

“Safety of People Engaged in Mining”

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DEFINITIONS

SAFETY:

1. The condition of being protected from or unlikely to cause danger, risk, or injury.
2. Relative freedom from danger, risk, or threat of harm, injury, or loss to personnel and/or property, whether caused deliberately or by incident/accident.

DEFINITIONS

- INCIDENT: It is a PLANNED or UNPLANNED event that has POTENTIAL to cause loss.
- ACCIDENT: An unfortunate/unplanned/unwanted incident that happens unexpectedly and unintentionally, typically resulting in damage or injury.
- BEN: An accident is a PLANNED EVENT that has occurred because we have failed to plan to prevent the occurrence

DEFINITIONS

- **HAZARD:-** Hazard is defined as “ a source of potential harm or situation with a potential to cause Loss”
- **Risk:-** Risk is defined as “ the chance of something happening that will have an impact on objectives.”
- Hazards have physical entity and it can be seen. Eg- An unsupported underground gallery. Poorly ventilated or dusty working environment. Hanging Boulder.
- And if someone is working under this condition then he is taking a Risk. It means Risk can't be seen it doesn't have any physical entity.
- However Risk can be calculated from the Hazard.
- More the Hazard more will be the Risk.

Definitions

- **HEALTH: “Health is a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity”.**

WHO 1948

MINERALS

- All substances obtained from the earth by mining, digging, drilling, dredging, hydraulicing, quarrying or by any other operations and includes mineral oils (natural gas and petroleum)



MINE

- Any excavation where any operation for the purpose of searching for or obtaining minerals has been or is being carried on and includes
 - i) All borings, boreholes, -----
 - ii) All shafts, in or adjacent to and belonging to a mine whether in a course of being sunk or not.
 - iii) All levels, Inclines -----
 - iv) All open-cast workings
 - v) All conveyors, Aerial ropeway -----
 - vi) All audit, -----, Machinery,----- belonging to a mine
 - vii) All protective works -----
 - viii) All work-shops and stores, -----
 - ix) All power stations, transformer stations, ----- solely or mainly for working the mine
 - x) Premises for storing refuge of the mine-----
 - xi) Any premises on which any process ancillary to the getting , dressing or preparation for sale of minerals -----



OPEN-CAST WORKING

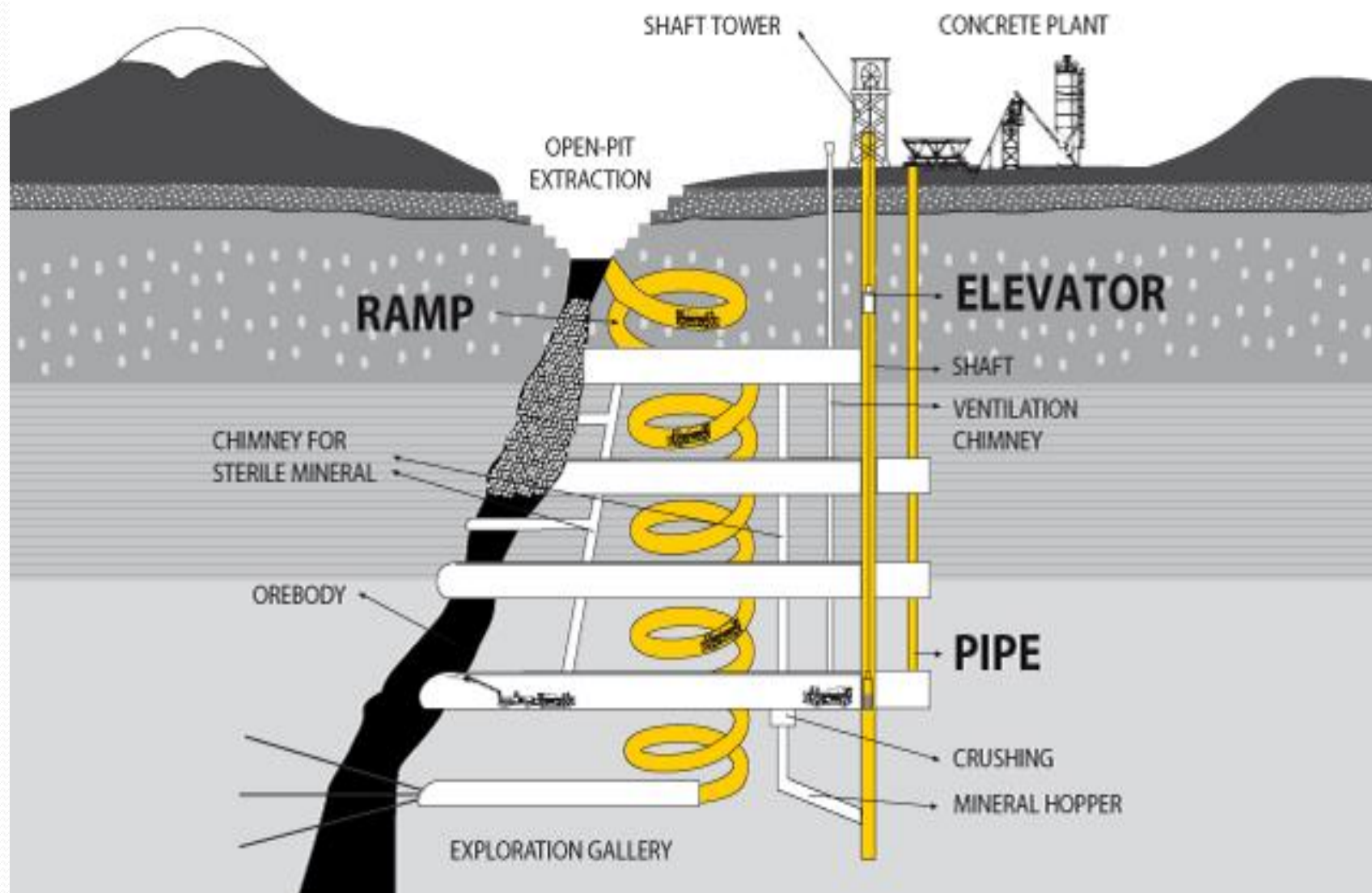
- A quarry or an excavation where any operation for the purpose of searching for or obtaining minerals has been or is being carried on, not being :
 - i) a shaft or,
 - ii) an excavation which extends below superjacent ground



UNDERGROUND WORKING

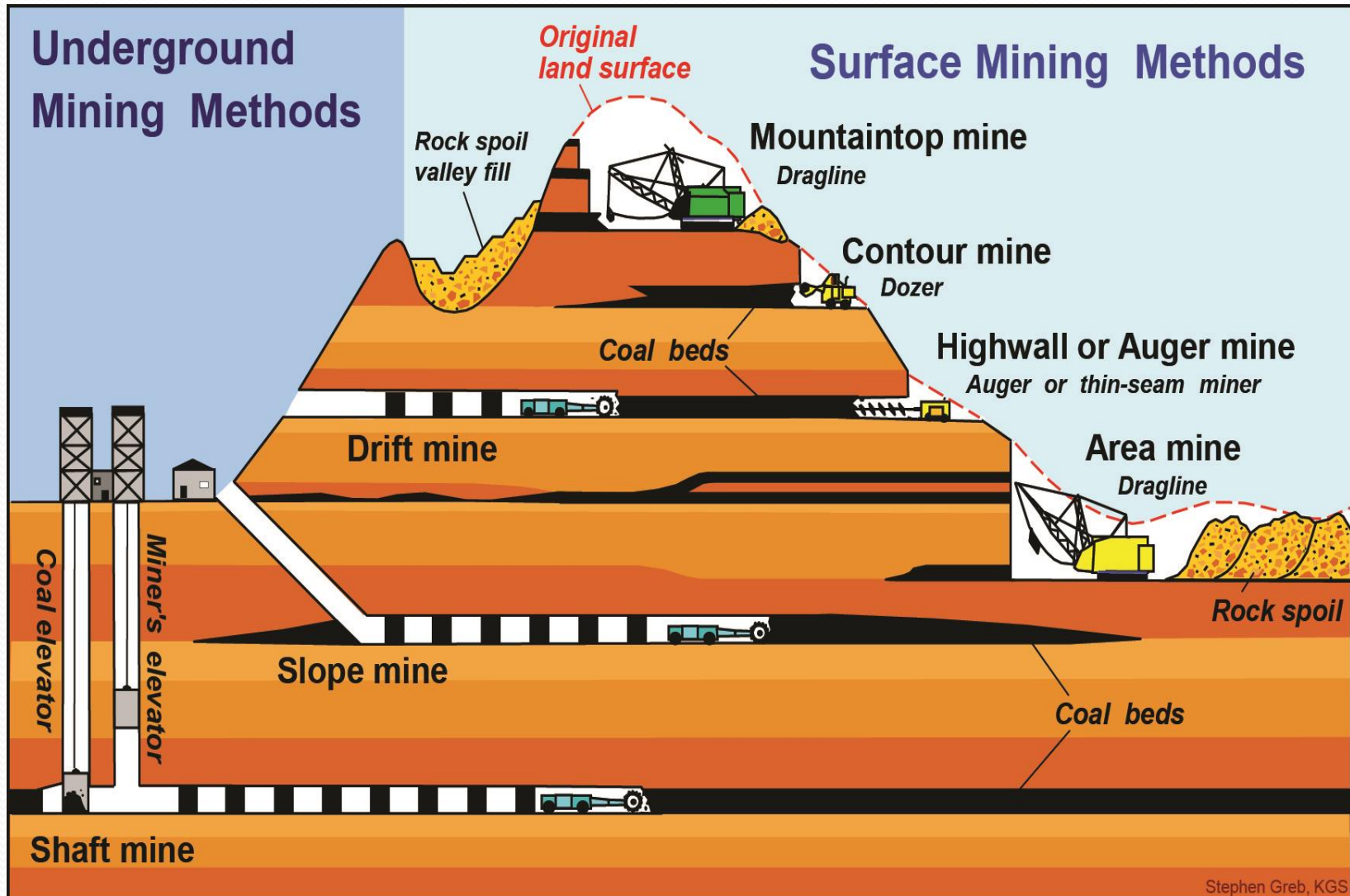
- An excavation which extends below superjacent ground is called underground workings.





Underground Mining Methods

Surface Mining Methods







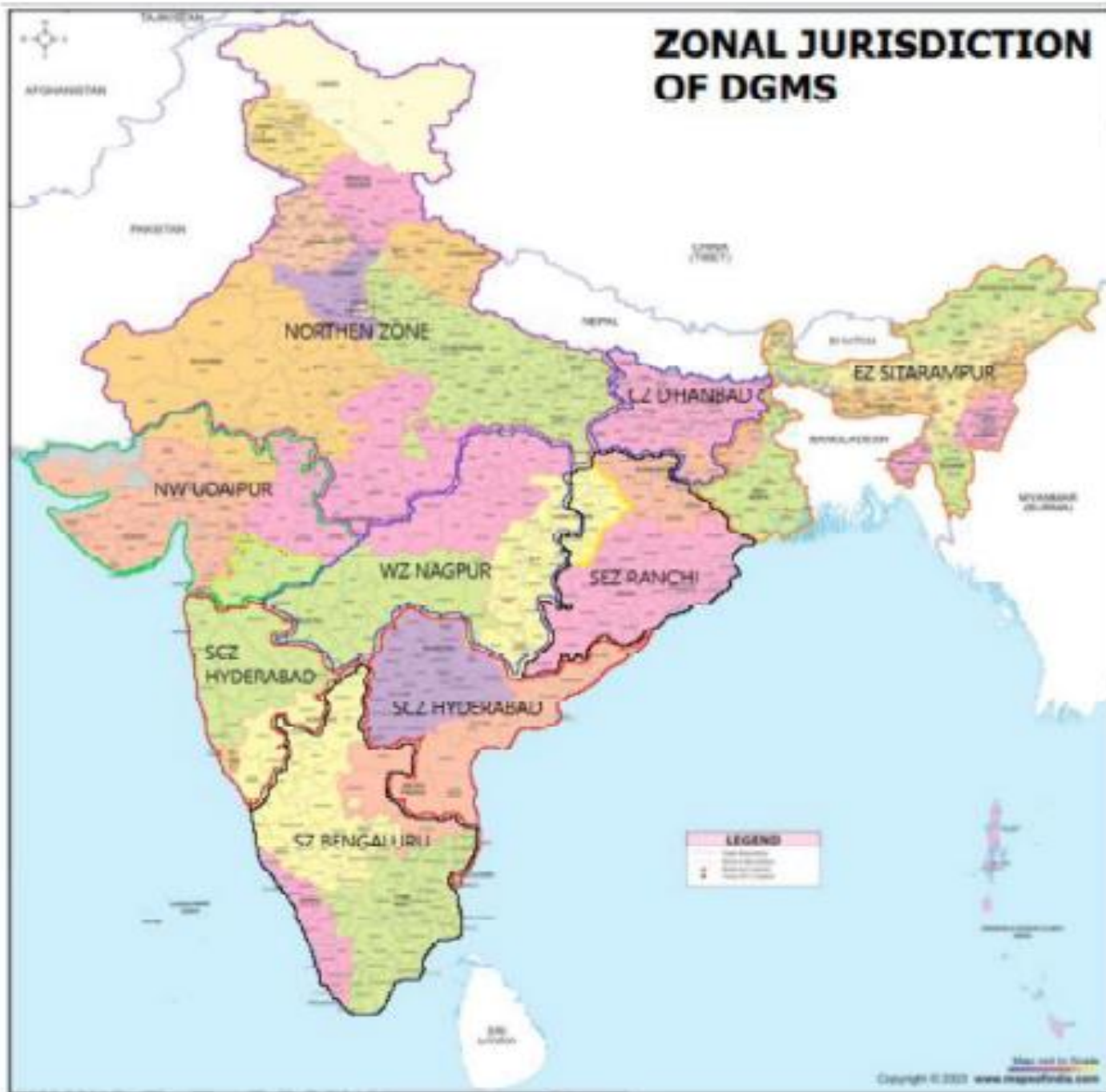
**DIRECTORATE GENERAL OF
MINES SAFETY**

**MINISTRY OF LABOUR &
EMPLOYMENT**

GOVT. OF INDIA

**HEAD QUARTER
DHANBAD**

ZONAL JURISDICTION OF DGMS



MINES ACT 1952

(Act No.35 of 1952)

- An act to amend and consolidate the law relating to the regulation of labour and safety in mines.
- The objective of this Act are-
 - To provide health, safety and well being of persons
 - To regulate the working conditions and environment
 - For measures to prevent accidents and occupational diseases
 - To provide basic amenities
 - To establish a system of inspection for enforcement

RULES AND REGULATIONS FRAMED UNDER THE MINES ACT, 1952

- The Coal Mines Regulations, 2017
- The Metalliferous Mines Regulations, 1961
- The Oil Mines Regulations, 2017
- The Mines Rules, 1955
- The Mines Vocational Training Rules, 1966
- The Mines Rescue Rules, 1985
- The Mines Creche Rules, 1966

OTHER ACT COVERED BY DGMS

- ELECTRICITY ACT, 2003 :

Central Electricity Authority (Measure relating to Safety and electric Supply) Regulation, 2010

ALLIED LEGISLATION

- Explosive Rules, 2008
- Factories Act, 1948 : Chapter III & IV
- Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989 under Environmental Protection Act, 1986
- Land Acquisition (Mines) Act, 1885
- The Coal Mines (Conservation & Development) Act, 1974

ACT NOT TO APPLY IN CERTAIN CASES (Except Sections 7,8,9 40,45 & 46)

1 (a) Any mine or part thereof for prospecting purpose only and not for use or sale :

Provided that-

- i) Not more than 20 persons are employed per day
- ii) Depth does not exceed six metres and
- iii) No part of the mine extends below superjacent ground

OR

(b) Extraction of Kankar, Murrum, Laterite, Boulder, Gravel, Shingle, Ordinary sand (excluding moulding sand, glass sand & other mineral sand), Ordinary clay (excluding Kaoline, China clay, White clay or Fire clay), Building Stone, Slate, Road metal, Earth, Fuller's earth, Marl Chalk and Lime stone; provided that,-

- i) Workings does not extend below superjacent ground ; or
- ii) Where working by open-cast-
 - a) Depth does not exceed six metres
 - b) Not more than 50 persons are employed per day
 - c) Explosives are not used

- Section 7,8,9 : Inspectors, Section 40: Employment below 18 years,
- Section 45: Prohibition of presence of <18 years, Section 46: Employment of women

WOMEN EMPLOYMENT

- Details of employment of women in mines as per the relaxation granted vide Gazette notification No. 393([S.O. 506(E)] dated 29th January 2019. Number of women employed aboveground between 7PM & 6AM
Number of women employed belowground workings
71 (Seventy one) 25 (Twenty Five)

HISTORICAL BACKGROUND

1901- Indian Mines Act enacted on 22.03.1901

1902- Bureau of Mines Inspection formed with Calcutta as headquarter

1904- Name of the organisation changed to Department of Mines

1908- Head Quarters of the organisation shifted to Dhanbad

1960- Name of the organisation changed to office of “The Chief Inspector of Mines” with effect from 01.01.1960.

1967- Organisation renamed as Directorate General of Mines Safety (DGMS) on 01.05.1967.

1988- DGMS declared S & T organisation

HISTORY OF MINING

- 1774 —→ East India Company granted first permission to an English Company for coal mining in Raniganj, Bengal.
- 1880 —→ M/s. John Taylor & Sons started gold mining at Kolar Gold Fields (KGF) in Mysore state
- 1866 —→ First Oil well was dug in Digboi, Assam, only seven years after the first ever oil well was drilled anywhere in the world viz. in Pennsylvania state, USA in 1859

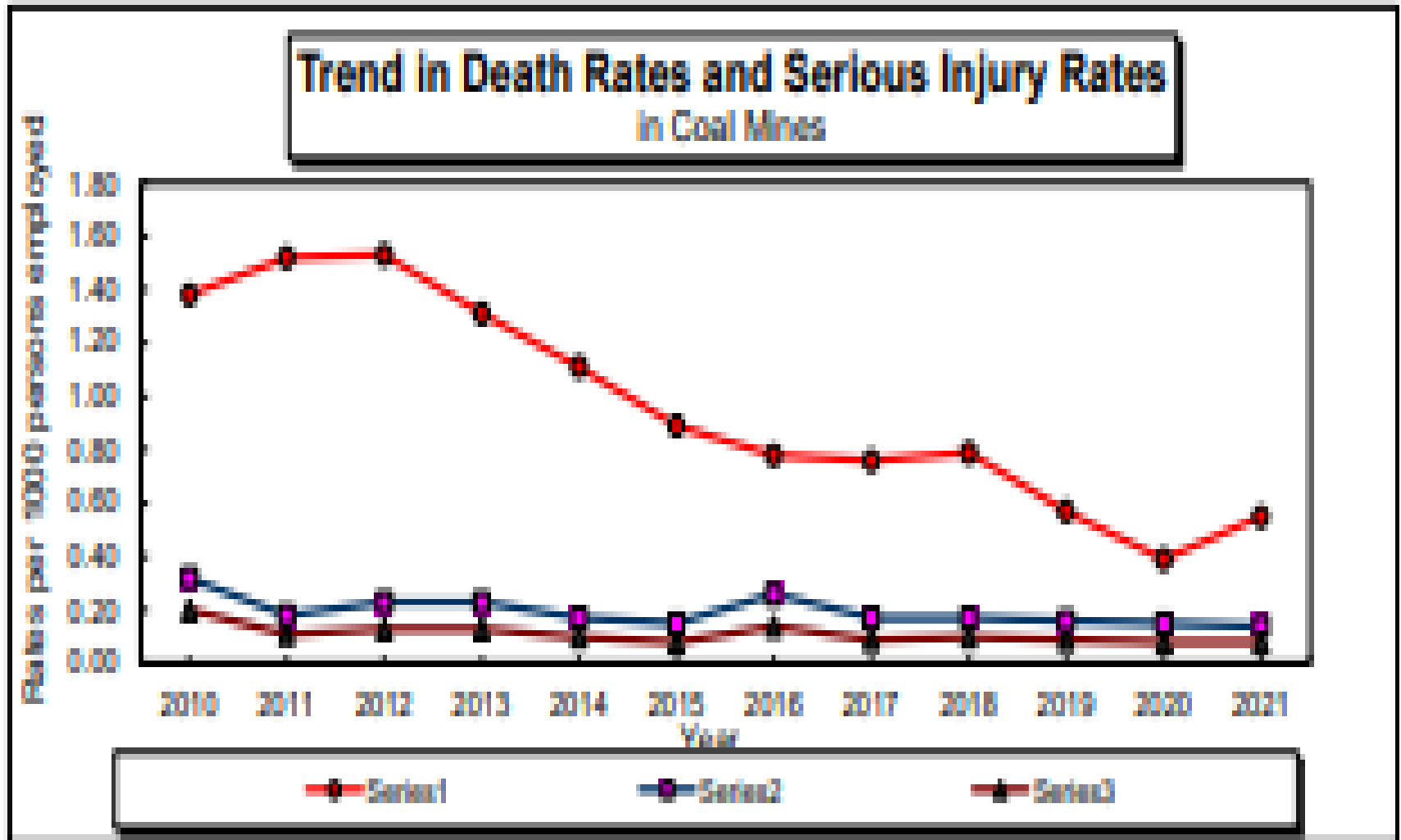
MINERALS MINED IN INDIA

- 89 minerals in total
- 4 Fuel, 10 Metallic, 48 Non-Metallic, 3 Atomic & 24 minor
- Fuel: Coal, Lignite, Oil, Gas
- Metal: Iron Ore, Lead-Zinc, Copper ore, Bauxite, Chromite, Goal ore etc
- Atomic Minerals: Uraninite, Ilmenite, Monazite
- Non-Metal: Limestone, Magnesite, Dolomite, Barytes, Kaolin, Gypsum, Steatite, Flourite, Marble, Granite, building stone etc.

ACCIDENT STATISTICS OF COAL MINES

Trend in Fatal & Serious Accidents and Death Rates & Serious Injury Rates in Coal Mines									
TABLE-7									
Year	Number of Accidents			Accident Frequency Rate/Lakh Manshifts	Number of Persons		Rate per 1000 Persons Employed		Death Rate per Million Tonnes
	Fatal	Serious	Total		Killed	S/Injured*	Death Rate	S/Inj. Rate	
2010	97	480	577	0.48	118	511	0.32	1.38	0.20
2011	65	533	598	0.51	67	556	0.18	1.52	0.11
2012	79	536	615	0.53	83	548	0.23	1.53	0.13
2013	77	456	533	0.47	82	468	0.23	1.31	0.13
2014	59	379	438	0.39	62	394	0.17	1.11	0.10
2015	54	302	356	0.31	55	316	0.15	0.89	0.08
2016	67	268	335	0.29	94	278	0.26	0.78	0.14
2017	56	266	322	0.28	61	272	0.17	0.76	0.09
2018	49	266	315	0.28	62	280	0.17	0.79	0.10
2019	51	193	244	0.21	56	204	0.16	0.57	0.09
2020	48	118	166	0.15	53	139	0.15	0.39	0.08
2021	43	188	231	0.20	51	195	0.14	0.55	0.08

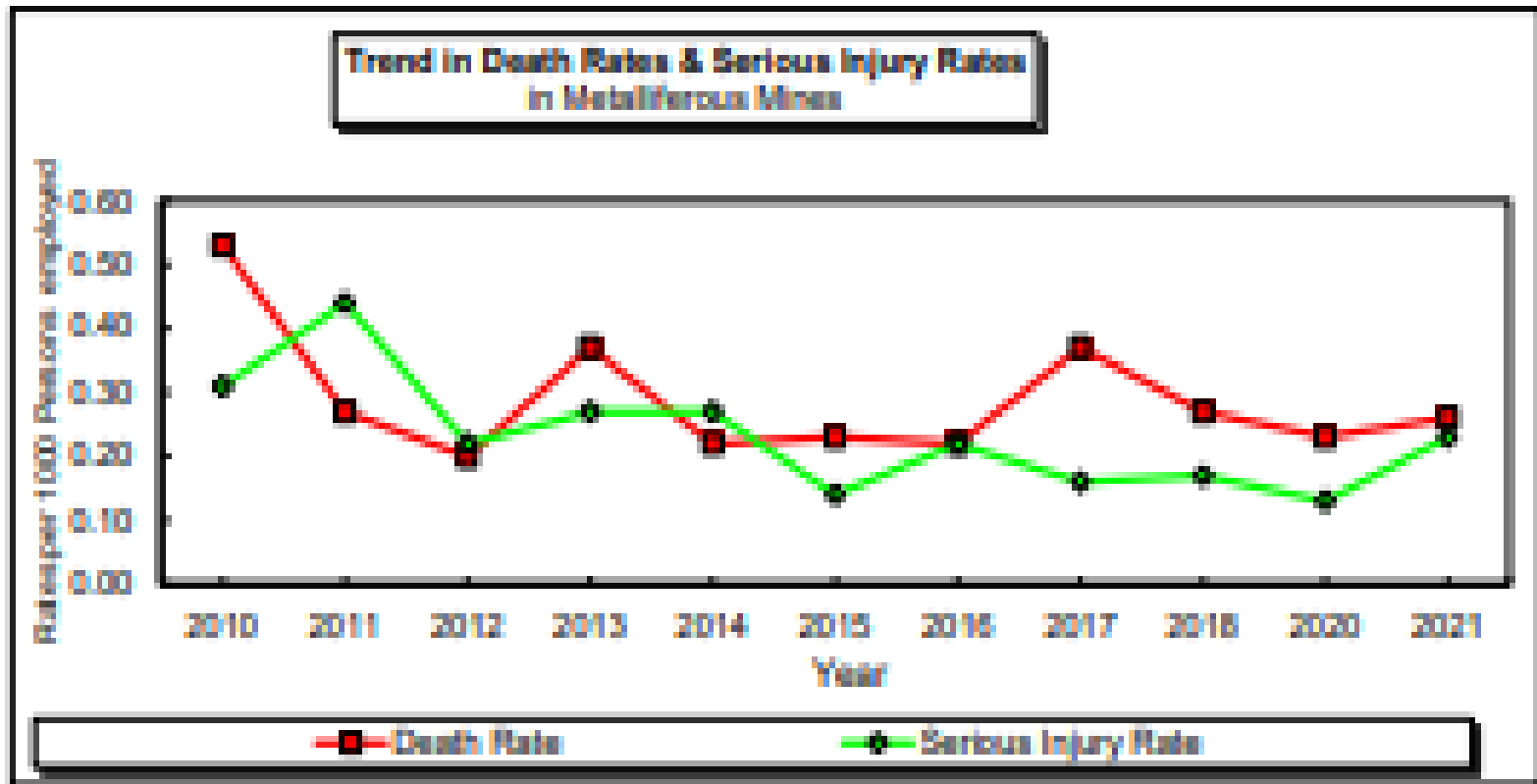
ACCIDENT STATISTICS OF COAL MINES



ACCIDENT STATISTICS OF METALLIFEROUS MINES

TABLE- 9		Trend in Fatal & Serious Accidents and Death Rates & Serious Injury Rates in Metalliferous Mines						
Year	No. of accidents			Accident frequency rate per 1000 persons employed	Number of persons		Rate per 1000 persons employed	
	Fatal	Serious	Total		Killed	Seriously injured*	Death rate	Serious injr. rate
2010	50	45	95	0.58	87	51	0.53	0.31
2011	41	65	106	0.61	47	76	0.27	0.44
2012	34	35	69	0.38	36	40	0.20	0.22
2013	54	37	91	0.49	69	50	0.37	0.27
2014	34	34	68	0.37	40	50	0.22	0.27
2015	41	22	63	0.34	43	26	0.23	0.14
2016	30	30	60	0.33	41	40	0.22	0.22
2017	45	12	57	0.31	67	29	0.37	0.16
2018	44	21	65	0.36	59	31	0.27	0.17
2019	40	39	79	0.43	44	49	0.24	0.27
2020	33	16	49	0.27	42	24	0.23	0.13
2021	30	35	65	0.36	47	42	0.26	0.23

ACCIDENT STATISTICS OF METALLIFEROUS MINES

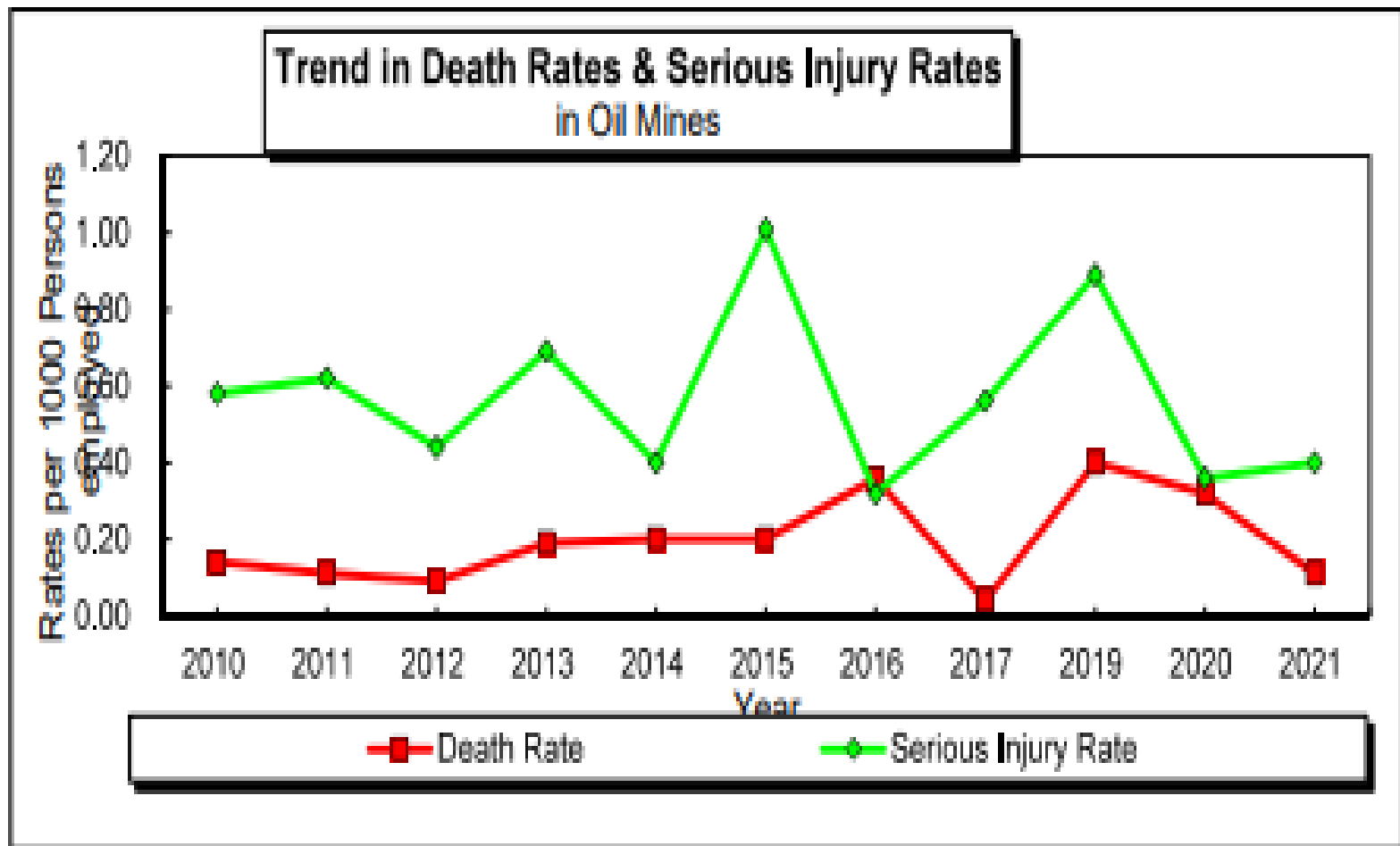


out of 47 deaths reported from metalliferous mines, 6 occurred in Iron ore mines, 12 in Stone, 2 in Limestone, 3 in Galena and Sphalerite, 1 in Manganese, and 23 in others

ACCIDENT STATISTICS OF OIL MINES

TABLE-11		Trend in Fatal & Serious Accidents and Death Rates & Serious Injury Rates in Oil Mines						
Year	No. of accidents			Accident frequency rate per 1000 persons employed	Number of persons		Rate per 1000 persons employed	
	Fatal	Serious	Total		Killed	Seriously injured*	Death rate	Serious injury rate
2010	4	16	20	0.68	4	17	0.14	0.58
2011	3	17	20	0.73	3	17	0.11	0.62
2012	2	10	12	0.53	2	10	0.09	0.44
2013	4	15	19	0.73	5	18	0.19	0.69
2014	5	10	15	0.60	5	10	0.2	0.40
2015	4	13	17	0.69	5	25	0.20	1.01
2016	9	7	16	0.64	9	8	0.36	0.32
2017	1	9	10	0.40	1	14	0.04	0.56
2018	2	2	4	0.16	2	4	0.08	0.16
2019	5	21	26	1.05	10	22	0.40	0.89
2020	7	8	15	0.60	8	9	0.32	0.36
2021	3	10	13	0.52	3	10	0.11	0.40

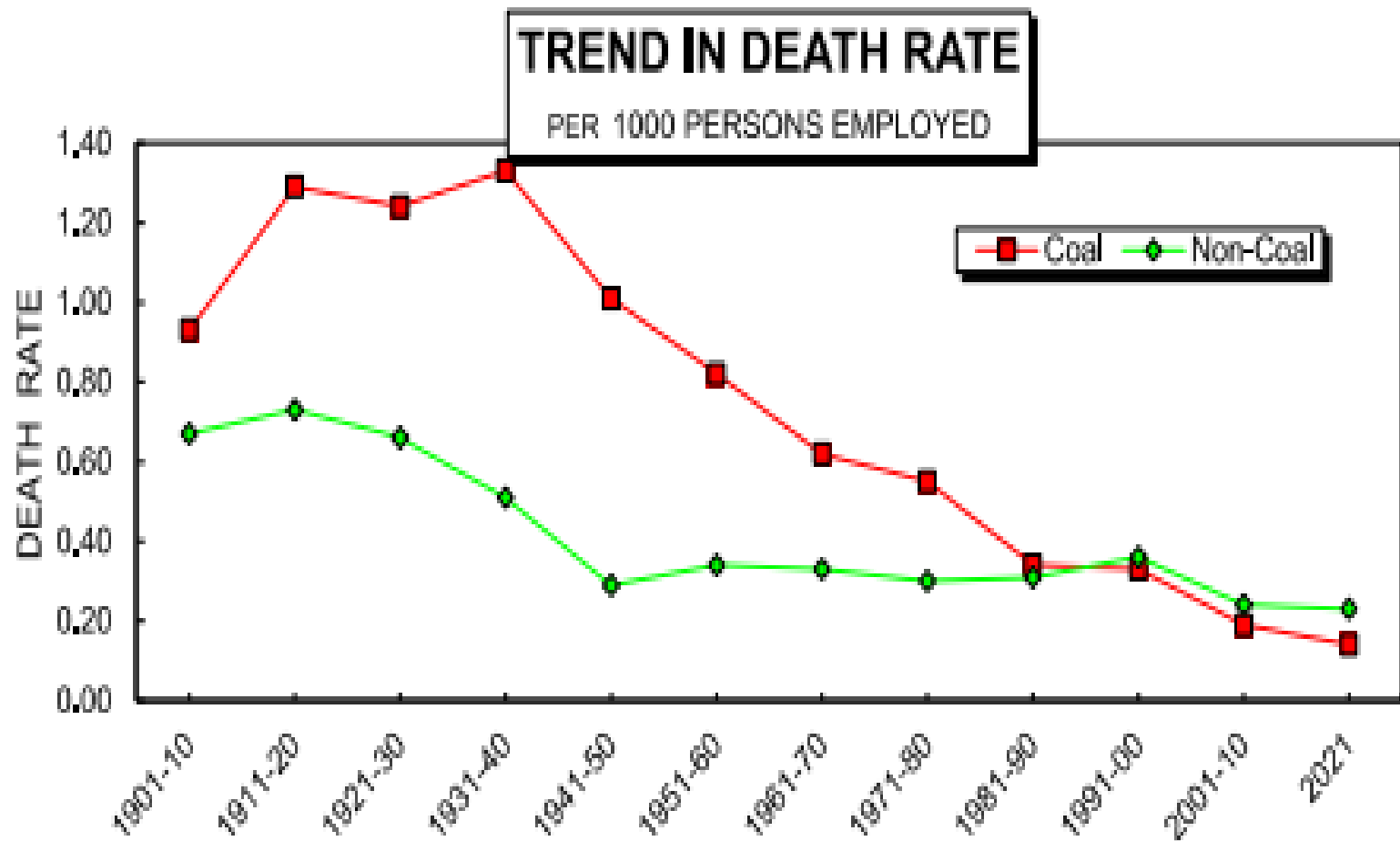
ACCIDENT STATISTICS OF OIL MINES



ACCIDENT STATISTICS OF 120 YEARS

TABLE-3	Trend in fatal accidents and fatality rates per 1000 persons employed (Ten yearly average)							
	COAL MINES				NON-COAL MINES			
	Av. No. of Acc.	Acc. rate	Av. No. of Fatalities	Fatality rate	Av. No. of Acc.	Acc. rate	Av. No. of Fatalities	Fatality rate
1901-10	74	0.76	92	0.93	16	0.47	23	0.67
1911-20	139	0.94	176	1.29	29	0.57	37	0.73
1921-30	174	0.99	219	1.24	43	0.54	50	0.66
1931-40	172	0.98	228	1.33	35	0.41	43	0.51
1941-50	226	0.87	273	1.01	26	0.24	31	0.29
1951-60	223	0.61	295	0.82	64	0.27	81	0.34
1961-70	202	0.49	259	0.62	72	0.28	85	0.33
1971-80	187	0.40	264	0.55	66	0.27	74	0.30
1981-90	162	0.30	185	0.34	65	0.27	73	0.31
1991-00	140	0.27	170	0.33	65	0.31	77	0.36
2001-10	87	0.22	108	0.27	54	0.32	67	0.40
2011-20	60	0.17	67	0.19	43	0.20	52	0.24
2021	43	0.12	51	0.14	33	0.15	50	0.23

ACCIDENT STATISTICS OF 120 YEARS



CAUSEWISE – COAL FATAL 2021

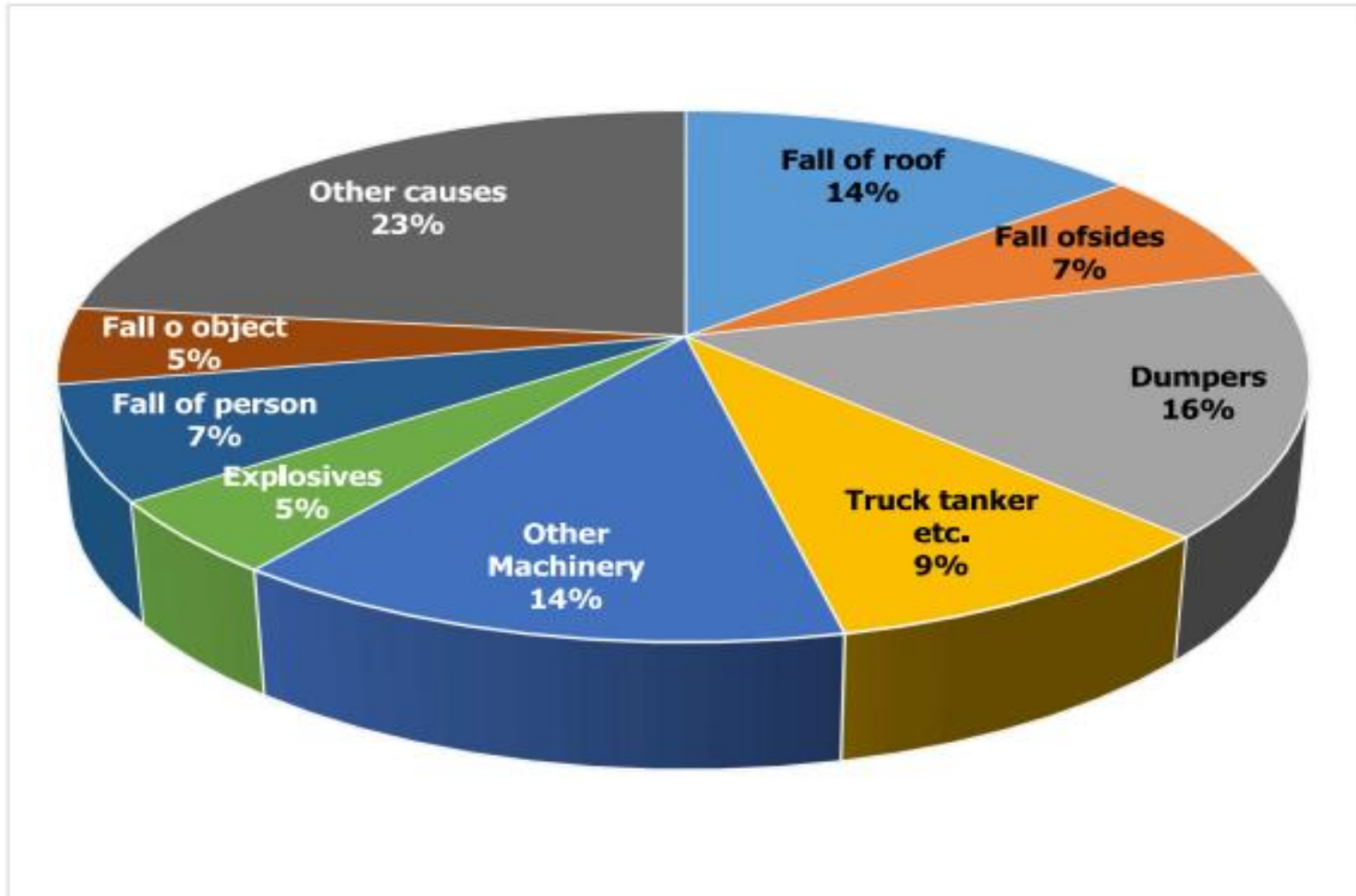


Fig.1 Cause-wise distribution of fatal accidents in coal mines during 2021

CAUSEWISE – COAL SERIOUS 2021

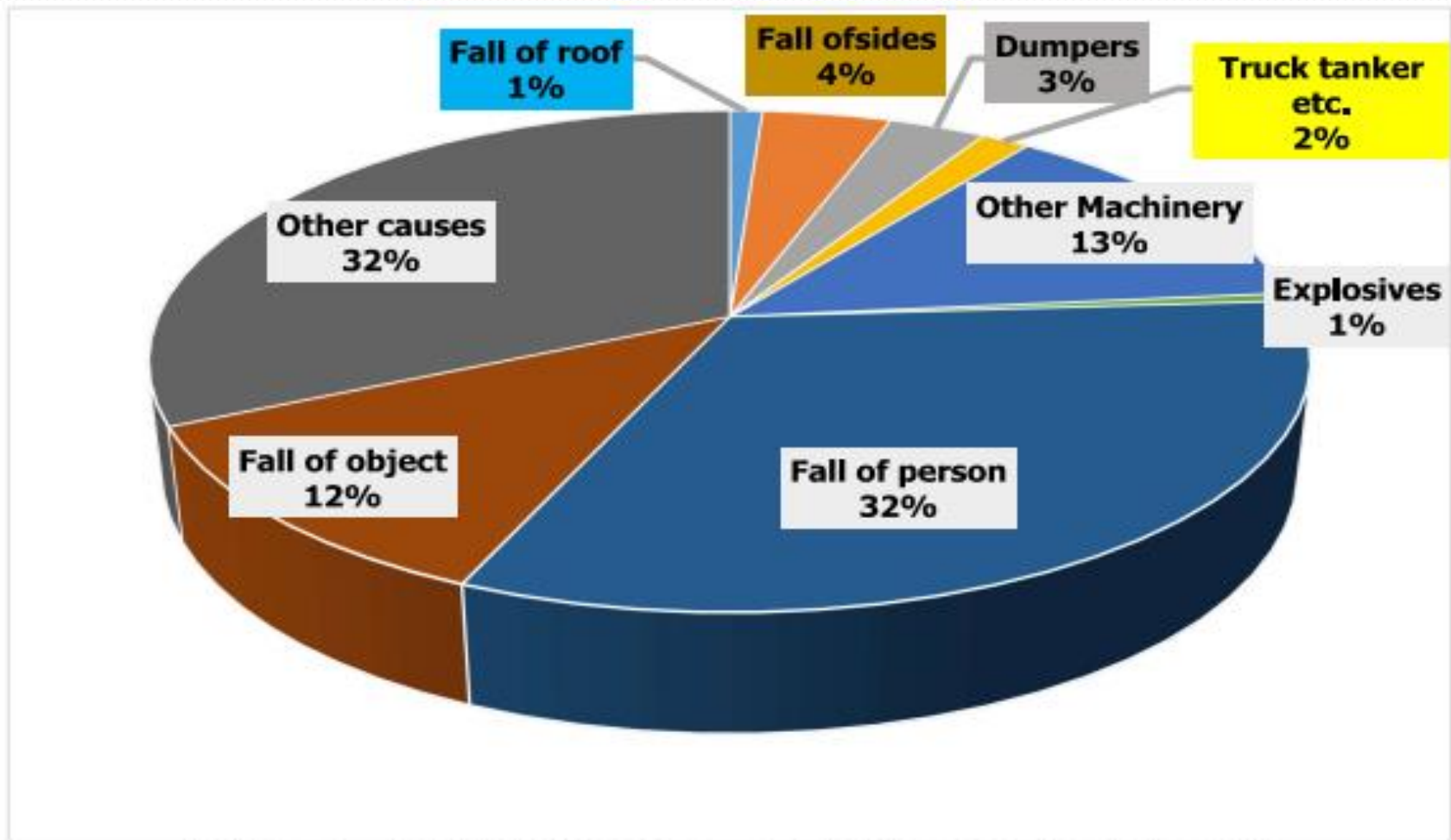


Fig.2 Cause-wise distribution of serious accidents in coal mines during 2021

CAUSEWISE – METAL 2021

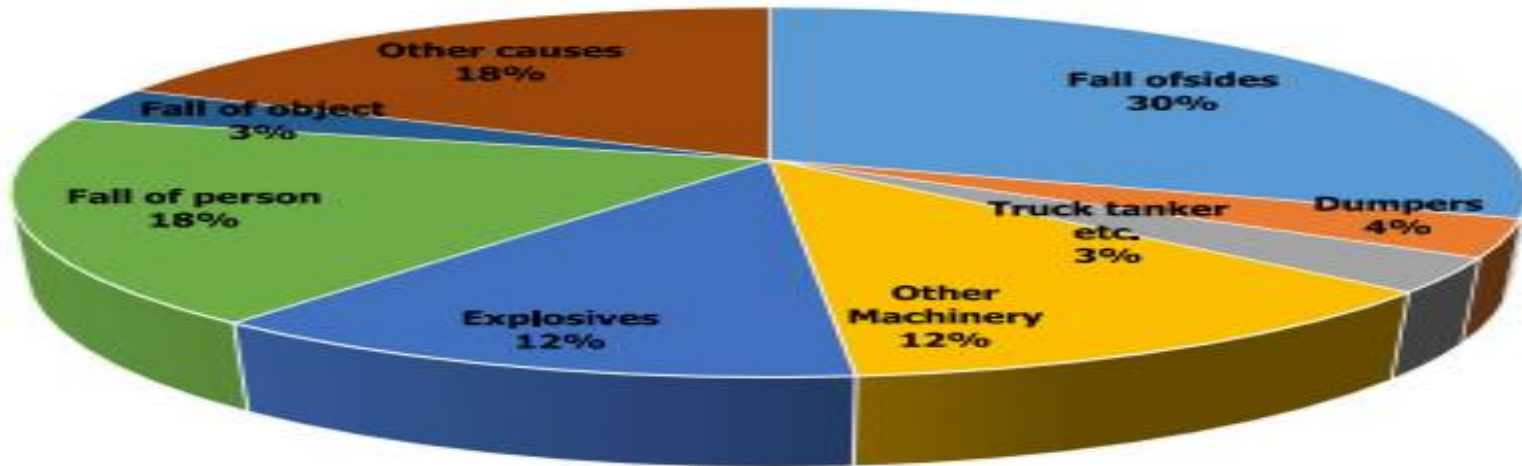


Fig.3 Cause-wise distribution of fatal accidents in metalliferous mines during 2021

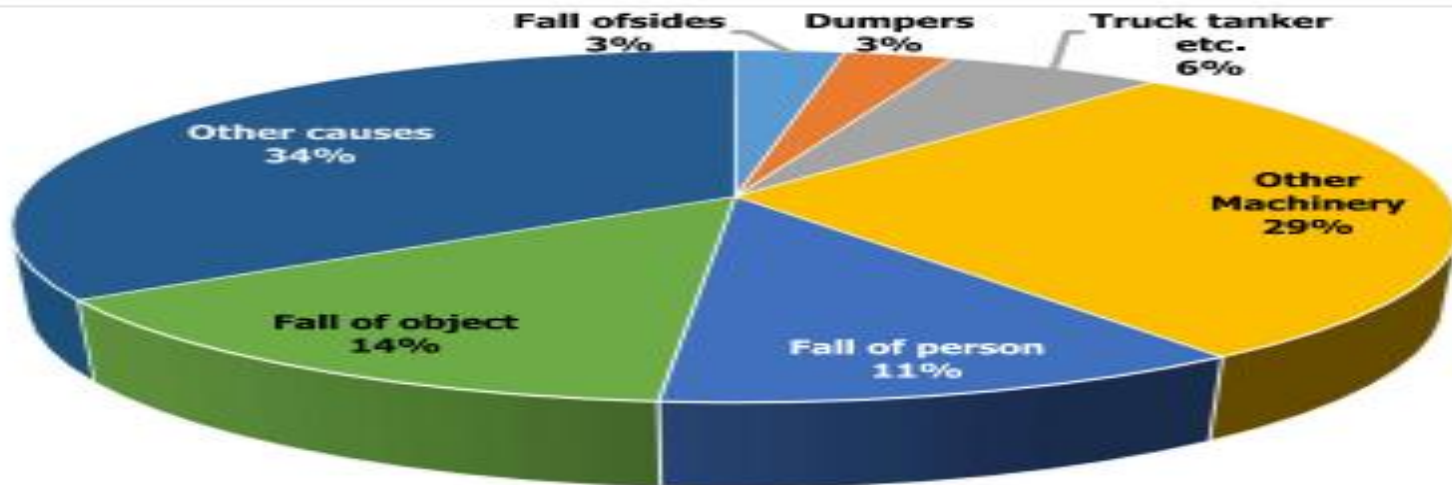


Fig.4 Cause-wise distribution of serious accidents in metal mines during 2021

CAUSEWISE – OIL 2021

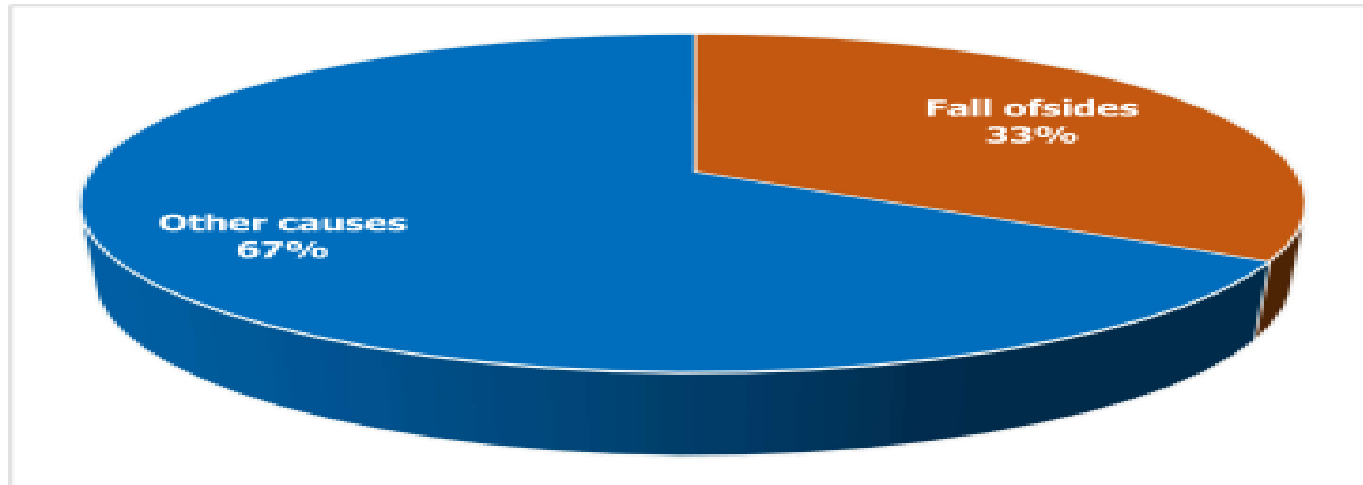


Fig. 5 Cause-wise distribution of fatal accidents in oil & gas mines during 2021

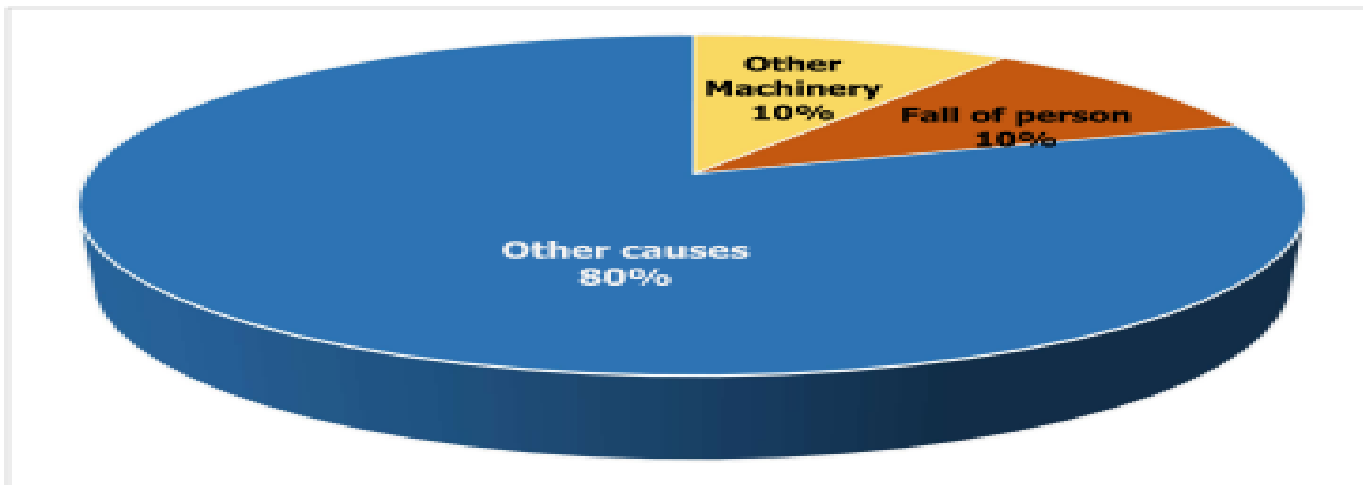


Fig. 6 Cause-wise distribution of fatal accidents in oil & gas mines during 2021

SOME IMPORTANT CAUSES OF ACCIDENTS

- Fall of Roof
- Fall of side
- Fall of object
- Fall of person
- Truck/Dumper/Tanker
- Explosives
- Drowning
- H.E.M.M.
- Electricity
- Rope Haulage



MAJOR ACCIDENT CAUSES

- Inadequate knowledge/ experience.
- Not aware of risks associated with different activities.
- Not informed about the safe operating /working procedures.
- Not trained.
- Lack of proper supervision.
- Non-usage of PPE.
- Little/No control over contractor workers.
- Some times ‘Nobody's baby’.

PROBLEMS OF THE UN-ORGANIZED SECTOR.

- **Small sizes of quarry lease/license/permit.**
- **Financially weak mine operators.**
- **Short period of lease.**
- **Lack of awareness about the mine safety provisions.**
- **Unsystematic and unscientific mining practices.**
- **Shortage of appointment of statutorily qualified competent persons.**
- **Highly illiterate, unorganised and migrant labour.**
- **Illegal possession, storage and use of explosives.**

COMMON VIOLATIONS

1. Notice of opening of the mine is not submitted to DGMS (Reg.3).
2. Plan showing boundaries not furnished to DGMS (Reg.3).
3. Either manager is not appointed or if appointed, not dully qualified (Reg.34).
4. No licence for use of explosive. Normally get the blasting done through contractor (Reg.153,154 & 160).
5. No blasting tools, blaster shelter (Reg.161 & 164).
6. No safety belt (Reg.114).
7. No footwear & no helmet (Reg.182 & 182A).
8. No first aid station (Rule.44).
9. No rest shelter (Rule.62).
10. No surface plan (Reg.61).
11. No form – B, form – D (Rule 77 & 78).
12. No report of accident even serious & many a times fatal accidents also (Reg.9).
13. No creche, though female workers having less than 6 yr old children are employed (Mines Creche Rules,1966).

COMMON VIOLATIONS

14. Non-submission of quarterly & annual returns (Reg.4 & 5).
15. No protection from dust & no arrangement for wet drilling (Reg.124).
16. No blasting record (Reg.169).
17. Very high benches or no benches, no slopes on benches (Reg.106).
18. No fencing around excavation (Reg.115(1)).
19. Working within 7.5m of the boundary (Reg.107).
20. Non submission of discontinuance/closure notice (Reg.6).
21. Termination & appointment of manager without informing DGMS (Reg.8A)
22. Non appointment of engineer (Reg.36).
23. Non payment of leave wages (Rule 53).
24. No initial or periodical medical examination (Rule 29B).
25. No potable drinking water (Rule 30-32)
26. No vocational training inclusive of persons engaged for carrying explosive (Mine Vocational Training Rules, 1966).

NOTIFIED DISEASES UNDER THE MINES ACT, 1952

- The Mines Act, 1952 ensures Safety, Health and Welfare of persons employed in Mines and it provides for notifying occupational diseases. Total Eight diseases have been notified under sub-section (1) of Section 25 of the Act.

LIST OF NOTIFIED DISEASES:

- Lead poisoning,
- Manganese poisoning
- Silicosis - 268 cases of silicosis were identified since 2017
- Cancer of the skin
- Asbestosis
- Contact dermatitis
- Noise induced hearing loss
- Coal miners' pneumoconiosis

NATIONAL CONFERENCE ON SAFETY IN MINES

- It is a tripartite forum at the national level in which the employers' representatives, the trade unions' representatives, the Government represented by Ministry of Labour & Employment, DGMS, various administrative ministries/ departments and State Governments and associated institutions, professional bodies, service associations, etc.
- Review the status of safety in mines and the adequacy of existing measures.
- Suggests measures for further improvement in safety, welfare and health.
- The twelfth conference was held on January, 2020 during which five major issues were discussed -
 - (i) Electrical safety – Recent trends, Strategy for improvement,
 - (ii) Role of information technology in mining sector,
 - (iii) Prevalence of pneumoconiosis/silicosis amongst workers, present status of dust control measures and strategy for improvement,
 - (iv) Strategies for disaster prevention in coal mines
 - (v) Occupational safety and health issues of contractual workers

LEGISLATIVE REFORMS

- The OCCUPATIONAL SAFETY HEALTH & WORKING CONDITION CODE, 2020 notified in the gazette of India on 29th September, 2020.
- The Code aims at lessening the burden of the employers as it would replace multiple registrations under various enactments to one common registration, one licence and one return.
- The Code has made maximum registration process to be initiated electronically enhanced paperless transaction.
- Contrary to earlier provisions women workers are entitled to be employed in all establishments for all type of work including hazardous process .
- Subsequent to enactment of Occupational Safety Health and Working Conditions code 2020, drafting of Rules & Regulations to be framed is under progress.

Thank you!

