

NOTES ON MINE ACCIDENTS

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Between 700 and 800 workers have died in mine accidents and an average of nearly 28 000 have been injured every year between 1970 and 1977 (1).

The immediate causes of these deaths and injuries are clear. On gold mines, falls of ground (including rockbursts) account for more deaths and injuries than any other kind of accident, and accidents with trucks and tramways are the second most frequent cause of death or injury (see Table 2). On coal mines falls of ground cause the highest number of deaths and accidents, trucks and tramways cause the highest number of injuries. Writing about mine accidents in 1977, the Government Mining Engineer points out that rockburst fatalities rose from 85 in 1976 to 114 in 1977 on the gold mines, and constituted 35 per cent of the fall of ground fatalities on these mines.

However, it is less easy to identify the conditions under which these accidents are likely to occur, and the decisions which give rise to these conditions.

The Department of Mines categorisation of accidents as due to 'danger inherent in work or misadventure' and to 'defective plant or machinery' only obscures the issue. Thus, the Department finds that in most years about 98 per cent of all accidents and some 80 per cent of fatal accidents fall into these two categories (2). This is equivalent to saying that 'mining is dangerous work' as if this were both an explanation of and a justification for high casualty rates.

But accidents are not random events. The Government Mining Engineer notes that the increase in fall of ground fatalities on the gold mines 'is undoubtedly related to the increased depth and extent of workings' (3). Deeper

mining means higher temperatures, humidity and pressure, and more frequent rockbursts.

The first question, then, if depth and danger are related, is: in terms of what criteria, is the decision to increase the depth of mines, made?

Second : to what extent can the consequences of falls of ground be minimised, and other accidents prevented, if the quality of safety work keeps pace with the degree of risk involved?

The Mining Engineer points to the following factors as 'militating strongly against the work that is being done to promote safety' : 'the impact of the fall-off in labour quality, a lack of job enthusiasm, inexperienced (recruits ?) and excessive turnover'. Breach of contract is increasing, he writes, resulting in a man working for seven months, 'whereas previously his services extended over nine months - leading to the loss of a fully trained and more experienced recruit for two months'.

In this connection, writing of the coal mines, he points out that operators of shuttle cars, continuous miners, mechanical loaders and other mobile equipment 'are drawn from an unsophisticated transient labour force with a high turnover rate.' This, plus 'excessive absenteeism', helps, he says, to create a more favourable climate for accidents.

It is probable that a 'lack of job enthusiasm' and 'excessive absenteeism' should be seen as a result of the highly dangerous nature of the work rather than as a cause. In this connection it has been persuasively argued that absenteeism and breach of contract should be seen as a form of worker consciousness - the response of tightly controlled and unorganised labour to, among other things, highly dangerous working conditions (4). It has also been suggested that the alarming incidence of outbreaks of violence on South African mines in the last 6 to 8 years - much of it dismissed as 'faction fighting' - is related to

dangerous and unpleasant working and living conditions (5). Certainly it is difficult to see how greater 'enthusiasm' would have prevented the death of 10 workers when 'collapse occurred around the supports after a 'seismic event' at Hartebeesfontein gold mine in 1977, or the death of 6 workers trapped by a flood of water when a plastic pipe failed at Randfontein Estates gold mine the same year.

It is likely that the risk of accident is increased when men are sent underground to do work for which they are often not properly trained or supervised. It is likely also that danger is increased by 'speed-up', which may mean putting men to work under faulty hangings, with a high risk of rockfalls and by poor compensation rates for low-paid miners, which mean that the fear of having to pay compensation does not stimulate mine owners to spend money on increased precautions which would, in addition, slow down production.

In general, the graphs of death rates per 1 000 workers supplied by the Department of Mines (see fig 1) show roughly constant trends for gold mines and for all mines between 1961 and 1977. At least, there is no dramatic improvement. The vast majority of accidents on the mines are almost certainly outside the control of the miners themselves (6). Clearly the remedy for 'defective plant or machinery' is in the hands of those who own the plant.

The high death and injury rates of the mines must be seen in the context of the specific structure of the South African mining industry, based on a system of migrant labour. Van Onselen has written that in Rhodesia 'the economics of death suited the Rhodesian mining industry because it relied not on the capacity of a fully developed proletariat to reproduce itself, but on a flow of migrant labour created within a regional economic system. As long as the flow of cheap labour continued, there was little stimulus to pay compensation, and as long as there was no compensation there was little incentive for any

co-ordinated attempt to reduce disease in the compounds or accidents underground' (7).

The necessity to pay compensation probably induces effort to reduce the accident rate. But the fact remains that while the labour force reproduces itself outside the mining industry, and compensation is paid as a proportion of wages (so that even if compensation is paid to dependants it is based on wages below labour's reproduction costs) the relationship between the cost to the industry of accidents and the costs of accident prevention is such as to work against the maintenance of safe working conditions.

NOTES

1. Department of Mines, Mining Statistics, various years. See Table 1.
2. Department of Mines, Mining Statistics, various years.
3. Report of the Government Mining Engineer, in Report of the Department of Mines, 1977, R.P. 27/1978. All further references to the Mining Engineer are from this source. See also the article by Miklos Salamon, Research Adviser to the Chamber of Mines, in which he writes 'the fact that the total potential energy change is proportional to the depth of mining suggests that, at greater depths, if everything else is equal, the rockburst hazard is greater.' Source: Metalworker, (Journal of the Amalgamated Engineering Union of South Africa), January 1979, p. 21. Salamon also describes some of the attempts made by mine-owners to minimise the effects of rockbursts (while still mining at great depths).
4. See, for example, the work of I.R. Phimister and Charles van Onselen on Rhodesian miners.

5. Dudley Horner and Alide Kooy, Conflict on South African Mines, Saldru Working Paper no. 5, Cape Town, 1976.
6. The value of some of the activities - such as poster displays and safety films - of the Committee for the Prevention of Accidents, as described in the January issue of The Indicator, (Journal of the S.A. Engine Drivers', Firemen's and Operators' Association) must be assessed in this light. The Association itself, however, takes the view that accidents are under the control of workers 'Die Komitee vir die Voorkoming van Ongelukke probeer om die mynbedryf op die maniere wat hierbo uiteengesit is, van diens te wees, maar in werklikheid kan ongelukke net deur die werker self - dus deur u - voorkom word' (p. 7).
7. Charles van Onselen, Chibaro (London, Pluto Press, 1976), p. 60.

TABLE 1 : ACCIDENTS ON SOUTH AFRICAN MINES, 1960, 1970 - 77

YEAR	CATEGORY (1)	GOLD MINES		DIAMOND MINES		COAL MINES		OTHER MINES		TOTAL	
		DEAD	INJURED	DEAD	INJURED	DEAD	INJURED	DEAD	INJURED	DEAD	INJURED
1960	1	592	18 464	16	138	491	2 298	34	778	1 133	21 678
	2	40	10 515	2	47	3	438	8	358	53	11 358
	3	33	252	1	8	2	37	1	23	37	320
	TOTAL	665	29 231	19	193	496	2 773	43	1 159	1 223	33 356
1970	1	483	15 080	16	119	73	1 425	114	1 809	686	18 433
	2	32	9 764	2	58	5	319	22	1 333	61	11 474
	3	9	173	3	9	1	13	10	106	23	301
	TOTAL	524	25 017	21	186	79	1 757	146	3 248	770	30 208
1971	1	475	14 590	11	139	62	1 431	83	1 665	631	17 825
	2	57	9 721	5	69	31	321	13	997	106	11 108
	3	14	142	2	15	1	24	11	55	28	236
	TOTAL	546	24 453	18	223	94	1 776	107	2 717	765	29 169
1972	1	476	14 065	6	121	52	1 147	87	1 640	621	16 873
	2	22	9 415	1	70	6	275	31	862	59	10 622
	3	13	108	2	9	0	24	4	70	19	211
	TOTAL	511	23 588	9	200	58	1 446	122	2 572	700	27 706
1973	1	491	14 371	13	99	45	1 203	86	2 694	635	18 467
	2	24	8 999	2	78	7	231	21	1 319	54	1 487
	3	24	142	1	10	0	26	23	112	48	291
	TOTAL	539	23 412	16	187	52	1 460	130	4 125	737	20 245

YEAR	CATEGORY (1)	GOLD MINES		DIAMOND MINES		COAL MINES		OTHER MINES		TOTAL	
		DEAD	INJURED	DEAD	INJURED	DEAD	INJURED	DEAD	INJURED	DEAD	INJURED
1974	1	460	13 876	21	109	64	1 320	164	2 879	709	18 184
	2	20	8 492	2	37	15	274	15	1 380	52	10 183
	3	9	126	0	5	5	22	16	87	30	240
	TOTAL	489	22 494	23	151	84	1 616	195	4 346	791	28 607
1975	1	450	11 914	10	64	83	1 300	127	2 382	670	15 660
	2	29	7 224	1	30	12	279	18	1 180	60	8 713
	3	19	98	2	4	5	29	9	108	35	239
	TOTAL	498	19 236	13	98	100	1 608	154	3 670	765	24 612
1976	1	507	12 917	9	57	73	1 478	122	2 165	711	16 617
	2	26	7 643	3	27	10	285	8	1 356	57	9 311
	3	24	168	-	2	3	18	1	67	28	255
	TOTAL	557	20 728	12	86	86	1 781	141	3 588	796	26 183
1977	1	"	"	"	"	"	"	"	"	"	"
	2	"	"	"	"	"	"	"	"	"	"
	3	"	"	"	"	"	"	"	"	"	"
	TOTAL	594	19 973	"	"	120	2 061	"	"	890	25 579

" denotes not available

TABLE 3
A. DEATH RATES PER 1 000 WORKERS, 1960, 1970 - 77

	1960	1970	1971	1972	1973	1974	1975	1976	1977
Gold mines	1,46	1,23	1,28	1,24	1,25	1,21	1,32	1,39	1,40
Coal mines	7,48	1,04	1,28	0,77	0,71	1,14	1,30	1,03	1,24
Diamond mines	1,08	0,98	0,88	0,44	0,78	1,11	0,66	0,69	..
Other mines	0,52	1,06	0,79	1,00	0,91	1,16	2,23	1,96	..
All mines	1,97	1,16	1,16	1,11	1,09	1,19	1,22	1,21	1,27

B. INJURY RATES PER 1 000 WORKERS, 1960, 1970 - 77

	1960	1970	1971	1972	1973	1974	1975	1976	1977
Gold mines	64,14	58,74	57,51	57,17	54,39	55,68	50,90	51,57	47,0
Coal mines	41,82	23,20	23,27	19,19	19,88	21,84	20,91	21,25	21,3
Diamond mines	10,96	8,66	10,87	9,77	7,20	7,31	4,94	4,94	"
Other mines	14,09	23,47	20,10	21,12	28,77	25,86	22,64	20,33	"
All mines	53,61	45,67	44,39	44,12	43,00	42,91	39,17	39,42	36,4

TABLE 2 : ACCIDENTS, DEATHS & INJURIES, BY TYPE OF ACCIDENT, 1977

Category	GOLD MINES		DIAMOND MINES		COAL MINES		OTHER MINES	
	No. of acci- dents	Injured	No. of acci- dents	Injured	No. of acci- dents	Injured	No. of acci- dents	Injured
Category 1								
Falls of ground : rockbursts other falls	506	114	567	-	-	-	-	4
Machinery	4332	208	4260	13	2	12	52	256
Trucks & tramways	185	6	182	6	-	6	6	71
Fall of material	4231	99	4145	23	-	24	38	1031
a) on surface	370	6	372	4	-	4	4	69
b) below surface	2823	27	2825	12	1	13	3	178
Falling in shafts, excavations etc.								
a) on surface	29	6	25	1	-	1	-	-
b) below surface	119	35	85	8	3	8	-	2
Struck by cage or skip	64	11	57	-	-	-	-	3
Travelling by cage or skip	48	6	49	3	2	1	1	2
Breaking of haulage ropes & connections	-	-	-	-	-	-	-	-
Travelling by ladder	14	-	7	-	-	-	-	-
Overwinds & runways								
Directly caused by electricity	40	7	33	2	-	2	5	12
Boilers & steam pipes								
Due to underground fires	11	15	23	-	-	-	-	-
Inundation by water or mud	17	17	11	2	2	-	-	-
Total Category 1	12789	557	12648	74	10	71	1678	1627
								2150
								145
								2069
Category 2								
Miscellaneous								
a) Explosion of gas	3	-	3	-	-	-	1	6
b) Subsidence								
c) Burning & scalding	206	1	213	4	-	4	33	33
d) Falling & slipping	1672	2	1672	5	1	4	113	109
e) Splinters	552	1	552	1	-	1	7	7
f) Elevators	1	-	1	-	-	-	-	-
g) Heat stroke	16	4	12	-	-	-	-	-
h) Heat exhaustion	89	-	90	-	-	-	-	-

i) Sundry	4708	22	4699	33	1	32	248	2	247	803	9	800
Total Category 2	7247	30	7246	43	2	41	402	9	402	1237	13	1231
<u>Category 3</u>												
Explosives:												
a) Drilling into misfired holes	11	1	24	-	-	-	2	-	3	9	2	22
b) Due to fumes	18	2	17	3	1	4	-	-	-	26	1	45
c) During blasting operation	9	2	7	3	-	3	16	2	15	12	2	15
d) Handling detonators	8	-	8	-	-	-	2	-	2	7	-	7
e) While charging	4	1	8	-	-	-	2	-	4	-	-	-
f) Withdrawing charges	2	-	2	-	-	-	-	-	-	-	-	-
g) Sundry	11	1	13	-	-	-	3	-	5	10	1	18
Total Category 3	63	7	79	6	1	7	25	2	32	64	6	107
Total all categories	20 099	594	19 973	123	13	119	2 105	120	2 061	3 451	164	3 407

SOURCE: Department of Mines, Mining Statistics 1977, R.P. 70/1978, pp. 21-22.

NOTE: (1) Figures in these Columns do not add up these totals.

C. DEATH AND INJURY RATES COMBINED PER 1 000 WORKERS, 1960, 1970
- 77.

	1960	1970	1971	1972	1973	1974	1975	1976	1977
Gold mines	65,60	57,97	58,80	58,41	55,64	56,89	52,22	52,96	48,39
(1)									
Coal mines	49,30	24,24	24,51	19,96	20,59	22,98	22,21	22,28	22,50
Diamond									
mines	12,04	9,63	11,74	10,21	7,98	8,42	5,60	5,63	"
Other									
mines	14,61	24,53	20,89	22,12	29,68	27,02	24,87	22,29	"
All mines	55,58	46,83	45,55	45,23	44,09	44,10	40,39	41,03	37,71

SOURCES: As in Table 1.

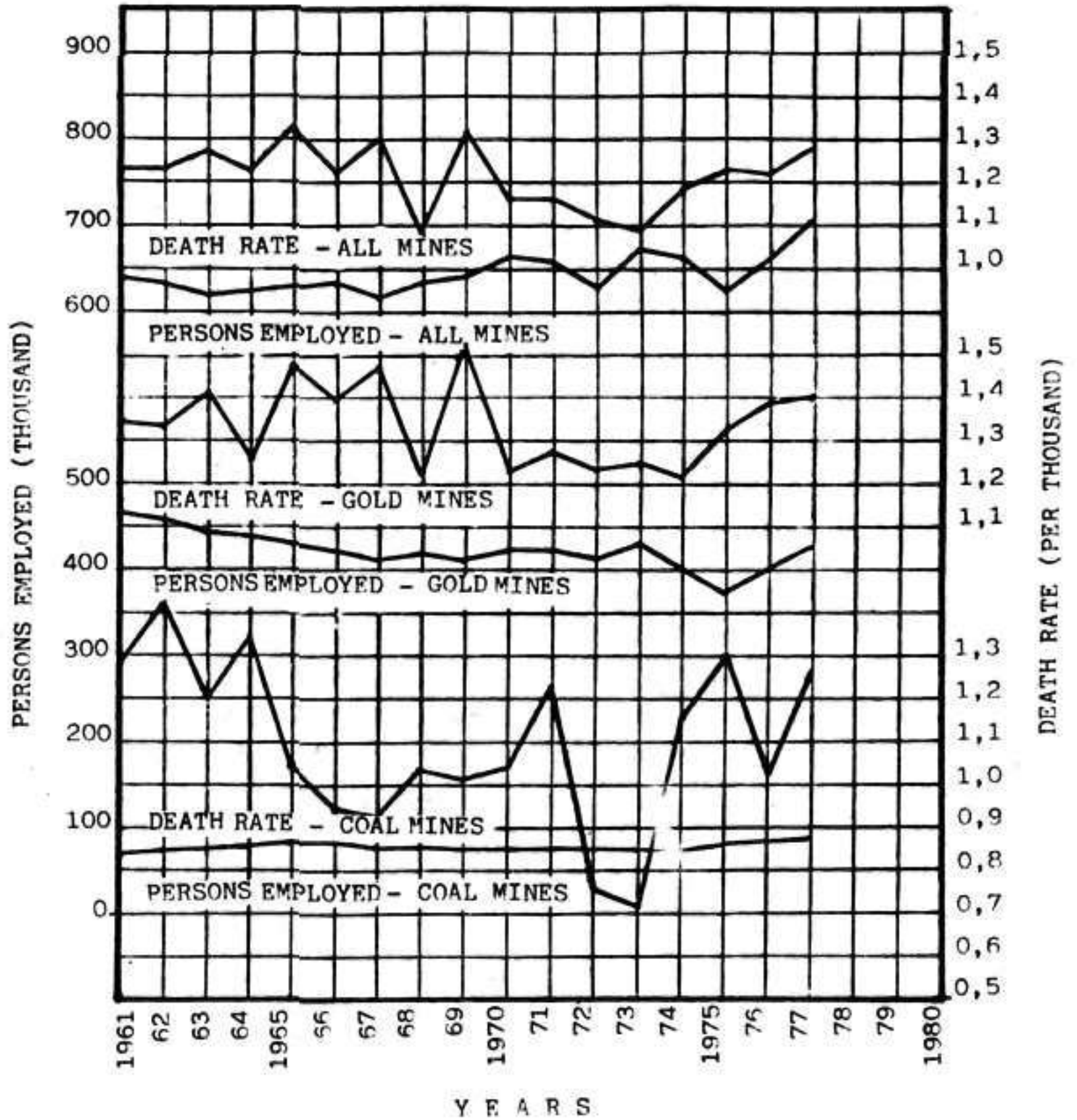
NOTES: (1) These figures were swelled by the Coalbrook disaster on January 21, 1960, in which 437 miners died.

(2) The figure of 75,17 in Mining Statistics for 1972 has been assumed to be an error.

(3) Figures for 1975 and 1976 have been corrected for an obvious error.

Fig 1

PERSONS EMPLOYED AND DEATH RATE - MINES



Source : Report of the Department of Mines for 1977 (R.P. 27/1978) p. 18.