



MHSC

Mine Health and Safety Council

Trackless Mobile Machinery (TMMs) Workshop

11 September 2020

Work Completed by the MHSC

Tebogo Thekiso

Technology Transfer & Knowledge Facilitator

Presentation Outline

- Introduction – MHSC Mandate and Role in the SAMI
- DMRE Report Analysis
- Work completed by MHSC
- MHSC Quick Win Initiatives
- Summary of Research Work Completed by the MHSC
- Conclusions/Questions



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Introduction- MHSC Mandate

MHSC is a national public entity established in terms of the MHSA, No 29 of 1996.

- **Advise the Minister** on all occupational health and safety issues in the mining industry relating to legislation, research and promotion
- **Review and develop legislation (regulations)** for recommendation to the Minister
- **Promote health and safety culture** in the mining industry
- **Oversee research** in relation to health and safety in the mining industry



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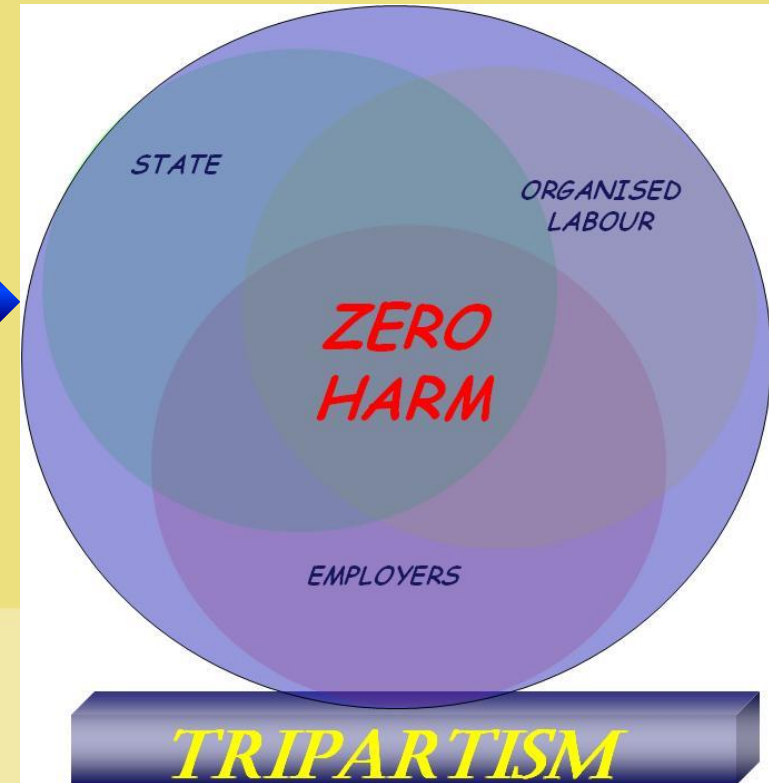
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Introduction- MHSC Role in the SAMI

- Promoting a culture of OHS.
- Fostering an effective tripartite partnership.

To promote the culture of OHS in the mining industry by striving towards zero harm on all health and safety issues and legislation

Driven by



**Mine Health and Safety Council
(MHSC)**

*State
Labour
Employers*

ARC

HRRAC

MRAC

Legislation
Regulations
Guidelines
Standards

MOHAC

Health Policy
Health Information
Health Regulations
Research Input

**Culture
Transformation
Advisory Committee
(CTAC)**

Oversight role on the
overall implementation
of culture transformation

SIMRAC

Research needs
Research Programmes

Centre of Excellence

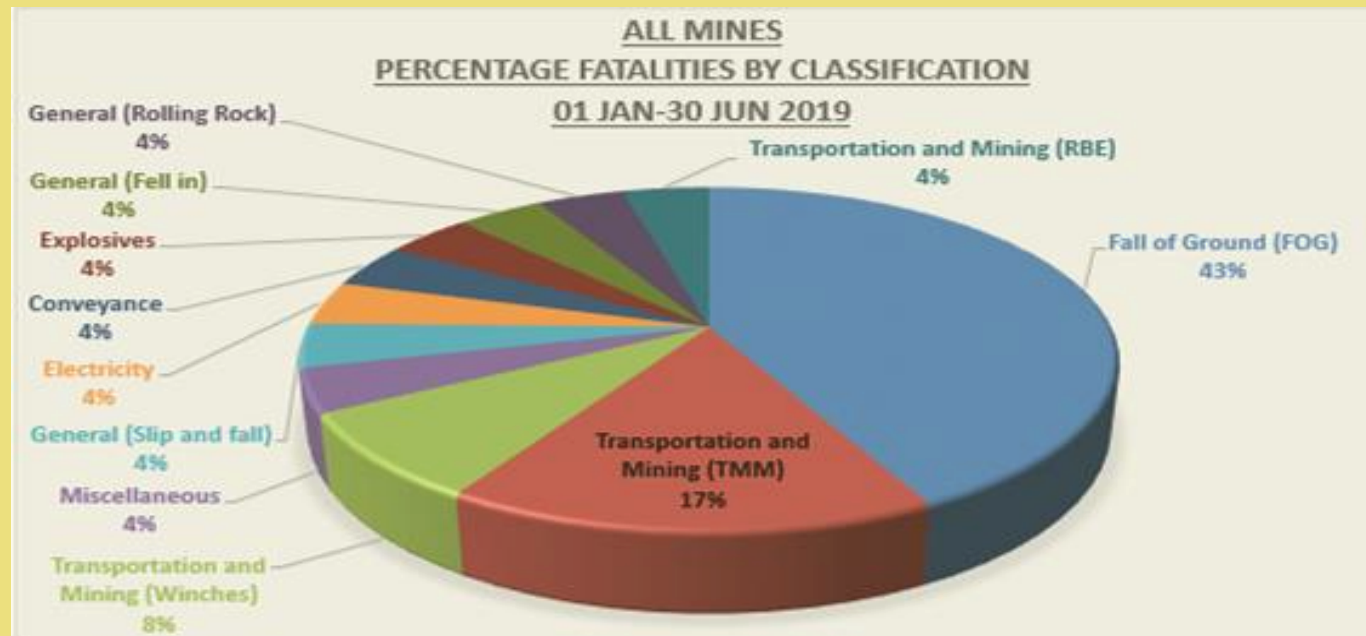
MITHAC

HIV/AIDS and TB
Programmes



DMRE Report Analysis (Jan – June 2019)

- Falls of Ground (FoG) – 43%
- Trackless Mobile Machinery (TMMs) – 17%
- Winches and Accessories (WA) – 8%



Latest DMRE statistics (Jan – Aug 2020)

Classification*	Persons Fatally Injured	Percentage
FOG	13	44%
Miscellaneous	3	10%
Transportation and Mining (RBE)	2	7%
Transportation and Mining (TMM)	2	7%
General (Fell in/from)	2	7%
General (Struck by)	2	7%
General (Inundation)	1	3%
Transportation and Mining (Winch)	1	3%
Transportation and Mining (Conveyors)	1	3%
Electricity	1	3%
General (Rolling rock)	1	3%
General (Inundated with ore)	1	3%
TOTAL	30	100%

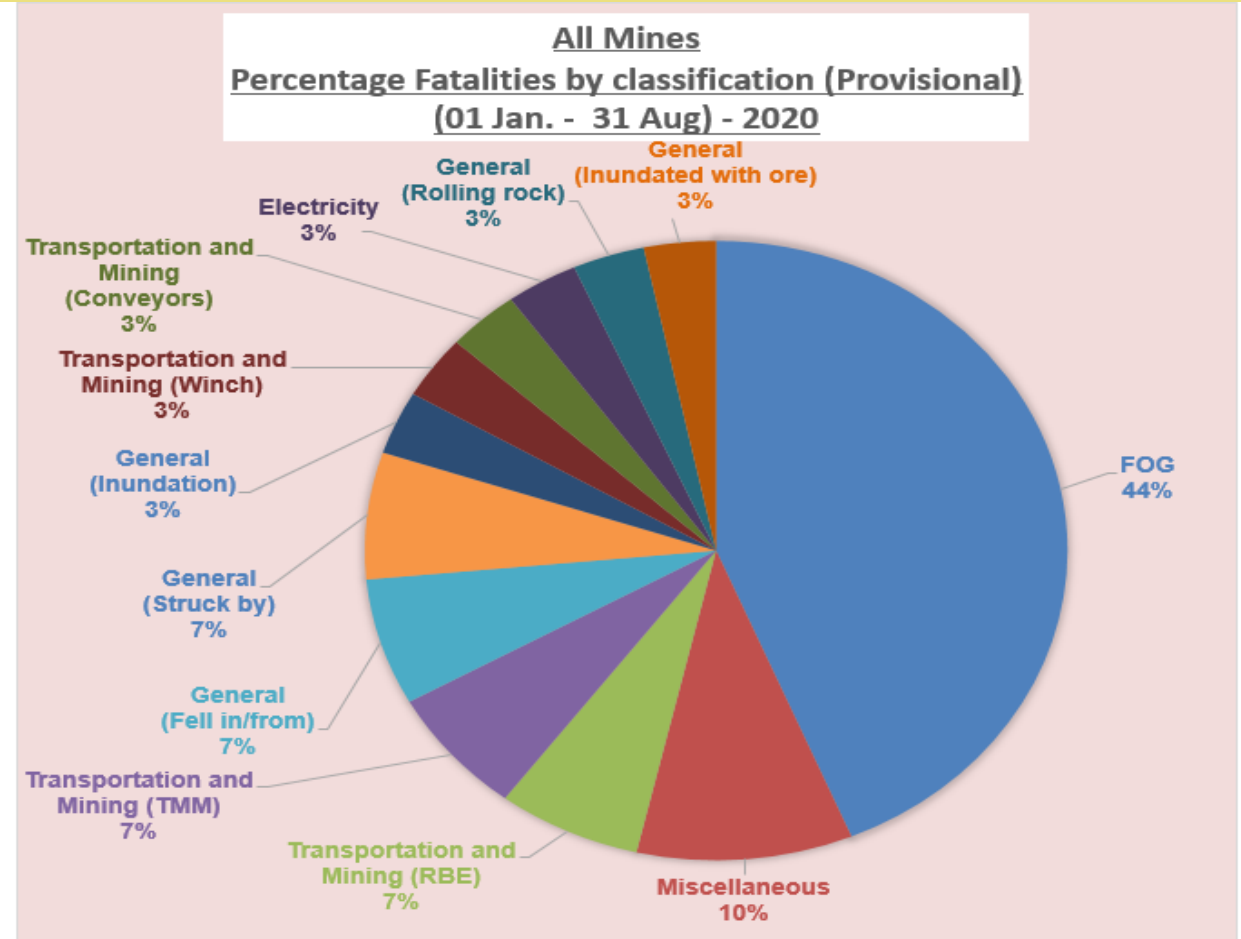
* provisional

FOG: Fall of Ground

RBE: Railbound Equipment

TMM: Trackless Mobile Machinery

Miscellaneous: Cause of fatality not yet established



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MHSC Quick Win Initiative

- Conduct a detailed analysis of the relevant SAMRASS documents (NOT POSSIBLE DUE TO COVID 19)
- Investigation on completed research work
- Hold a workshop
- Develop dissemination material



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Research Work Completed by MHSC

- **SIM 020504 – Ergonomics of Mining Machinery and Transport in the SAMI. (Report & Summary)**
- **SIM 030502 – Causes of Transport and Trammig Accidents in the Mining Industry. (Report, Summary & Booklet)**
- **SIM 040502 – Brake Testing of Trackless Mobile Mining Machinery (Report)**
- **OTH 308 – Investigation into the Influence of Haul Road Designs in Transport Accidents (Report)**
- **COE150501 – Assess the Feasibility of Collision Management Systems (Report & Summary)**
- **Guideline for the Compilation of a Mandatory Code of Practice for Trackless Mobile Machines TMMs (MCOP)**
- **Mine Health and Safety Act –Chapter 8 Regulations**



Summary of Research Work Completed by MHSC

- **Related Projects: (Links)**
 - **Health 702: Incidence and work related risk factors of Musculoskeletal Disorders**
 - **SIM020904: Investigation into slipping and falling accidents and materials handling in the SAMI**
 - **OTH202: Investigation of the causes of transport and tramming accidents on Other Mines**
 - **COL506: Investigate the causes of transport and tramming accidents on the Coal Mines**
 - **OTH 003: Establish the primary causes of accidents on mines other than Gold, Coal and Platinum.**
 - **GEN 213: Improve the safety of workers by investigating the reasons why accepted safety and work standards are not complied with in the Mines**
 - **COL203: Engineering human factors in Machinery and transport accidents**



Summary of Research Work Completed by MHSC

- **SIM 020504 – Ergonomics of Mining Machinery and Transport in the SAMI. (Report & Summary)**
 - **Completed in 2003 (Related Projects, Health 702 & SIM 020904)**
 - **Objective:**
 - **The objective of the study was to conduct an ergonomic evaluation of Mining Machinery and Transport Systems**
 - **This evaluation was based on an ergonomic system to identify ergonomics-related hazards that impact on Operators ability to work safely and efficiently**



Summary of Research Work Completed by MHSC

➤ SIM 020504 – Continued

➤ Conclusion:

Operators of Mining Vehicles contend with a range of conditions:

- inadequate sized & designed cabs,
- situated in inappropriate location on the vehicle,
- poorly designed cab displays and controls, etc...which compound stress on the operator.

➤ Recommendations:

- Improvements to be aimed at reducing the risk of musculoskeletal disorders and worker fatigue associated with cabin design
- For studies to be done to determine the functional anthropometry data representing both male and females in the design of operator workstations of mining equipment
- South African Anthropometric Data – SANDF survey vs Mining Survey
- Seat Maintenance Programmes



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Summary of Research Work Completed by MHSC

- **SIM 030502 – Causes of Transport and Trammimg Accidents in Trackless Vehicles. (Report, Summary & Booklet)**
 - **Completed in 2003 (Related Projects: OTH 202, COL 506, OTH 003, GEN 213, COL 203, SIMRISK 401)**
 - **Objective:**
 - **Project aimed at consolidating findings and recommendations of previous SIMRAC projects, OTH202 and COL506 looking into Transport & Trammimg accidents.**
 - **Factors leading to accidents were explored and split into Latent Failures (Organization related) & Active Failures (Operator related)**
 - **Project defined Modes of Failure, Root Cause Analyses and suggests corrective action**



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Summary of Research Work Completed by MHSC

- **SIM 030502 – Continued**

- **Outcome:**

- **Outcome was an easy to read booklet on the wide ranging factors that contribute to Transport & Tramming accidents**



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Please complete Questionnaire



Summary of Research Work Completed by MHSC

➤ SIM 040502 – Brake Testing of Trackless Mobile Mining Machinery (Report)

➤ Objective:

- Project aimed at developing an in-service brake testing specification for TMMs of less than 50 tons
- The specification was intended to be used by Mines for testing and in-service verification of brakes as an input to maintenance to minimize risk of brake system related accidents and preventing runaway vehicles

➤ Outcome:

- Outcome of project was primarily an In-service brake testing specification for TMMs to be used as a Maintenance Tool/ Aid.



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Summary of Research Work Completed by MHSC

- **OTH 308 – An Investigation into the influence of Haul Road Design, Construction and Maintenance**
 - **Objective:**
 - **Aim of Research to examine the Role of Haul Road Design in Transportation and Mining Accidents**
 - **Outcome:**
 - **Evidence of a relationship between Haul Road Conditions and Transport Accidents**
 - **A safety audit system methodology for evaluating Haul Road Transportation Design and operating conditions adapted according to the specific needs of Mine Transportation**
 - **Only 0.16% of reportable accidents were attributed to deficient road design and conditions (Analysis of reportable accident data between 1994 and 1996)**



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Summary of Research Work Completed by MHSC

➤ COE150501 – Assess the Feasibility of Collision Management Systems (Report & Summary)

➤ Objective:

- **Project Aim: Develop a Framework to Evaluate Different Collision Management Systems**
- **The Framework Includes:**
 - **Development of Standardized Verification Methods for CMS on V-V interactions for Surface Ops**
 - **Established a Vehicle Dynamics Simulation Capability at GeroTek for predicting Performance of CMS Capability (To Analyze Scenarios and determine Specifications for Warning, Retarding & Stopping)**
 - **Simulation Capability extended to determine Minimum Specifications for Detection Zones of CMS**
 - **The Acquisition and Commissioning of Equipment to establish Objective Testing Capability for Evaluating CMS and Vehicle Dynamics**



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Summary of Research Work Completed by MHSC

➤ COE150501 – Continued

➤ Outcomes:

- Gaps between Developed Specifications and Current Technologies Identified (R&D proposed to close Gaps)
- Outcomes of this Research Enabled the Objective Evaluation of existing CMS in relation to:
 - Analyzing Collision Scenarios
 - Potential for reducing collisions
 - Developing suitable Intervention Techniques
 - Developing a Simulation Capability to Quantify Performance of CMS
 - The Test Equipment & Test Protocols created a National Capability, enabling In-Situ Field Testing of CMS on Mining Equipment above ground



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Summary of Research Work Completed by MHSC

- **Guideline for the Compilation of a Mandatory Code of Practice for Trackless Mobile Machines TMMs (MCOP)**
 - **Promulgated on 30th November 2000**
 - **Revised in July 2014**

- **Chapter 8 Regulations on TMMs**
 - **In terms of the Mine Health and Safety Act 29 of 1996**
 - **Suspension of TMMs Sub – Regulations Status**



Please complete Questionnaire



Conclusion

- **Aim of the TMMs Workshop**
- **TMMs are 03rd contributor to SAMI Fatalities and 02nd under Transport & Mining YTD**
- **Is Research conducted adequate to address all TMMs issues – Technological Intervention vs Soft Issues**
- **Need for Training Intervention – CETM & MQA**
- **Need for Adoption of Leading or Best Practice – MOSH & MHSC**
- **Need for Collaboration – To avoid Duplication of Efforts**
- **Mining Industry CULTURE – Cultural Transformation Framework to address Latent and Active Failures**



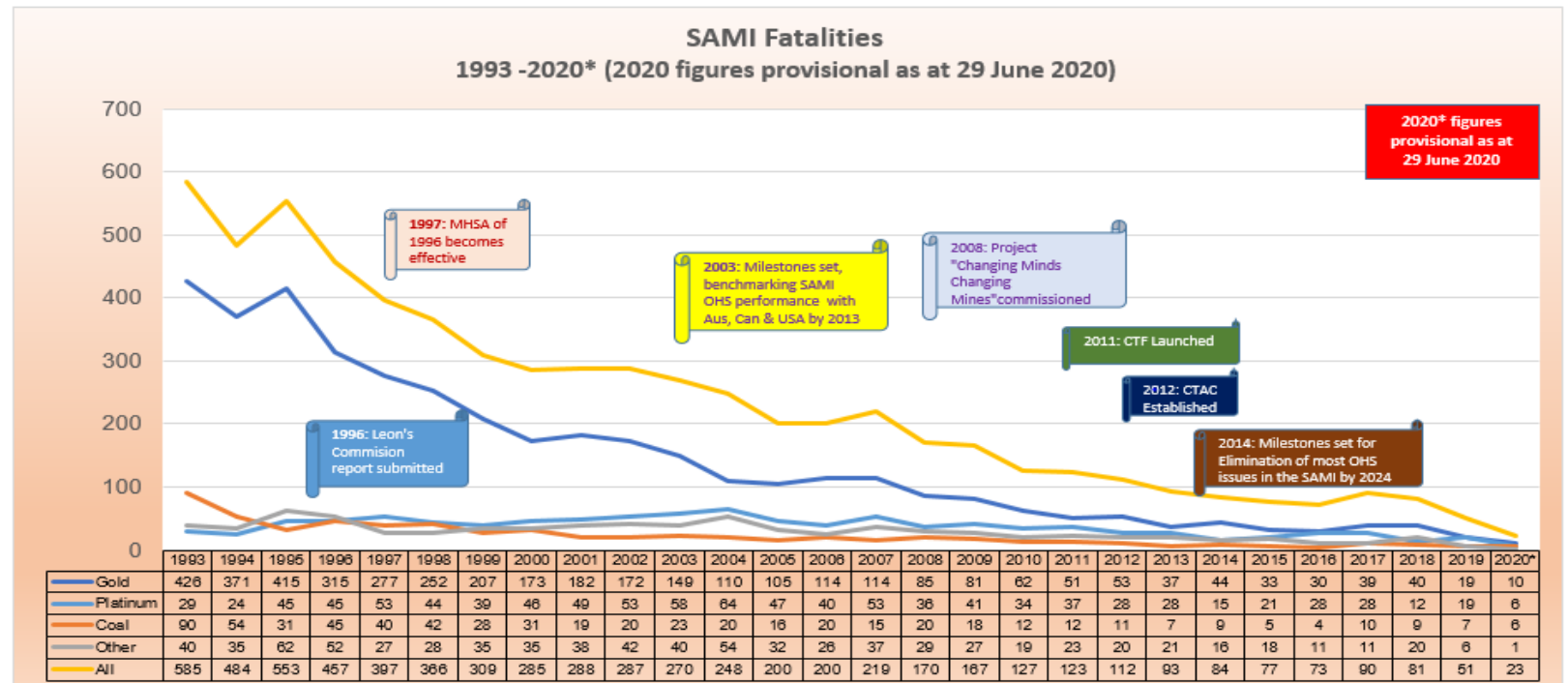
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Conclusion

- Need for SAMRASS data analysis on TMMs 10 to 15 Years Period – Detailed Description of Incidents to address the plateau effect of OHS Stats

	Gold	Platinum	Coal	Other	All
1993	426	29	90	40	585
1994	371	24	54	35	484
1995	415	45	31	62	553
1996	315	45	45	52	457
1997	277	53	40	27	397
1998	252	44	42	28	366
1999	207	39	28	35	309
2000	173	46	31	35	285
2001	182	49	19	38	288
2002	172	53	20	42	287
2003	149	58	23	40	270
2004	110	64	20	54	248
2005	105	47	16	32	200
2006	114	40	20	26	200
2007	114	53	15	37	219
2008	85	36	20	29	170
2009	81	41	18	27	167
2010	62	34	12	19	127
2011	51	37	12	23	123
2012	53	28	11	20	112
2013	37	28	7	21	93
2014	44	15	9	16	84
2015	33	21	5	18	77
2016	30	28	4	11	73
2017	39	28	10	11	90
2018	40	12	9	20	81
2019	19	19	7	6	51
2020*	10	6	6	1	23
Gold	Platinum	Coal	Other	All	





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Thank you

EVERY MINE WORKER RETURNING FROM WORK UNHARMED EVERYDAY

23 Years of Positive Contribution to Zero Harm for mine workers.

Pursuing Research Excellence