Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 218 (2016) 131 – 140

Procedia
Social and Behavioral Sciences

11th International Conference of The International Institute for Infrastructure Resilience and Reconstruction (I3R2)
: Complex Disasters and Disaster Risk Management

A Factor Analysis of Urban Railway Casualty Accidents and Establishment of Preventive Response Systems

Kim, Hyun ju[a], Jeong, Ja young[a*], Kim, Jang wook[a], Oh, Jae kyung[b]

[a] *Management Research Department KORAIL Research Institute, 240, Jungangro, Dong-gu, Daejeon City, 300-720, South Korea*

[b] *Seoul National University of Science & Technology, 232 Gongneung-ro, Nowon-gu, Seoul, 139-743, South Korea*

Abstract

Since the commencement of urban railways in 1974 and KTX service in 2014, the use of railways has been steadily increasing. The number of people using rail transportation has been steadily rising. As a result, this has also led to an increase in the number of passenger-related accidents that are occurring within railway stations. In an effort to prevent such accidents, much of the rail operation system is now automated. Nevertheless, the potential risks of railway accidents are very much present today. This study has utilized the railway accident databases of rail operators to allow for analysis of different types of railway accidents, age of accident victims, gender of accident victims, pedestrian facilities involved in accidents, passengers involved in accidents, and underlying causes of rail accidents. Based on these statistics and analyses, this paper proposes the development of a railway safety education program and the establishment of railway safety education centers as a means of preventing railway accidents.

Peer-review under responsibility of Dept of Transportation Engineering, University of Seoul.

Keywords: railway, railway accidents, railway safety education program, railway safety education center ;

1. Introduction

1.1. Background

As efforts are increasing in order to create an environmentally-friendly urban transportation environment, public transport policies have shifted their focus from a road-centric approach to one that is more rail-centric. This is helping to stimulate an increase in railway usage. However, regardless of this increase in the number of rail passengers, safety measures ensuring passenger safety are still in need of much improvement. In 2010, a significant amount of enhancements and installations of safety equipment led to a sharp drop in the number of railway accidents but this rate of decline has since slowed down.

Railways make up one of the most vital types of infrastructure in society and many of them are now being operated under automated systems, but accidents are still prevalent and are being caused by station equipment, passengers, and employees. In addition to the general transit population, the recent increase in the use of bikes has resulted in an influx of cyclists using rail as well. This has also given rise to an increase in accidents. In addition, a lack of a systematized approach on managing and recording incidents of railway- related accidents as well as an absence of safety education centers further contributed to accidents involving passengers falling off the platform, incidents involving

*Corresponding author. Tel.: +82-42-615-4690 ; Fax: +82-2-361-8541.
E-mail address: urban925@korail.com

Peer-review under responsibility of Dept of Transportation Engineering, University of Seoul.
doi:10.1016/j.sbspro.2016.04.016

being jammed in doors, slipping on stairs, and others. There are also a high number of delays due to malfunctioning trains and rail equipment. Consequently, in order to ensure passenger safety amid the increasing trend of railway use, steps need to be taken to analyze causes of accidents and to reduce the number of accidents. This paper surveys and analyzes the characteristics and underlying causes of urban railway accidents that result in injuries or death. Based on this analysis, this paper proposes measures that can be taken to prevent such railway accidents.

2. Preceding Research

In Classification of Railroad Accident Types and Its Standardization (Lim and Kim, 2006), characteristics of domestic and overseas railway accidents were compared and analyzed as a means to deduce policy implications. By re-categorizing and standardizing different types of railway accidents, the study suggested having standardized railway accident codes and sorting various different railway accidents and maintained that this system is a key element within the railway safety management system.

In Railroad Accident and Emergency Response Management System Report (Kim et al., 2008), preparation of scenarios for different emergency situations in railway operations and development of standardized operation procedures for emergency responses were suggested. Emergency situation scenarios for high-speed rail and conventional rail as well as standardized emergency response procedures were proposed to be included within standard emergency response procedures. It further proposed development of training programs for railway employees and related personnel. In Facilities in Urban Rail Safety Survey Report (Korea Consumer Agency, 2010), passenger-related accidents and urban railway accidents in Seoul and the greater metropolitan area were studied by randomly selecting 26 stations as samples. Focusing the research on types of equipment that were most often found to be involved in accidents, incidents were analyzed so that measures could be taken to prevent passenger accidents. In Building Railroad Accident Risk Analysis and Evaluation System Report (Wang et al., 2011), a standardized categorization model for railway accident risks was suggested. It also suggested the development of a threat evaluation system as well as proposing a test and certification model for railway system safety. It proposed a railway safety management system based on a system involving threat analysis of railway accidents and threat level evaluation. Through such types of implementation, railway safety management in Korea could be brought up to par with those in developed countries and it would be able to better respond to the increasing number of technical and social hazards. Furthermore, in Rail Safety Statistics Report (Ministry of Land, Infrastructure and Transport, 2013), 5 years' worth of information that is available in the railway safety information management system during the years between 2008 and 2013 was analyzed. Analyzed information included accident information on high-speed, conventional, and urban railways. The study revealed the trends in railway accidents and causes of railway accidents for each quarter of the year during the period of study. In Railway Safety Performance Report (Ministry of Land, Infrastructure and Transport, 2013), information from Britain's Rail Safety & Standard Board (RSSB) and Annual Safety Performance Report (ASPR) was used as references for categorizing domestic railway accidents and analyzing threat levels. The study provided information on rail safety to personnel in the railway sector and supplied analytical information on the causes of railway accidents.

Table 1. Comparison of operational characteristics of Urban and Conventional Railways

Category	Operational distance (km)	#of stations	#of trips (per day)	Scheduled speed (km/h)	Transport volume (thousand passengers/ year)	Transport volume (thousand passengers/ day)	Average distances between stations (km)	Average # of passengers per trip (passengers/trip)	Average # of passengers a day per station
Urban Railway	137.9	120	2,423	29.3-35.9	1,513,665	4,136	1.15	1,707	34,467
Conventional Railway	3,052	330	362	65.8-93.7	79,644	219	9.25	605	664

Source : 2014 DB from railway operation organizations