intrusion was also reported in agricultural lands resulting in poor crop yields in the few acres of land accessible to the Yanadis. Of all the problems narrated, women's concerns were strongest with regard to water contamination as they have to meet all their daily needs from very limited and toxic water available.



Water being drawn from a pit near Kakuvaripalem village for agriculture

In Siddavaram, due to polluted drinking water (panchayat tap water), people suffer body pains and skin allergies. The toxicity of water was also indicated by a study conducted by students of Adhi Sankara college (Gudur) who tested the same water and the women reported that the lab results came out to be unfit for drinking. The water is yellow in colour and has traces of oil floating on it. As per the advice of the doctor, they stopped consuming the tap water and shifted to using the hand pump

water. There is only one hand pump for the whole colony of 70 households. Due to groundwater depletion by mining, water scarcity is acute during summer. As a result of this, the people are forced to use the tap water for non-cooking uses such as bathing, washing clothes, etc. If they bathe with this water, they complain that they experience skin allergy (prolonged itching).

Similarly in the case of Bollavolu, the people experienced body ache and fever due to drinking polluted water. Some people complain of breathing issues and about gastric problems. The dental camp findings identified many cases of dental erosion in people from all the villages which can possibly be an outcome of gastric acid. This could be a direct or indirect health consequence of mining.

Ten samples of drinking water were collected from different sources like borewell and panchayat water of the villages visited. These were tested at a laboratory in Hyderabad. The samples were tested for physical and sensory characteristics such as colour, odour, turbidity, pH level and electrical conductivity and general chemical characteristics such as hardness, levels of calcium, magnesium, ammoniacal nitrogen, nitrite, nitrate, fluoride and silica. Bacteriological analysis was also carried out for the test samples. Test results showed that except for three water samples from three villages, namely Siddavaram, Nernuru and Bollavolu, the physical-sensory characteristics and observed values of chemical parameters as well as microbial characteristics are somewhat within acceptable limits for human consumption. Water samples in these three villages displayed high levels of turbidity and additionally a stale smell was observed in the panchayat water in Siddavaram. Although some of the parameters were still within permissible limits, the test reports highly recommended that water treatment plants be set up. The water still poses a risk to the health of people if consumed on a long term.

The testimonies given by the locals regarding the quality of water and the findings of the dental camp do not match with the water test results. Field verification of the water bodies and the severe physical discomfort and ill health experienced by communities has to be taken seriously as the women are complaining in all the villages. Further testing and a thorough analysis of the water in these villages has to be done to understand the water and health correlations and the impacts of mining.

Water analysis report- A summary:

Physical and sensory characteristics:

Reference values:

Sl.no	Parameter	Units	IS10500 Ref. Values	
			Acceptable	Permissible
1	Colour	PCU (Hazen)	5	15
2	Odour	Rating	Agreeable	Agreeable
3	Turbidity	NTU	1	5
4	pH at 25° C	pH value	6.5 to 8.5	No relaxation
5	Electrical conductivity (EC)	µ Siemens/cm	≤2250 (CPCB, Class-E)	

Result values:

Water source	Colour	Odour	Turbidity	pH at 25° C	Electrical conductivity (EC)
Siddavaram Borewell water	< 1	Agreeable	0.55	7.60	2751
Siddavaram Panchayat water	05	Stale smell	13.0	7.95	2460
Govindapalli borewell water	< 1	Agreeable	1.0	8.44	608
Ballavolu borewell water	< 1	Agreeable	1.30	7.47	572

Ballavolu borewell water	< 1	Agreeable	19.0	6.38	530
Kakuvaripalem borewell water	< 1	Agreeable	0.75	7.62	956
Tiruvengalayapalli panchayat water	< 1	Agreeable	0.40	7.36	2310
Tiruvengalayapalli RO water	< 1	Agreeable	0.45	6.52	278.6
Nernuru overhead tank	< 1	Agreeable	0.55	7.91	1229
Nernuru borewell water	< 1	Agreeable	15.0	7.63	2002

General chemical characteristics:**Reference values:**

Sl.no	Parameter	Units	IS10500 Ref. Values	
			Acceptable	Permissible
1	Total hardness (TH)	As CaCO ₃ mg/L	200	600
2	Calcium	Ca ⁺⁺ mg/L	75	200
3	Magnesium	Mg mg/L	30	100
4	Ammoniacal Nitrogen	NH ₃ mg/L	0.50	No relaxation

5	Nitrite	NO ₂ mg/L	3.0 WHO	
6	Nitrate	NO ₃ mg/L	45	No relaxation
7	Fluoride	F ⁻ mg/L	1.0	1.5
8	Silica	SiO ₂ mg/L	-	-

Result values:

Water Source	TH	Ca	Mg	Amm. Nitrogen	Nitrite	Nitrate	Fluoride	Silica
Siddavaram Borewell water	564	160	39.8	BDL	0.23	12.99	0.35	6.12
Siddavaram Panchayat water	540	116.2	60.8	BDL	1.38	12.58	0.54	6.17
Govindapalli borewell water	84	29.6	2.4	BDL	0.32	3.2	0.27	3.63
Ballavolu borewell water	136	39.2	9.2	BDL	0.20	4.58	0.23	6.50
Ballavolu borewell water	62	19.2	3.4	BDL	0.32	4.4	0.38	3.99
Kakuvaripalem borewell water	200	60.1	12.1	BDL	0.43	9.4	0.32	3.37
Tiruvengalayapalli panchayat water	156	39.3	1.9	BDL	0.11	12.50	0.95	11.95
Tiruvengalayapalli RO water	50	16	2.4	BDL	0.24	3.3	0.18	0.35
Nernuru overhead tank	256	60.1	25.7	BDL	0.29	6.3	0.55	2.83
Nernuru borewell water	160	56.1	4.86	BDL	0.69	9.42	1.26	6.34

BDL: Below detection limit of the test method

Bacteriological analysis:**Reference values:**

Sl.no	Parameter	Units	IS10500 Ref. Values
1	Total coliforms	MPN/100 ml (95% CI)	–
2	Thermotolerant coliforms	Absent/ Present	Absent
3	E. coli	Absent/ Present	Absent

Result values:

Water source	Total coliforms	Thermotolerant coliforms	E. coli
Siddavaram Borewell water	Not detected	Absent	Absent
Siddavaram Panchayat water	542 (180,1405)	Absent	Absent
Govindapalli borewell water	130 (35, 302)	Absent	Absent
Ballavolu borewell water	542 (180,1405)	Absent	Absent
Ballavolu borewell water	Not detected	Absent	Absent
Kakuvaripalem borewell water	Not detected	Absent	Absent
Tiruvengalayapalli panchayat water	49 (17,126)	Absent	Absent
Tiruvengalayapalli RO water	Not detected	Absent	Absent
Nernuru overhead tank	Not detected	Absent	Absent
Nernuru borewell water	Not detected	Absent	Absent

Dental camp findings - A summary:

In the case of Siddavaram, the examined population consisted only of adults and exhibited high levels of dental caries and extensive dental erosion that largely affected the functional and aesthetic aspects of the individual. Though adverse oral health habits were not widespread, the minimal recorded population also showed changes in their oral health such as discoloration and nascent premalignant lesions. Thus, awareness about the same is necessary to prevent further development. Water analysis in the sample collected from the village revealed high levels of certain minerals that can indirectly increase the risk of certain diseases but did not directly impact oral health.

The population assessed in Govindapalli was a combination of both adults and children. Minimal representation of adverse oral habits was observed within the community. Similar to Siddavaram, the population revealed a high level of caries presence and pulpal erosion within the community. Also, poor periodontal health was a common finding among middle aged individuals. Water samples analyzed from this village revealed that altered levels of Ca, Mg and especially fluoride may impact the overall poor oral health observed within this community.



A woman gets her teeth examined at the dental camp in Kakuvaripalem village

The population examined in Ballavolu was primarily adults with a slightly higher incidence of adverse habits such as alcohol, smoking and tobacco than the previous villages. Similar to earlier village assessments, the incidence of caries and dental erosion was significantly high but periodontal health was relatively good in most of the individuals examined. The water analysis revealed results similar to that of Govindapalli.

The oral examination in Kakuvaripalam revealed a cohort of adults and children in the community. The adults revealed minimal reports of adverse habits such as smoking and tobacco chewing. But these habits had led to presence of oral lesions in a few such as tobacco pouch keratosis. Dental erosion was a common finding in half the assessed population along with good periodontal health. But unlike previous villages, there was low caries presence in the community irrespective of age. The water sample analyzed revealed findings similar to that of Ballavolu and Govindapalli.



Wrinkled mucosal patch seen with discoloration in area where chewable tobacco was held

The examined population in Tiruvengalayapalli consisted predominantly of adults and a few children. This village had presented with half the assessed adult population having tobacco chewing habit, highest among all the villages included in the camp. This habit has also led to oral lesions such as tobacco pouch keratosis in a few. Unlike the previous villages, the caries presence was very high among the adults and very low among the children within the same community. Poor periodontal status and widespread pulpal erosion was also recorded in more than half the examined individuals. Water analysis revealed improper borewell and filtration lines that require prompt resolution.

The last village examined was Nernuru which comprised both adults and children. Tobacco chewing was a common adverse habit observed among the females in the village that had led to tobacco pouch keratosis in a few. Unlike previous villages examined, the caries levels were low in both adults and females with good periodontal health in half the population assessed. However, the presence of dental erosion continued to remain high even in this village. One significant finding unique to this village was a high prevalence of dental fluorosis with varied severity among all age groups examined. This finding could be explained by the results of the water sample analyzed from this village that showed a slight increase in level of fluoride than the desirable level recommended. Other parameters altered in the water sample are Ca, Mg and nitrate, but their significance in oral health is yet to be determined.



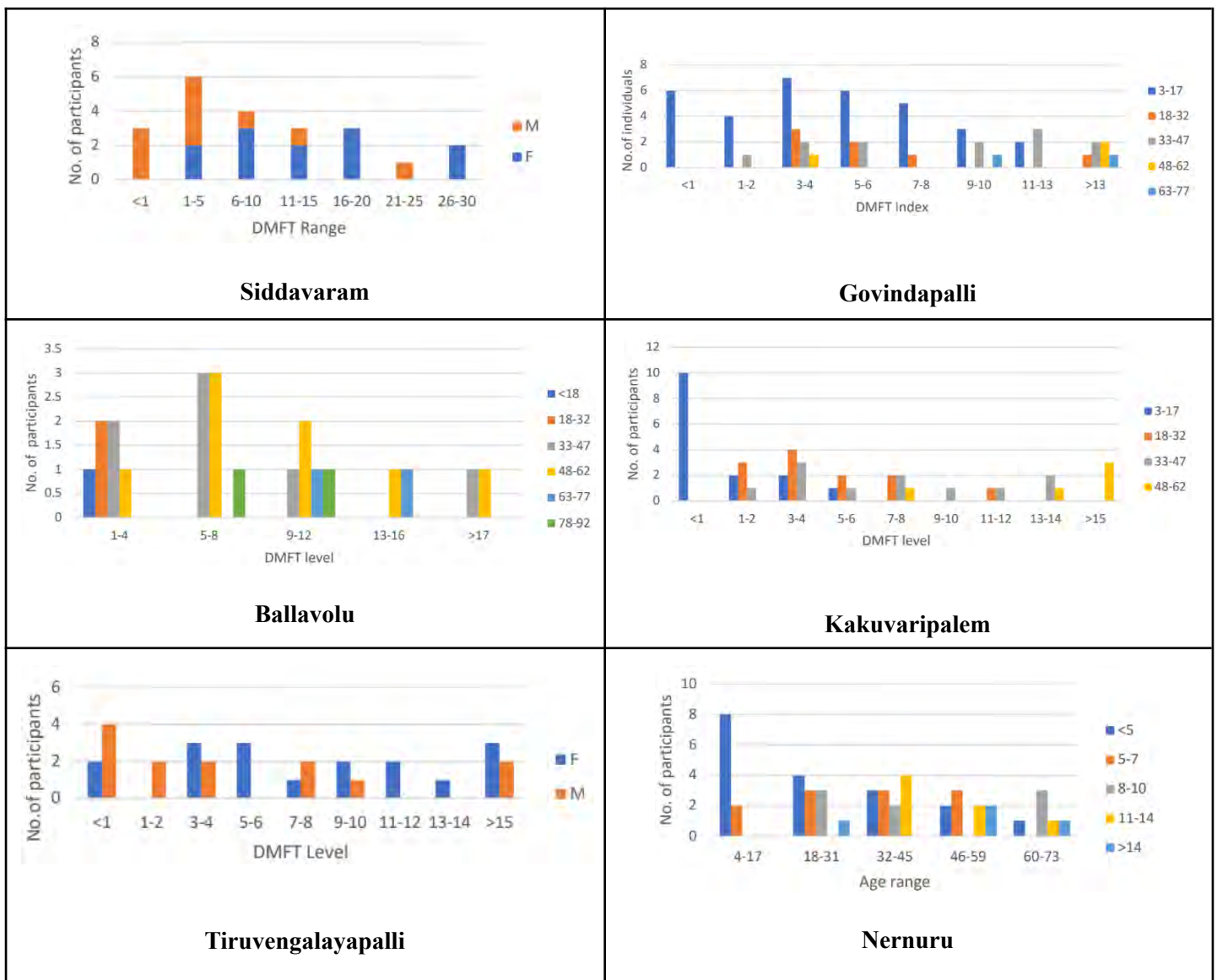
Fluorosis identified as pitting and brown discoloration in the members of Nernuru

Some common findings among all the villages were that education level was low to moderate and the oral hygiene status was very poor especially in the older population (>40 years). The intervention urgency was predominantly immediate dental attention due to pain or infection of dental origin. The

water analysis in these villages showed a measurable amount of silica in various concentrations in each village. However, their significance in health is yet to be understood and further evaluation is needed.

The possible future strategies recommended include demonstration on proper oral hygiene practices, tobacco cessation counselling, general health camp to detect other underlying systemic conditions and dental camps with facility to perform simple dental procedures such as oral prophylaxis (scaling), sealant application, simple restorations and pain management. Some of the participants showed loss of multiple teeth due to decay and a complete prosthetic rehabilitation (dentures) is an intervention urgency for them.

DMFT status: The number of decayed, missing and filled teeth (aka dental caries) of people in each village.



4. Injuries and occupational health problems:

There are several instances of accidents and physical injuries reported by the women who work in the mines. Minor wounds can be seen among almost all of the mine workers, especially those who work at the quartz mines, especially in their hands and legs. Eye injuries and loss of eye-sight or having eye problems was commonly reported. In Tiruvengalayapalli, they reported that blasting resulted in the disability of two men (one man lost his right arm and one man lost one eye). An old woman had a rock stuck in her eye during blasting and had to undergo surgery to remove it. Many women said they get blinded in the strong sunlight especially as the whole area is filled with silica dust. They cannot cover their nose or eyes with their sarees as it affects their visibility and breathing. Hence, they complained that dust goes into their eyes and nose all the time and they return home with a lot of burning sensation each evening.

Venkatamma, 55, Nernuru

Venkatamma belongs to the Maala community of the Scheduled Caste category. She is 55 years old and she has been living with multiple health problems. Previously she used to engage in mining activities but due to her poor health, her husband refused to let her work anymore. Almost 15 years back she experienced a heavy white vaginal discharge and menstruated for 15 straight days. She did not find a cure from medication hence her doctor suggested she remove the uterus. So she underwent hysterectomy.

Even with her poor health condition she used to work in the mines or as agricultural labourer for twice or thrice a week. She was diagnosed with a blocked heart artery 6 years ago. She had difficulty breathing and eating, hence she consented to bypass surgery. Since the surgery, she has been taking medication and the doctor has advised her not to do any work as she was not physically capable. Apart from this, she also is diagnosed with diabetes.



A woman from Tiruvengalayapalli shows an injury on her foot she recently sustained while working in the mines.

Apart from the risk of physical injuries, they are also exposed to the biggest health risk of silica exposure. As they do not use protective gears in the mines, respirable silica dust causes silicosis, chronic obstructive pulmonary diseases (COPD) and lung cancer with increased risk of tuberculosis (TB), chronic renal failure and several autoimmune diseases. Some of the women reported cancer among workers while TB, hypertension and diabetes were commonly reported. One woman reported having a daughter with muscular sclerosis. In one village alone the women reported that there were at least 20 TB patients and 20 widows/single women due to deaths caused by TB or other respiratory ailments (probably Silicosis). Low Blood Pressure, body ache, kidney issues, physical weakness, nerve damage in hands, paralysis and skin allergy are some of the health issues that the women listed out.

Case Study:

Ravanamma, 60, Tiruvengalayapalli

Ravanamma belongs to the Scheduled Caste community of Madiga. Currently she stays at home to take care of her grandchildren. But she had been working in Quartz mining since her teenage, for about 30 years. She never owned any lands and mining has been the only source of income for her family. She and her husband, along with their daughter and son, migrate as far as Vijayawada to engage in mining activities. They stay there for a few months together and return back to their villages. This frequent migration has affected the education of her children as they had to drop out of school with no one to take care of them.

They were not provided with any accommodation at the mining site and she with her husband and children had to stay in cramped up spaces with a tiny roof over their head. Even arrangements for food and water also had to be taken care of by themselves. There were not even bathroom facilities and they had to bathe and defecate in the open. "In rain, cold, wind or heat, four of us lived in that small space and it was not easy".

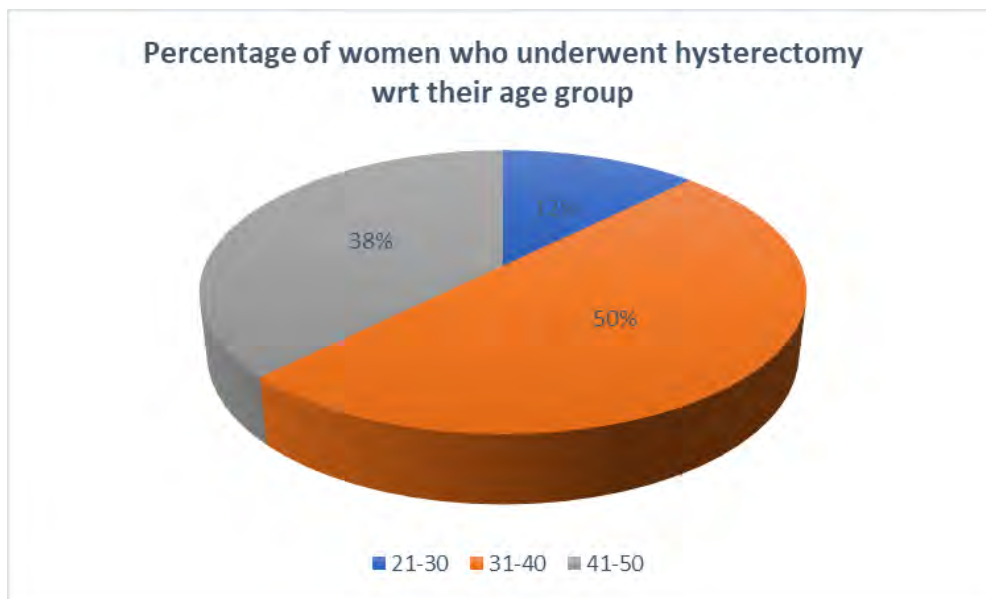
She narrated an incident of an accident she met with while working on a mining site in Pavuru. During an instance of rock blasting, a flyrock hit her eye even though she was hiding in a safe distant place. She was rushed to a hospital with blood oozing out of her eye and the rock was removed by the doctor. She had issues with eyesight for a while after the accident. Only after this disastrous event was she given safety equipment like gloves, goggles and mask to work by the company.

Her husband was diagnosed with Tuberculosis and died because of it. He was taken to hospitals for treatment and was prescribed tablets, but none of them worked. No monetary support was extended by the government and they couldn't afford to buy healthy food for her husband.

Currently, she is in a lot of pain physically due to years of stringent labour. For a few years now, she has been suffering from breathing related issues. She also got her uterus removed 10 years ago due to cyst formation, as per doctor's advice.

She now lives with her son and his family, taking care of the grandchildren and doing household chores. As her son dropped out of school, he also works in the mines along with his wife, and thus the cycle continues.

The one issue that needs great attention and could not be ignored is the number of cases of hysterectomies in these villages. The women claim that many women in their villages undergo hysterectomy as a normal practice. Out of the 13 interviewed women, 8 of them had their uterus removed, especially because of a cyst formation in their uterus and ovaries. The majority of the thirty women who attended the workshop said that hysterectomy was a normal practice. The doctors that every woman consulted warned that she might die if she didn't undergo hysterectomy. Out of fear for their lives, these women get their uterus removed. Young women in their early 20s are no exception to this cycle. The women also complained that due to severe discomfort while working in the mines, constant urinary infections, menstrual problems and fevers that sometimes forces them to lose wages, they are convinced that removing their uterus would be an end to their problems. The age range at which the women had their hysterectomy is between 22 and 50. The median age at which they had gotten their hysterectomy performed is 38.



Children's health and safety

Women reported that fever and cold due to dust pollution is a common health problem among children in all of the villages. Some of them also face trouble breathing due to this pollution. Mining residues are not properly disposed of and instead they are dumped along the roadside which causes a lot of dust pollution in the villages. Also the frequent movement of mining trucks along these routes cause dust pollution, especially as trucks ply very close to the Yanadi habitations. In the evenings, the mining company sends water lorry tankers to be sprinkled on the roads to control the dust pollution, sometimes, but this is very inadequate.



A truck carrying sand near Ballavolu village

In Ballavolu, the nearest school is 1 km away from their village. The people are scared to send them to school due to the frequency of trucks on the road. In almost all the villages, the women narrated stories of how their children narrowly escaped getting run over and due to this constant fear, they are spending money out of their pockets (around Rs.1000-1500 per month) to arrange for auto rickshaws for their children to reach school safely. Some women complained that they cannot afford to spend money on auto trips for their children. Even if the school is within the village premises, the safety of children whether to walk to school or to play outside their houses, has become a hazard. The incident of a two year old infant's death in the mine pit has created anxiety in every mother here.

In Andhra Pradesh, many state schools have gone through rationalisation in order to cut costs and merge schools. This has resulted in some of the villages in the study area having schools in their villages shut down and relocated to neighbouring villages. This has caused grave inconvenience and a safety concern as children have to now walk to another village.

5. First aid or medical kits at mine sites:

Only one of the women interviewed reported the availability of a first aid kit if they get injured. The women are rushed to the nearest hospital in case of an injury/ accident. Most of them reported that they have to resort to their own means for medical treatment, if injured. Long term treatment for injuries and accidents have crippled the financial situation of families who have met with accidents or have acquired chronic illnesses. The Mines Act of 1952 contains detailed provisions regarding the safety of the workers. First aid boxes should be provided in every mine to be readily accessible during all working hours. Every first-aid box has to be kept in charge of a responsible person, who is medically trained in the first-aid treatment of any kind of injury which should be readily available during the working hours. The mining companies here were reported by the women, not to take into consideration the legal regulations for the safety of workers.

6. Areas for rest at mine sites:

None of the companies where the interviewed women worked, provided places for them to take rest during the work hours. They either rest under the sun or under a shade of a tree, if there is any. But in these mines, there are no trees near the vicinity of work. Section 22 of The Mines Rules, 1955 states that- *“Provision of shelters.—At every mine where more than 50 persons are ordinarily employed, there shall be provided adequate and suitable shelter at or near loading wharves, opencast workings, workshops and mine entrances where 25 or more persons are ordinarily employed, for taking food and rest”*

Depriving of a proper place for the workers is a violation of The Mines Rules of 1955.



An abandoned silica mining pit near Ballavolu village

7. Impacts of Silica mining on Biodiversity, Forest and Agricultural Lands:

Out of the five villages visited, three of them reported that there has been a decrease in forest area due to expansion of mining and in return, decrease in the access to firewood and NTFP.

Earlier, people used to collect wild mangoes, honey and other herbs from the forests for self-consumption and sometimes they sell them in the local markets. This practice is absent nowadays due to drastic reduction in the forest cover due to indiscriminate mining. Women pointed to many of the traditional varieties not being available now- tamarind, berries, amla, palm trees are being cut down for silica mining. Palm trees provided a variety of food and income support to the Yanadis but women reported that most trees have been cut down for mining. People also could notice the reduction, or in some cases the complete extinction of some varieties of animals and birds such as rabbit, monkey, pigeon, eagle, sparrow, etc. in their forests.

Yanadi women have a rich knowledge of their biodiversity as they traditionally collect many herbs and medicinal plants which they sell in the surrounding towns. They collected wild food and hunted birds and small fauna. The women complained that there is no forest cover any more as both forest land and revenue lands have been encroached for mining. One young woman shared how her grandmother has a medicinal plant garden in her homestead but this is badly affected due to dust and water salinity.

Apart from this, Yanadis have lost their lands (patta and banjar lands) which they had either traditionally owned or were given to them by the government under the land reforms schemes. Previously, some good bureaucrats tried to help the Yanadis by allotment of assigned lands and houses but due to poor quality of land, Yanadis' inability to be enterprising and intimidation by upper castes, most Yanadis have either lost their land to mining contractors or do not have proof of their ownership. The women complained that they watch helplessly as mine owners and non-tribals occupy their lands without their consent. This has led to conflicts, but the political power dynamics prevent Yanadis from seeking redress. During the workshop, women shared several instances of land grabs. They also shared how the majority of the land is owned by a royal family which has parcelled out lands informally to local villages for cultivation and housing. Informal sale of land also takes place, although formally and politically, the land is owned by the royal family. Hence, if mining operations take place next to their houses or if Yanadis are evicted from lands cultivated by them, they cannot protest.



A farmer at a groundnut farm near Ballavolu village

From the narratives shared by the women, it was demonstrated that many Yanadi families have lost land or it is made uncultivable due to salt water intrusion by mining activities. None of the women interviewed have received any land development schemes for restoration of these lands nor have they received work under MGNREGS for employment relief or land restoration. The majority of the women who attended the workshop reported that the few days of work under employment guarantee are grabbed by the non-tribals. They also reported that cashew and mango plantations have been cut

down by mining contractors on the one hand and by non-tribal farmers for groundnut cultivation on the other. Some of the Yanadis who received assigned lands themselves quarry for quartz in their lands and later convert these into mango orchards but those lands mined by contractors are abandoned without any reclamation. Artisanal mining has become more lucrative than agriculture. Hence people in these villages have moved towards mining as their primary source of livelihood either voluntarily or involuntarily, and other livelihood options are increasingly diminishing.

Yanadis in this area have traditionally survived on fishing. The villages have several small and big fishing ponds. The women complained that the bigger fishing ponds are auctioned to non-tribals as Yanadis do not have the financial resources or political clout to bid for these. The smaller ponds are now encroached for mining activities or the water bodies are badly contaminated. This has led to reduction in aqua species in quantity, variety and seasonal availability. Silica mining has tragically affected their incomes from fishing as they are not able to sell the superior varieties of fish any more. Due to polluted waters, the health of the fish is affected and surrounding towns are no longer purchasing the fish brought by the Yanadis of the mining areas. The survival of the fish has also been affected due to water contamination. Another mining impact has been the destruction of roads by mining trucks which has affected the transportation of fish from the villages to towns in a timely manner. Hence, many fish perish or get spoilt before they are sold. Yanadis do not have the resources to purchase equipment like ice boxes or vehicles to take their catch to nearby towns although mine owners' revenues have multiplied from sale of ore, whether legally or illegally.



A woman washing clothes at an abandoned silica mining pit near Kakuvaripalem village

As villages are surrounded by mine pits, common lands have disappeared and people find it difficult to find fodder or even to take cattle for grazing as they fall in mine pits and get injured. Most EIA reports of silica mines in this area, commit to decommissioning of mines by creating green belts, reclaiming mine pits with land filling, plantations, creation of fish ponds to channelise groundwater and rainwater accumulated by the digging of pits, reclaiming lands through casuarina and other

species. Study of some of the EIA reports stated that the lands proposed for mining were degraded. However, **women narrated that there were useful trees like palmyra, amla, cashew, mango, neem, etc and several other species for their food and medicines which have been made extinct due to excessive digging and encroachments. Hence, there is a discrepancy between women's perceptions of biodiversity loss and that of other stakeholders.** Ignoring women's knowledge of local habitats whether while granting of mining licences or implementation of mine closure activities, would lead to poor and non-inclusive valuation of ecosystems and poor performance in mine repurposing. **A gender just mine repurposing ensures that local women take lead in the planning and restoration processes with due entitlements and decision-making.**

8. Deaths:

Once the ore is removed, the local communities reported that mine owners simply abandon the sites leaving behind huge pits. Many silica mines are operating right next to the villages and almost at the door steps of the poor Yanadi families, posing serious hazards to their physical mobility. Women and children have to walk across these pits for their toilet, fetching drinking water or to go to work. In Ballavolu, 3 adult men died due to unrestored mine tailings when they went there to drink water, 5 years ago. Due to heavy vehicular traffic, an old man died while crossing the road. These vehicles pose a danger to the children who have to walk to school and women reported several instances when children narrowly escaped getting run over. Similarly in the case of Kakuvaripalem, an infant of two years who belonged to the ST- Yanadi colony died in the mining tailings. According to local reports, there was no compensation paid to the victim's family except for Rs.2000 as funeral expenses, and no criminal actions were taken against the contractors. The STs were intimidated even from filing an FIR. Currently, the said mine pit has been cordoned off from the public and it has become inconvenient for the women to access their toilet spaces and pathway to fetch water. These accidents have kept the people in constant fear.

The grazing lands of cattle are reduced drastically due to increased mining and hence grazing has become difficult. Due to destruction of grazing lands, the cattle have to be taken far away for grazing. Some cattle die of truck accidents on roads. In Tiruvengalayapalli, women said that many cattle deaths occur due to them eating plastic. Even though this is not a direct impact of mining, this could be an indirect effect of mining expansion as the cattle don't have grazing lands, resulting in them eating plastic.



Women at the FGD in Kakuvaripalem village

Main Demands of Yanadi Women

Potable Drinking water in all the villages studied - need for cleaning up of water bodies, treatment of current drinking water supply, piped and treated drinking water, fluorosis treatment, and desalination of drinking water and irrigation sources where salt water intrusion has taken place.

Reclamation of contaminated fishing ponds, ground water sources, mine pits that are filled with contaminants, reclamation of agricultural lands

*Improving the dust mitigation measures and regular monitoring by statutory authorities
Land development and reclamation where Yanadis received lands from the government or their own lands to make them cultivable.*

Forest lands, grazing lands, common lands to be restored with species that are beneficial to local communities and Yanadi women should be consulted in species selection, biodiversity protection and regeneration and allowed to access these community lands.

Firewood species, fodder species, medicinal plants and wild foods that are traditionally local to the terrain need to be regenerated by providing daily wages from the DMFT and MGNREGS funds. This will demonstrate a sustainable model of just restoration and sustainable livelihoods and green jobs to local tribal and dalit communities.

Regulation of mining operations, abandoned pits, prawn farms and excessive usage of water and diversion of cultivable lands without proper lease - all these have to be reviewed from the legal compliance to the Water and Trees Act of Andhra Pradesh.

Safe roads and public transport especially for children-mine sites should not be close to our Yanadi habitations as it has become unsafe for our children.

Schools to be located in the village - prevent children from going out to other villages for school

Restoration of fish ponds and leasing out fish ponds to Yanadi communities /women's SHGs

Green jobs for their children as there are many Yanadi boys and girls who are graduates and post graduates.

Assessment of Tuberculosis, Silicosis, the high rate of hysterectomies and occupational health problems of women in these communities is urgently required.

Alternate livelihoods to be created from DMF funds especially interlinked with Yanadi women's skills in fishing and fish trading, and employment guarantee under MGNREGS through mine area restoration works and land reclamation.

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