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**INTEGRATION AND TRANSPORTATION OF DANGEROUS GOODS HANDLING  
MANAGEMENT BETWEEN AIR AND RAILWAY TRANSPORTATION**

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**ABSTRACT**

The paper objective is to maintain safety and zero accident related to the handling dangerous goods on Railway and Air transportation by passenger. This Paper review and analyze the Common Dangerous Goods handling between Convention concerning International Carriage by Rail (COTIF) Appendix C – Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) and International Air Transport Association Dangerous Goods Regulation (IATA DGR) latest edition also with National Regulation related to the Dangerous Goods Transportation, especially related to Item or article carried by Passenger who use multimode transport between Railway station and airport. This paper method is descriptive-explorative using a quantitative qualitative data source from the International and national regulation as well as literature references. The results of this paper to encourage party between Mass Rapid Transit/Light Rail Transit/Regular Train operator and Airport operator in JABODETABEK to find the correct procedures in implementing dangerous goods handling in the near future to ensure safety on both transportation mode that could be integrated closely in the near future.

**KEYWORDS:** air transportation; dangerous goods; handling management; integration; railway station; safety handling

**INTRODUCTION**

Nowadays in Indonesia as one country in Asia which just started operated the MRT as one the new transportation mode for railway being used by citizen who work down town and also continue traveling overseas through the airport. Because the citizen become passenger on this transportation and may carry the hand carry, there will be a possibility of hand carry or the baggage that will be purposed for checked baggage may contain Dangerous Goods article or substance. This could endanger the people in case any incident or accident involve during transportation. Carrying dangerous goods involves the risk of an incident due to the fault of other traffic participants, climatic conditions, badly chosen packaging materials or the lack of marking. Although the transportation of dangerous stuff is always a risky procedure, however, a possibility of managing and reducing risk factors to a minimum is a highly realistic option (Batarliene & Jarašuniene, 2014).



Sources : <https://your.heathrow.com/heathrows-secret-rail-station/>

**Fig.1. Jabodetabek Urban Railway Network Map**

There are many legal acts that facilitate the maintaining of safety while transporting goods by railway, but they are not mandatory, which creates many difficulties, because not all countries maintain the same standards and procedures (Drzewieniecka & Nowak, 2018). However the national regulation may not cover all the dangerous goods handling by passenger. Therefore In transport of dangerous goods must be accepted modern aspirations of European Railways. In Europe it is already functioning so-called handover system of the Dangerous Goods by Rail (RID) materials "on the trust", i.e. the railway that receives such a shipment from neighbouring railway, receive it without checking of any elements by RID, and government body control is reduced to rapid control of supporting documentation. Such shipments practically don't stay at the border stations, they are transported by direct fast trains with absolute priority on the line, with the most advanced monitoring operating system. (Lj & Tolmac, 2015).



Sources: <https://twitter.com/unece/status/769421798517727232>

**Fig.2. International DG Regulation (RID & IATA DGR)**



Sources: <https://twitter.com/unece/status/769421798517727232>

**Fig.3. National Regulation Cover for UU 23 2007 about Railway and UU 1 2009 about Aviation**

Shipping dangerous goods is one of the most complex and extra safety requiring transportation technologies. Therefore, because of specificity and risk, this process must be precisely controlled, regulated and handled (Batarliene & Jarašuniene, 2014). While for air transportation the fact is that the carriage of Dangerous Goods carry by passenger is increasing exponentially and we must act now to prevent further loss of life. No information is specified about the possible interactions among vehicles and their loads, infrastructures used and surrounding environment. The consequence is the lack, in the current set of rules, of measures aimed to manage and minimize transport risk such as, for

example, a rational restriction of the passage of dangerous goods in areas characterized by high vulnerabilities for both the population and the environment or the indication about how it is much suitable to split goods for transport. Such situation makes HazMat transport risk assessment and management more difficult than chemical plants one because there is much more uncertainty about potential accident dynamics and localization (Torretta, et al., 2013).

In general, special attention must be paid to the transportation of dangerous goods, which are very risky and in an emergency, this condition can have risky consequences that endanger humans, as well as the environment (Šolc & Hovanec., 2015). Safety, it is very important to transport dangerous goods. In railroad transportation faces risks and threats, which must be considered. Deficiencies in the implementation of transportation of hazardous materials in the world and for example in Turkey according to Şencan and Yavuz (2017) which leads to very serious dangers. These problems lead to very serious life, property and environmental disasters. Huo et al. (2017) discuss the requirements in air transportation, and railroad for the use of lithium batteries in the countries of the USA, Europe, China, Korea, where transportation regulations are not consistent in various countries and national regulations are not consistent with international regulations. Lithium batteries are manufactured and shipped globally, and safe transportation from production sites to suppliers and consumers, as well as for disposal, must always be guaranteed.

Shu-yun, Rong-bin, and Xiu-ju (2016) in China explained management and discussed must be socialized intelligently, and effectively and practice professional operations and management based on experience for the safety, efficiency and quality of transportation of dangerous goods. As another example in Poland it was transported via 12.5 percent DG by train in 2014 (Nowacki, Krysiuk, & Kopczewski, 2016). Dangerous goods can cause accidents and cause fire, explosion and chemical poisoning or burning with enough danger to humans and the environment. There is no monitoring system in Poland to control in real time the transportation of dangerous goods. Prvulovic. et al. (2013) added that, rail transport in Serbia with many dangerous goods, shows a lot of extraordinary events. To reduce problems caused by railroad transportation, it is necessary to control the cost of transportation of goods based on invitation regulations, to build a database and to build an efficient managerial system, supported by computer equipment.

Basic activity within shipping is transportation, which ensures the physical movement of the goods (or persons) from the starting point to the destination. Another important area of transport is material handling, which may also be defined as the physical movement of material, however with the aim of further action (transportation, storage, etc.). A specific area of material transport is transportation of hazardous material. This area requires more emphasis on prevention and transportation safety. It is evident that properly secured loads prevent injuries to people, damage to vehicles and property (Hoskova-Mayerova & Becherova, 2016). Learning from the accident data of Dangerous Goods

handling in Czech Republic, below is the following data were given to us by ČD Cargo just for the research purposes. As it is obvious from table 1, in 2010–2014 in the Czech Republic there were in total 1,557 emergency events (EE) while transporting dangerous substances on railway.

**Table 1. Number of accidents while transporting dangerous substances on railway In Czech Republic**

Year	3 categories based on the magnitudes and Number of EE (Emergency Events) on railway			Total
	A	B	C	
2010	3 (2)	62 (5)	327 (80)	392 (87)
2011	5 (2)	72 (3)	264 (71)	341 (76)
2012	1 (0)	50 (6)	263 (83)	314 (76)
2013	1 (1)	45 (4)	218 (72)	264 (78)
2014	3 (1)	51 (6)	192 (74)	216 (81)
Total	13 (6)	280 (25)	1264(380)	1557 (411)

Sources: (Hoskova-Mayerova & Becherova, 2016)

Further on the recent study

**Table 2. Fault and Not Fault by the employee on Railway accident**




Railway accidents where an employee or a train unit is (partly) at fault are caused by	Railway accidents where an employee or a train unit is not at fault:
<ol style="list-style-type: none"> <li>insufficient professional training and maintenance of professional knowledge and drivers' skills,</li> <li>wilful failure to abide regulations and legislation,</li> <li>drivers' lack of attention,</li> <li>low quality trainings,</li> <li>technical condition (security systems).</li> </ol>	<ol style="list-style-type: none"> <li>terrorist attack,</li> <li>climate and industrial conditions (flood, strong wind, landslide),</li> <li>unauthorized access on rails (suicides),</li> <li>imperfection of tracks (bridge collapse).</li> </ol>

Sources: (Hoskova-Mayerova & Becherova, 2016)

Based on the Hazard type there are 3 types of most hazard which create the accident on Railway transport as per Table no 3 below.

**Table 3. The hazard types involved on Dangerous Goods transportation by Railway**

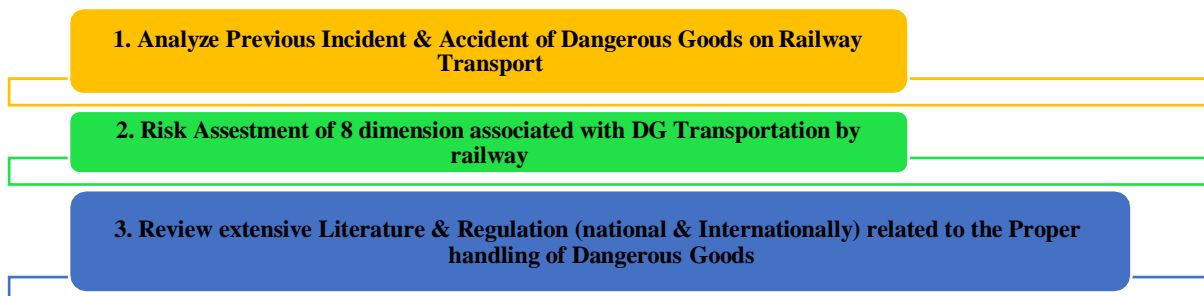


Accident	Manifestation	Notes On accident
Fire 	Heat radiation	Usually only time spatial restriction, restricted involvement of <u>person</u> , ignition of materials, damage of environmental elements, usually extensive material damage
Explosive 	Pressure wave scattering of debris fragments including shards of glass	Quick course of <u>event</u> , restricted involvement of buildings, constructions, technologies, synergic and cumulative effect on surrounding objects, material damage
Toxic Substance leakage 	Toxicity	Significant involvement and/or danger of persons, animals extensive of environmental element, material damage is usually insignificant.

*Sources : Melkes & Mika, (2015)*

## METHODS

This paper based on study of literature review and collection of national and international regulation. Below is the step of procedures taken to get the proper handling of dangerous goods upon transport by railway and continue by air.



**Fig.4. Procedure Step of Dangerous Goods Handling Management by Railway and Air**

Firstly is to Analyse the incidents and accidents in the field of transporting dangerous goods by railway

transport, to identify key risks related to the transportation of supplies as well as to assess safety aiming at a reduction in the risk of incidents. (Batarliene & Jarašuniene, 2014).

Secondly is to Assess the risks and benefits associated with the transportation of hazardous materials by truck and rail. Given the dimension of terrorism, transportation of hazardous materials has become an even greater problem and of major concern. In general, the risk measures relating to routing of hazmat by rail that should be considered are: 1)

potential for terrorists' acts; 2) hazardous material release probabilities; 3) impact on population and environment in the case of release; 4) consequences to population from non-accident risks, 5) length of route; 6) track conditions, 7) highway conditions, and; 8) accident rates for each mode (Spraggins, 2010).

Finally is to review through the extensive literature, also from RID, IATA DGR and National Regulation UU 23 2007 about Railway and UU 1 2009 about aviation. Additionally, the sub regulation of UU 23 2007 about railway are PP 72 2009 about Traffic and Railway Transport and PM 48 2014 about procedures for loading, compiling, transporting and unloading goods by train. By reviewing these regulations and any other literatures connected with these regulations can further assist us to find the best practice in creating the procedure to connect airport and railway station.

## RESULTS AND DISCUSSION

### Result of Analyze incident and accident from literature

**Table 4. Result of Analyze Accident Table 2**

Three Categories of Emergency Event in Czech Republic	A	B	C	Total
Remark	Serious accident, means a collision or derailment of railway carriage which occurred in relation with railway transport, resulting in death or harm of at least 5 people or damage of great extent (5 million Czech Korunas)	Danger	An accident (C) in railway transport is a situation which occurred in relation with railway transport resulting in death, harm or significant damage (more than 500,000 Czech korunas).	
Percentage of	0,83 % or round up 1%	17,9% or round up 18 %	81,18% or round down 81 %	100%

Based on Table 3 above Cat C as an accident mostly dominate around 81%, According to the numbers given in brackets in table 1, we can state that to a certain extent employees affect EEs. Even if EEs caused by employees are not frequent, it is necessary to prevent these accidents and eliminate them. From Table 2 “Fault and Not Fault by the employee on Railway accident”, we can learn and set proper training of handling dangerous goods which is match with the need of the train operator or railway operator. And from Table 3 “The hazard types involved on Dangerous Goods transportation by Railway”. We will find out that the most hazard typical which is involved on the dangerous goods handling management by railway are Explosive (Class 1), Gases (Class 2), Flammable liquid (Class 3), Flammable Solid (Class 4), Oxidizer (Class 5), Toxic Substances (Class 6), Radioactive Material (Class 7), Corrosives \*(Class 8) and Miscellaneous (Class 9) (Recommendations on the Transport of Dangerous Goods, 2013).



**Fig. 5. Dangerous Goods Sign at MRT Station in Singapore**

Therefore according to Chakrabarti and Parikh (2011), while shipping hazardous substances, accidents depend on risks. The authors base risk calculations on the incident probability and comprehensive analysis of consequences. The article states that the risk assessment of hazardous substances depends on three factors: 1) number of accidents; 2) traffic intensity of one day and the density of populated areas; 3) length of the route. (Batarliene & Jarašuniene, 2014). These factors then will be considered as part of the risk assessment on the next step of the procedures.

To ensure the safety of the participants involved in the system of dangerous goods, the five following factors making an impact on the transportation process should be taken into consideration: 1) selection of alternative transport types; 2) evaluation of routes; 3) evaluation of the technological transportation process; 4) assessment of transportation risk; 5) possibility of reducing accident risk to a minimum (Blanco 2011). (Batarliene & Jarašuniene, 2014). Later these 5 factors will become part of the improvement way for the dimension that will be assessed on the next step of Risk assessment



associated with Dangerous Goods Transportation.

**Results of Risk Assessment**

Refer to the Table below

**Table 5. Risk assessment and analysis of 8 dimension with the way to improve hazmat safety handling**

No	Assesment of dimension	How to improve hazmat safety
1	potential for terrorists' acts	Providing authorities with Transportation Incoming Hazard material movement data
2	hazardous material release probabilities	Inspection of chemical loading facilities
3	impact on population and environment in the case of release	Optimization of safe routing of hazmat shipments based on a number of criteria such as population density, traffic density, emergency response capabilities and known threats
4	consequences to population from non-accident risks	As per above
5	length of route	Developing and designing new tank cars
6	track conditions	As per above
7	highway conditions	Training rail employees for hazmat incidents
8	accident rates for each mode	Emergency response training assistance

Sources : *Spraggins, (2010).*

From the Risk assestment table above, we analyze that the information, technology and awareness must be developed by the authority cooperate with training institution as well as the technician who master the hazmat or dangerous goods handling management in manage all the dimension which has been assessed and ensure all the improvement of hazmat safety work accordingly.

Managing Fire Incidents at MRT Stations and Tunnels - Safety Features, When the Singapore Rapid Transit Systems (RTS) first started in the 1980s, the fire safety provisions were based on NFPA 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems. There were no local codes or standards for designers to make reference to then. During the early stages for North East Line and Changi Airport Line, relevant requirements from NFPA 130 and the Singapore Fire Code as well as other relevant codes of practice were collated and documented in Fire Safety Outline Reports. The reports were then submitted to the local fire authority, the Singapore Civil Defence Force (SCDF), for consideration. (Safe, 2000).



**Fig.6. Automatic Detection Supressed System  
(Fire Alarm Panel, Fire Pump Sprinklers, Dry Main & standby Fire house)**



**Fig.7. Fire Protection System ( Fire Extinguisger & Hose Reel)**

Emergency response is part of Dangerous Goods Handling management, therefore MRT/LRT and railway station can refer to the MRT station in other country that already established with this procedures

### **Result of Extensive Literature review**

#### **1. RID (The Regulation concerning the International Carriage of Dangerous Goods by Rail)**

Based on the RID For the carriage of dangerous goods as hand luggage, registered luggage or in or on board vehicles, the exemptions in accordance with 1.1.3.1, 1.1.3.2 (c) to (g), 1.1.3.4, 1.1.3.5, 1.1.3.7 and 1.1.3.10 shall apply (COTIF, 2015). The most important factors for the safe transport of dangerous goods by railroad are validity control precautions and packing and transport equipment maintenance. Using of dangerous good packing equipment (packaging, containers and tank containers, tank trailers) in accordance with the Ordinance on the international carriage of dangerous good by railroad (RID - Regulations Concerning the International Carriage of Dangerous Goods by Rail)(Lj & Tolmac, 2015).

Carriage as hand luggage, registered luggage or in or on board vehicles 1). Dangerous goods may only be carried in freight trains, except a) dangerous goods which are acceptable for carriage in accordance

with the Annex complying with the relevant maximum quantities and the special conditions of carriage in trains other than freight trains; b) dangerous goods which are carried, under the special conditions of the Annex, as hand luggage, registered luggage or in or on board vehicles within the meaning of Article 12 of the CIV Uniform Rules. 2). Dangerous goods may only be taken as hand luggage or carried or be handed over for carriage as registered luggage or in or on board vehicles if they meet the special conditions of the Annex. 1.3.2.3 Safety training Commensurate with the degree of risk of injury or exposure arising from an incident involving the carriage of dangerous goods, including loading and unloading, personnel shall be trained in the hazards and dangers presented by dangerous goods. The training provided shall aim to make personnel aware of the safe handling and emergency response procedures. 1.3.2.4 The training shall be periodically supplemented with refresher training to take account of changes in regulations.

## **2. IATA DGR (International Air Transport Association Dangerous Goods Regulations)**

Based on IATA DGR Subsection 2.3.0.1 to 2.3.0.2. Goods in Table 2.3.A of IATA DGR about Provision for Passenger and Crew. where dangerous goods including excepted packages of radioactive material, forbidden for passengers or crew members to carry, as or in 1) checked baggage; as or in 2) carry on baggage; 3) on the person; except as stated in, the following dangerous goods, as listed in 2.3.2.1 to 2.3.2.6, are permitted in aircraft as registered baggage only and with operator agreement (s), to dangerous goods, as listed in 2.3.5.1 to 2.3. 5.11, is permitted on the aircraft as baggage without the operator's approval (s). Without prejudice to additional restrictions that may be exercised by the State for the purposes of aviation security, except for incident reporting requirements 9.6.1 and 9.6.2, the provisions of this Regulation do not apply to 2.3.2 to 2.3.5 when passengers or crew members carry or in baggage transported by operators that have been separated from their owners during transit (eg lost baggage or baggage not directed properly) or in excess baggage carried as cargo as permitted by 1.2.7.1 (g).

Note: 1. See subsection 2.2 for a list of Hidden Hazardous Goods that may not be clear to passengers and crew and which may be accidentally in the trunk. 2. The following provisions are tabulated in Table 2.3.A of IATA DGR (IATA, 2019) The limitation of battery lithium for passenger also affected the limitation battery lithium as air cargo, therefore more safety in preventing unstable dangerous goods substance (such as Lithium batteries-large size) enter the first gate in terminal and warehouse and more screening before loading and transporting into aircraft. From various type of Lithium Battery, we know how to pack, mark, label, document and handling upon loading and inside aircraft, also know how to act during emergency (Rizaldy, Gultom, & Raffi, 2017).

## **3. Regulation about Railway**

Based on Indonesia Regulation number 23 of Indonesian Republic 2007 about Railway, Article 54,57,139,140,142,143, 189, 195 and 196 these chapter explain about the Train Station and dangerous

good handling management also fine for institution or service user (Republic of Indonesia Law, 2007). Article 54 verses 1. Train station for take and drop purposes of passengers as referred to in Article 35 paragraph (3) letter a at the lowest is equipped with facilities: a. safety; b. security; c. convenience; d. passenger boarding; e. people with disabilities; f. health; and g. public facilities; Article 57 (1) Train stations can provide services special. (2) Special services as referred to in paragraph (1) may be in the form of: a. passenger waiting room; b. loading and unloading of goods; c. warehousing; d. vehicle parking; and / or e. deposit counter.; Article 139 (1) Freight by train is carried out with using a car. (2) Transportation of goods as intended in paragraph (1) consists of: a. public goods; b. special items; c. hazardous and toxic materials; and d. hazardous and toxic waste material;

Article 140 (1) Transportation of general goods and special goods as such referred to in Article 139 paragraph (2) letter a and letter b must meet the requirements: a. loading, compiling, and unloading goods in places that have been determined accordingly with its classification; b. safety and security of goods transported; and c. used cars according to the classification goods transported; (2) Trains for transporting hazardous materials and toxic as referred to in Article 139 paragraph (2) letter c and hazardous and toxic material waste as referred to in Article 139 paragraph (2) letter d Required: a. meet safety requirements in accordance with dangerous and toxic nature of the material transported; b. use marks according to the nature of the material dangerous and toxic transported; and c. include qualified officers certain according to the nature of the hazardous material and toxic transported; Article 142 (1) In the transportation of goods by train, The Railway Facility Operator is authorized to: a. check the suitability of goods with a letter of transportation goods; b. refuse transport goods that are incompatible with letter of transportation of goods; and c. report to the authorities if goods to be transported are goods forbidden. (2) If there is transported goods are considered endanger safety, order and interests general, the organizer of the railroad facility can cancel the train trip;

Article 143 (1) The service user is responsible for the correct information declared in the transportation certificate goods. (2) All costs incurred as a result of information which is incorrect and detrimental to the Facility Provider Railways or third parties become a burden service user responsibility. Article 189 Operator of Railway Facilities operating Public Railways facilities that do not meet the standards the feasibility of operating the railroad facilities as intended in Article 27 which results in a train accident and damages to property or goods, being punished with imprisonment for a maximum of 1 (one) year 6 (six) months and a maximum fine of Rp.500,000,000.00 (five hundred million) rupiah); Article 195 Railway infrastructure officer who operates Railway infrastructure does not have a proficiency certificate as referred to in Article 80 paragraph (1), shall be sentenced with a maximum imprisonment of 1 (one) year. Article 196 Operator of Railway Infrastructure that operates railway infrastructure with officers who do not have certificate of proficiency as referred to in Article 80 paragraph (1), shall be sentenced to a maximum imprisonment of 1 (one) years and a maximum fine of Rp.500,000,000.00 (five hundred million rupiah).

Based on PP 72 year 2009 about Traffic & Railway Transportation, and related with dangerous goods has been verified on Article 136 (1) (2c,d) (3a,b) -Goods Transport; Article 139 (1) (2) dangerous goods & waste; Article 140 Transportation media (close, open and special); Article 141(1) (2) - requirement compliance and knowledge of crew; Article 142 and 143 loading & unloading of goods. (Regulation, 2009)

Based on PM 48 year 2014 about Procedures for loading, compiling, transporting and unloading goods by train. Article 2cd; Article 5 Classification of Dangerous Goods & waste; Article 6 Characteristic of Dangerous Goods; Article 7 (1bc) documentation & permit; Article 23 (1) Activity of loading dangerous goods must pay attention on some conditions; (2) packing, marking and labelling handling; (3) Emergency procedures; Article 34 (cd) activity of transporting dangerous goods and waste; Article 36 (1) (2e) cancellation of dangerous goods and waste transportation; Article 43 (1) Car used for transporting dangerous goods & waste (2) Requirement compliance ; Article 52 (1) place of unloading (2) unloading activity requirements ; Article 56 (3) training of dangerous goods and waste (Minister of Transportation of the Republic of Indonesia, 2014).

#### **4. Regulation about Aviation**

Based on Indonesian Regulation 2009 about Aviation 7th Part Special Cargo dan Dangerous Goods Article 136, 137,138 and 139 (Republic of Indonesia Law, 2009) Article 136 (1) Transportation of special and dangerous goods must meet flight safety and security requirements. (2) Special goods as intended in paragraph (1) are in the form of goods which due to their nature, type and size require special handling. (3) Dangerous goods as referred to in paragraph (1) can be in the form of liquid, solid, or gas materials that can endanger health, life safety, and property, as well as flight safety and security. (4) Dangerous goods as intended in paragraph (3) are classified as follows: a. explosives; b. gas compressed, liquefied, or dissolved under pressure (compressed gases, liquefied or dissolved under pressure); c. flammable liquids; d. flammable solids or flammable solids; e. oxidizing substances; f. toxic and infectious substances or goods; g. radioactive material or goods (radioactive material); h. corrosive substances; i. liquids, aerosols, and jelly (liquids, aerosols, and gels) in certain amounts; or j. other dangerous substances or substances (miscellaneous dangerous substances). (5) Commercial air transport business entities that violate the provisions in paragraph (1) are subject to administrative sanctions in the form of warning and / or revocation of licenses.

Article 137 Further provisions regarding the procedures and procedures for imposing administrative sanctions as referred to in Article 136 paragraph (5) shall be regulated by Ministerial Regulation. Article 138 (1) Owners, expedition agents of cargo planes, or senders who deliver special and / or dangerous goods must deliver notification to the manager of the legislation and / or air transport business entity before being loaded onto the aircraft. (2) An airport business entity, an airport operating



unit, a legal business entity, or a commercial air transport business entity that carries out special goods and / or dangerous goods transportation activities must provide a storage or stacking place and be responsible for the preparation of goods handling systems and procedures special and / or dangerous as long as the goods have not been loaded into the aircraft. (3) The owner, expedition agent of an aircraft cargo, or sender, an airport business entity, an airport operating unit, a legal business entity, or a commercial air transport business entity that violates the provisions of the

transportation of dangerous goods as referred to in paragraph (1) and paragraph ( 2) administrative sanctions in the form of warning and / or revocation of permit. Article 139.

Further provisions regarding procedures for the transportation of special and dangerous goods and the imposition of administrative sanctions are regulated by a Ministerial Regulation. From those four regulation, we can analyze that the carrying of dangerous goods must meet safety requirement for both mode transportation either Railway and Air Transportation. There will be a fine or sanctions when some regulation was broken by the stake holder either shipper or passenger and operator or Railway operator or Airline operator on the National Regulation. The staff who handle dangerous goods should have proper training before handling Dangerous Goods in order to ensure safety onboard either on the railway and aircraft as per stated on the International Regulation.

## CONCLUSION

Safety start from the ground, but more safety in preventing unstable dangerous goods substance (such as most of Lithium batteries in the large size) enter the first gate in MRT/KRL/LRT/Regular Train station and more screening before entering Airport in carrying dangerous goods article and transporting it into aircraft. Proper Procedures can be created based on the evaluation or reporting of accident and incident of carrying Dangerous Goods on railway and air, continue with the proper risk assessment by authority or government to ensure that the prevention system work, and finally ensure stake holder of Dangerous Goods handling comply with the regulation locally, nationally and internationally on both mode of transportation. We wish party involve on this dangerous goods handling management can implement the recommendation or best practice and create standard operation procedure based on the latest literature, the updated and revision of the regulation nationally and internationally. And we expect and recommend that Soekarno Hatta International Airport Jakarta can be a best rail connected Airport with safety procedure start from the Railway station in JABODETABEK as the Heathrow London later on (see figure 7).



Sources: <https://your.heathrow.com/heathrows-secret-rail-station/>

**Fig.7. Heathrow Airport in UK Britain as Best Rail Connected Airport**

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