RAILWAY SAFETY REGULATOR

RAIL SAFETY ON THE RIGHT TRACK

LEVEL CROSSING PROTECTION TECHNOLOGY:A HUMAN BEHAVIOR PERSPECTIVE

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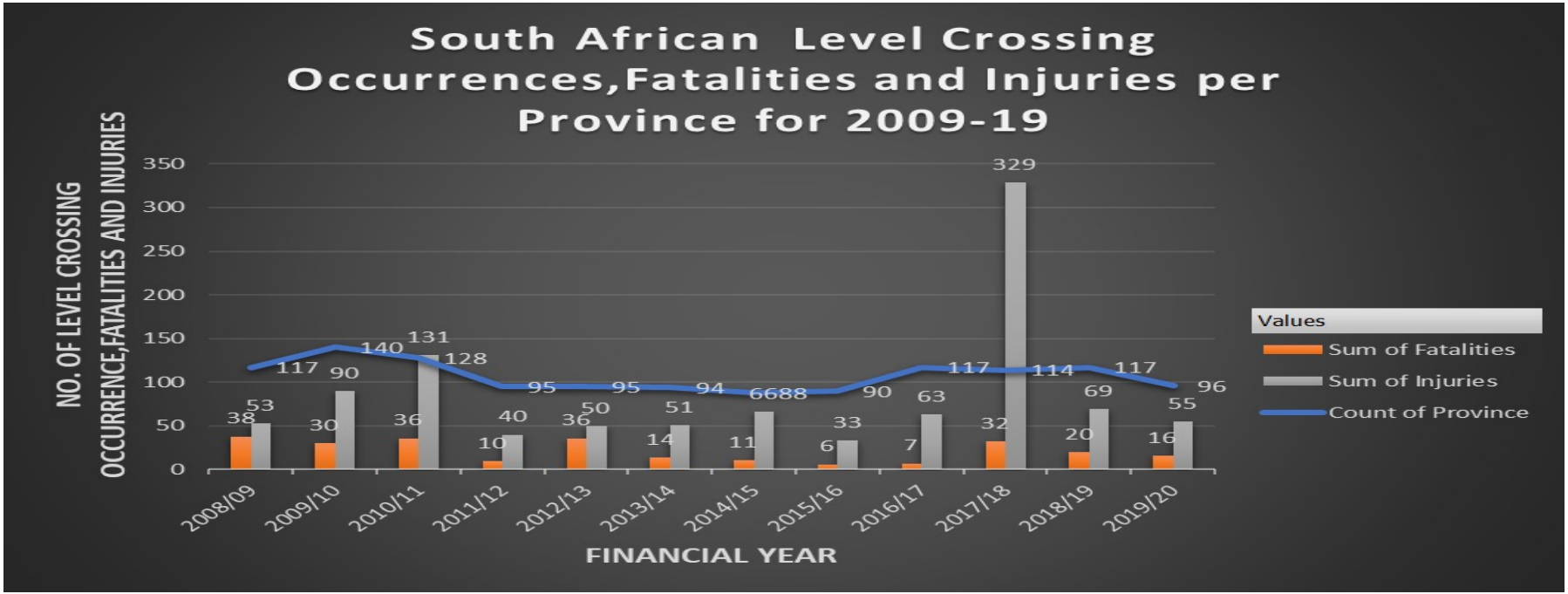
INTRODUCTION

- Level crossing safety is an outcome of interaction between social and technical components.
- Level crossing safety is a shared responsibility between the rail operators, road authorities, road users, town planners and the railway safety regulator.
- Therein lies the complexity in designing level crossing protection technologies that algin with human behavior.

INTRODUCTION

- Two research projects conducted that focused on:
  - The analysis of Level crossing accidents and possible solutions to improve safety and;
  - Investigation of level crossing technologies and its application in South Africa.
- Data analysed:
  - Occurrence data analysed over 10 years.
  - Root causes identified from investigation reports
  - Physical assessment and risk assessments conducted by rail operators

OVERVIEW ON LEVEL CROSSING INCIDENTS



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PRASA,TFR AND RSR INVESTIGATION REPORTS

Level Crossing Accident Cause	Description of Level Crossing Accident Cause	Number of Reports that Reflect this finding	Percentage of Total Findings	Total Number of Investigation Reports
Immediate Cause	The Driver of the Road vehicle failed to stop at the crossing/failure to obey level crossing signage	34	92%	37
	Attempting to overtake stationary vehicle that stopped at the level crossing	1	3%	
	The Driver of the Road vehicle was driving at night/rainy weather collided with train	1	3%	
	None mentioned in the report	1	3%	

PRASA,TFR AND RSR INVESTIGATION REPORTS

Level Crossing Accident Cause	Description of Level Crossing Accident Cause	Number of Reports that Reflect this finding	Percentage of Total Findings	Total Number of Investigation Reports
Root Cause	The Driver of the Road vehicle failed to stop at the crossing/Non-Adherence to Road Signage	19	51%	37
	Lack of/Inadequate enforcement by the Traffic Police	6	16%	
	Sub-standard vehicle Maintenance (Brakes)	1	3%	
	Failure to have fall back plan when boom gates	1	3%	
	Root Cause could not be determined	10	27%	

HIGH RISK LEVEL CROSSINGS

Level Crossing Location	Province	LX occurrences (2016-2021)	Level of protection
Witbank	Mpumalanga	23	Road signs
Rustenburg - Kgalestad (Dr Moroka)	North West	20	Road signs/Flashing Red Disk
Klaarwater	KwaZulu Natal	8	Road signs/ Flashing Red Disk
Mtubatuba	KwaZulu Natal	7	Road signs
Brits	North West	7	Road signs/ Flashing Red Disk
Ermelo	Mpumalanga	7	Road signs
Charlottedale	KwaZulu - Natal	6	Road signs/ Flashing Red Disk
Rustenburg - Burgerreg (Church)	North West	6	Road signs/ Flashing Red Disk
Marikana	North West	5	Road signs Flashing Red Disk
Ramathlabama	North West	4	Road signs/ Flashing Red Disk

HIGH-RISK LEVEL CROSSINGS

- The high-risk level crossing are in these provinces:
  - North West;
  - KwaZulu Natal and;
  - Mpumalanga
- The top ten high level crossings indicate that seven of the level crossings are actively protected and three are passively protected

HIGH-RISK LEVEL CROSSINGS- WITBANK

HIGH RISK LEVEL CROSSINGS

- The top 10 high-risk level crossings are protected by road signs and without any form of barrier to prohibit/prevent cars or road users from transverse through the level crossings when it is not safe.
- This is an indicator that the current level of protection employed at these level crossings has a direct impact on the number of level crossing incidents and require the implementation of higher protection levels.

PILOTED LEVEL CROSSING TECHNOLOGY-BOSHOEK

HUMAN BEHAVIOUR AT LEVEL CROSSINGS

HUMAN BEHAVIOR PERSPECTIVE

- A study conducted in 2017 on the human behavioral risks indicated the six common contributory factors leading to level crossing occurrences:
  - Traffic characteristics
  - The road environment
  - Subjective factors
  - Education and understanding the law
  - Socioeconomic and structural factors
  - Culture

HUMAN BEHAVIOR PERSPECTIVE

- Risk exposure is accompanied by an increased intensity of operations.
- The impact of the system(level crossings) being pushed back in its performance envelope leads to an increased number of incidents.
- People can adapt to situations to suit their own needs and preferences, and this introduces a variation in human behavior.

HUMAN BEHAVIOR PERSPECTIVE

- The system design are linked to the nominative approach which describes how the system is supposed to operated.
- The design process should consider the human behavior.
- To ensure that there is limitation on the decision taking regarding the presence of a train approaching.
- The growth of communities near the railway increase the number of vehicles that cross over the railway line.

PROPOSED SOLUTIONS

- Elimination of Level Crossing with Unacceptably High Level of Risk
- Educating road users (Road Vehicle Driver and other Level Crossing Users)
- Enforce Compliance to Level Crossing /Road Signage
- Level Crossing Maintenance Management
- Level Crossing/Road Engineering Design

CONCLUSION

- The Level Crossing sociotechnical system is complex.
- Responsibility of level crossing incident prevention is a shared responsibility between all stakeholders.
- Therefore, the liability for level crossing incidents can not be pointed to just road users.
- There is a need for rail operators to continue to implement innovate protection technologies.

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Thank You