

Journey Risk Management Study : IOCL Dimapur Depot

Committee Members

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1. INTRODUCTION

The most significant contributor of traumatic injury at work is the use of vehicle in road traffic [4]. There are 1635 road accidents during transportation reported by Indian oil and gas companies in the last five years [5]. As per [1], motor vehicle fatality rate in oil and gas industry is many folds more than all other industry. The major measures to prevent motor vehicle job-related fatalities are [1]:

- Decreasing the total amount of travel.
- Seeking alternate means of transport if possible.

- Reducing the risks associated with road transport.
- Reducing crash severity to reduce injury severity.

IOCL Dimapur Depot deals with POL products which come under essential commodities. Therefore, reducing the amount of travel for POL tank trucks (TTs) is not an option as POL products need to reach every nook and corner of the state of Nagaland. There is currently no other transport infrastructure available in Nagaland to transport POL products. Prevention of crash severity may reduce injury severity, but there may be other disasters arising due to crash of POL transport vehicles (e.g. fire, soil / water pollution etc.). Therefore, the only viable measure for reducing POL transport-related motor vehicle fatalities is to reduce risks associated with road journey. Journey Risk Management is a promising preventive measure to reduce road travel related risks [1].

1.1. Risk & Risk Management

Risk in supply-chain refers to unimaginable events that might happen in future causing disturbance to the smooth supply of materials [3]. The major feature of risk is that it is somewhat quantifiable which comes out to be handy in eliminating it [3]. The concept of risk can therefore be linked to probability of an unforeseen and undesired event. There can be three ways of finding probability of an event [3]:

1. **Calculation:** Prior knowledge of an event or situation is used to compute probability.

$$Probability = \frac{\text{Number of ways of occurrence of the event}}{\text{Total possible outcomes}} \quad (1)$$

2. **Observation:** Historical information on frequency of occurrence of an event can be used to calculate observation based or empirical probability.

$$Probability = \frac{\text{Number of times of occurrence of the event}}{\text{Total number of observations}} \quad (2)$$

3. **Subjective estimation:** People's opinion and judgements can be used to determine likelihood of an event. But, one should always carefully scrutinize before accepting subjective estimates.

Risk management revolves around three major activities: identification of risks, analysis of their consequences, developing germane measures to control risks, and review of control measures [3] [4]. A superior approach to manage risk is proactive analysis of likely events beforehand and planning steps to alleviate their effects [3]

1.2. Basic Idea of Journey Risk Management

Journey Risk Management points to organized and planned process for minimizing transportation-related risks within a organization's operations [1]. As part of JRM study, a general risk assessment is conducted which covers assessment of the driver, the vehicle type, route to be travelled, weather, time of the day, and distance [2]. The assessment of the driver generally comprises minimum qualifications, hours of sleep, and hours of service. Vehicle assessment includes corroboration that the vehicle is germane to the journey and a confirmation of completed pre-trip inspection [2]. Route risk assessments are completed on main roads and are evaluated prior to each trip [2]. Being declared as essential commodities in India, petroleum products (eg. MS, SKO, HSD) need to reach every nook and corner of the country regardless of the geography, difficulty level of the driving terrain, and adverse weather conditions.

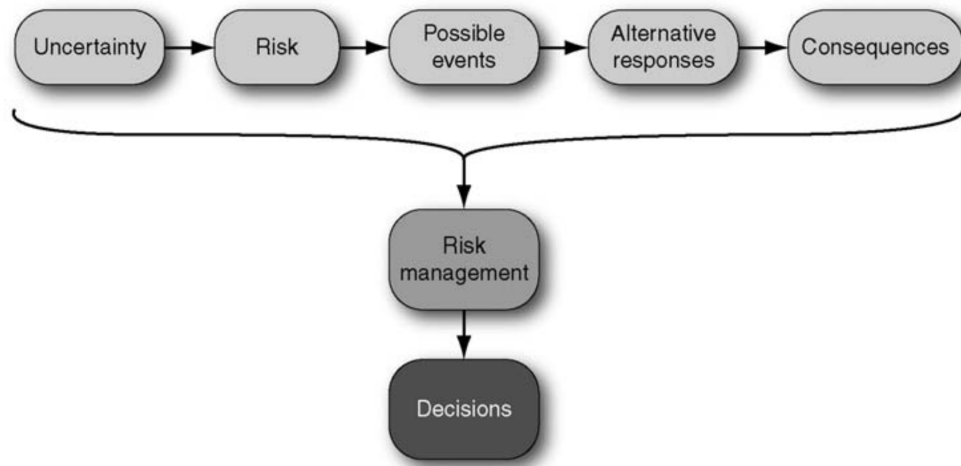


Figure 1: The basic risk management process

1.3. Need of Journey Risk Management

POL installations are controlled and supervised environments in terms of safety and health with prolific safety and health related measures, policies, and procedures. But, once POL TTs leave the installation premises, the environment becomes unsupervised. Also, the driving environment becomes uncontrolled with lots of public third party drivers. Moreover, the operating conditions may also change constantly. Petroleum products like MS, HSD, SKO etc. being essential commodities, some level pressure is always there on the POL TT drivers to reach the destination on time. This may result in unsafe practices by TT drivers and also may make it difficult to manage the changing environment and operating conditions [1]. In order to address these issues, Journey Risk Management needs to be adopted by supervisors of POL supply chain managers.

2. DEVELOPMENT OF JOURNEY RISK MANAGEMENT PLAN (JRMP)

In this section, step by step procedure to develop JRMP in relevance to POL transportation will be discussed with the help of [1], [3], & [6].

2.1. Development of Road Safety Framework

While developing a JRMP, first thing is to have a comprehensive road transport safety policy. At Indian Oil, there exists a thorough road transport safety policy which encapsulates motor vehicle act and hazardous good transport guidelines.

2.2. Development of Risk Register

A Risk register needs to be developed to spot overall driving vulnerability. For each driving activity, potential the hazards or operating conditions capable of causing motor vehicle incident is to be written down. In doing so, previous company lesson learnt circulars and input from TT drivers to be utilized. Finally, we have to jot down the risks or consequences that may occur out of each hazard. A sample risk register has been shown in figure 2.

Activity	Category	Hazard	Risk
Driving in winter	Road	Slippery roads	Skidding causing crash
	Weather	Extreme cold	Hypothermia in the event of an incident
	Traffic	Other drivers	May travel too fast for conditions and enter driver's lane
	Vehicle	Extreme cold	May cause starting problems
	Driver	High alertness for extreme driving conditions	May lead to driver fatigue causing micro-sleeps

Figure 2: A Sample Risk Register [1]

2.3. Discovering Control Measures for Risks & Risk Control Matrix

We have to identify the control measure(s) to prevent or mitigate the risks listed in the risk register. Writing down these measures against each risk will give us the Risk Control Matrix. The JRMP planner should try to include all the control measures to best manage the risks encountered in road transportation. Those controls need to be pragmatic and consistent. The risks can be rated with respect to the vulnerability of consequences (e.g. high, medium, low).

2.4. Route Analysis

Route data is collected to analyze the possible risk factors for driving difficulty for a particular trip. It will help to eradicate accidents and other emergencies in a journey. Risk rating to be given for every section of the trip along with possible control measures based on risk control matrix. A sample route analysis for one section has been shown below:

Route Analysis				
Section	Route Data	Risk Factors	Control Measures	Risk Rating
1	Dimapur Depot Exit Gate	T-junction with 2 way traffic	Use convex mirrors installed to monitor traffic & use indicators of vehicle	High

2.5. En-route Considerations

During the journey, drivers should monitor risks continuously and act as per the control measures. It is advisable for drivers to plan their rest stops, stoppage for meals, and to plan for avoiding distractions while driving. JRM plan may include possible rest spots, restaurants, hospitals, repair shops, and emergency contact numbers for the convenience of the driver.

2.6. Post-trip Considerations

Drivers should plan the return journey after completion of the trip. The plan starts with post trip vehicle inspection to ensure that the vehicle is fit for the next trip. Any changing risk factor / hazard during the journey and/or near miss to be reported to the journey managers (in our case POL depot/terminal's concerned officer) for improvement in the JRM plan.

2.7. Creation of the JRM Plan

The JRM plan is one single document including the road safety policy, risk register, risk controls, route analysis, en-route considerations, and post-trip considerations.

3. JRM PLAN FOR ROUTE 1

In this section JRM plan for for route 1 of 28 km distance from IOCL Dimapur Depot (25.890355, 93.723578) to Medziphema Auto Centre (25.757663, 93.847789) will be discussed. A total of 12 number of IOCL retail outlets are covered in this route.

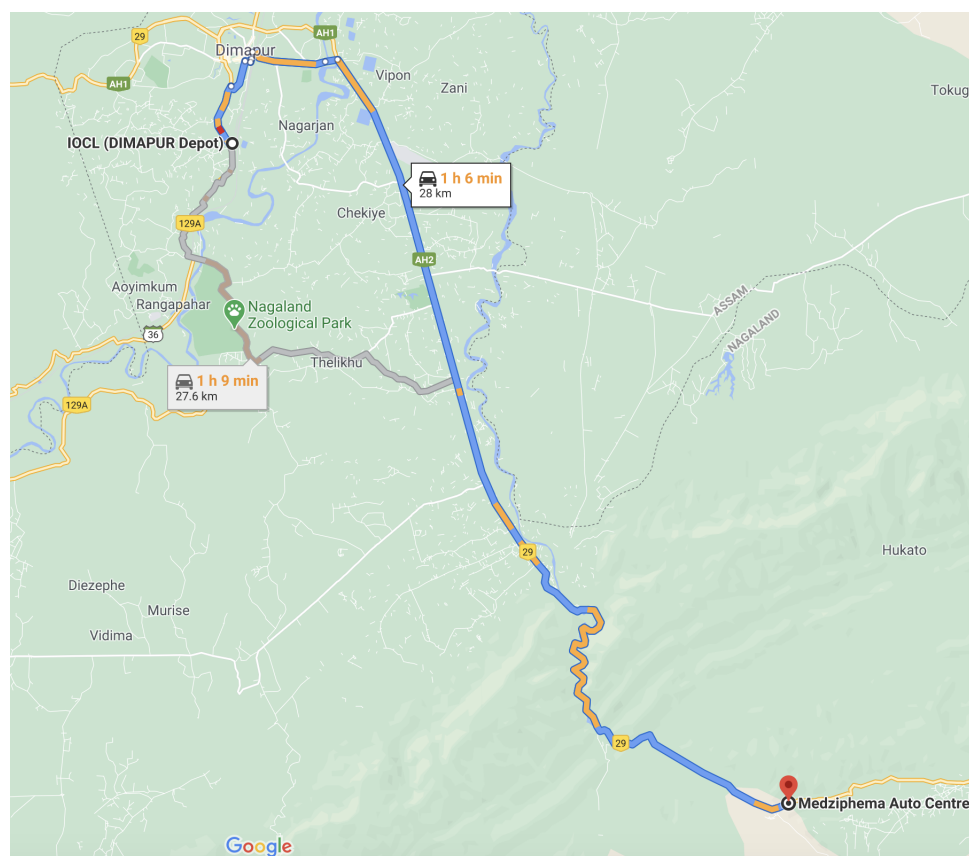


Figure 3: Route 1 for JRM Plan

3.1. Road Safety Framework for Route 1

Indian Oil's tank truck movement framework is guided by Motor Vehicle Act and Industry Transport Discipline Guidelines (ITDG). Each tank truck need to comply with the following guidelines:

- There should be one driver and one cleaner / helper for each tank truck.
- The driver need to possess a valid driving license for heavy vehicles (Transport category).
- The driver must undergo training on safe transportation of hazardous goods once in a year and their DL need to be endorsed by RTO for the training.
- Both the driver and helper must be provided with training as per OISD Std. 154 guidelines.
- Both the driver and helper should be in sound health condition. Therefore, periodic health and eye check up record to be kept.
- The maximum allowable speed for TT on load is 50 KMPH and the same for empty TT is 60 KMPH.
- The TT must follow the route approved by IOCL.
- The mandatory night rest / halt timing is from 22:00 Hrs to 06:00 Hrs. Therefore, the TT driver should refrain from driving during night post 22:00 Hrs.
- Contain one TREM (Transport Emergency) card.
- There should not be any deviation from the approved route for a considerably longer duration during a trip, unless there is any emergency or approval from competent authority.
- Vehicle Tracking System's VMU in working condition.
- There should be at least one 9/10 Kg DCP fire extinguisher and one 1/2 kg CO2 type fire extinguisher in each TT.
- There should be one First aid box.
- Fire screen between cabin and tank.
- 300A battery cut off switch.
- Battery terminals must be covered.
- HAZCHEM signs must be clearly visible.
- The TT crews must comply with all other general traffic rules.

3.2. Risk Control Matrix for Route 1

The risk register was developed by augmenting all the possible risk factors for route 1. The risk control matrix was then developed taking into account of the risk factors included in the risk register. The risks considered are particularly relevant to route 1. For other routes, new risk factors may come and need to be incorporated accordingly. The risk control matrix for route 1 is shown as Figure 4.

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Activity	Category	Hazard	Risk	Possible Control measures	Risk Rating
Driving in city / town traffic	T junctions / intersections	Other drivers	May cross road suddenly	Drive carefully and reduce speed, use indicators if necessary	High
	Bumper to bumper traffic	Other drivers	May brake suddenly or may hit from behind	Drive slow. Keep significant distance from the vehicle at front. Use mirrors to get the behavior of vehicle(s) behind. Helper should guide while overtaking. Avoid sudden / harsh braking.	Medium
	Rainy weather	Slippery road	Risk of getting hit or hitting other vehicle	ABS should be in good condition. Drive slow. Keep extra distance from vehicles in front and vehicles behind.	High
	Winter driving (early morning / night)	Slippery road	Risk of getting hit or hitting other vehicle	ABS should be in good condition. Drive slow. Keep extra distance from vehicles in front and vehicles behind.	High

Activity	Category	Hazard	Risk	Possible Control measures	Risk Rating
Driving in Rainy season	Road	Slippery roads	Skidding causing crash	ABS should be in good condition. Drive slow. Keep extra distance from vehicles in front and vehicles behind.	High
	Hilly Area	Land slide	TT getting stuck in land slide or TT getting hit by boulder	Watch carefully Avoid night driving	High
	Vehicle	Vehicle condition	Vehicle condition may lead to crash	Tyres must be in good condition. ABS system & brakes should be well maintained. Overall maintenance should be sound.	High
	Driver	High alertness for extreme driving condition	May lead to driver fatigue causing micro-sleeps	Sound sleep before the trip. Take rest wherever possible. Taking tea / caffeine drinks	Low
Driving in Summer days without rain	Weather	Extreme hotness	Hyperthermia	Sipping water and electrolyte drink. Using cooler if available	Low

Activity	Category	Hazard	Risk	Possible Control measures	Risk Rating
Driving in Winter	Weather	Extreme cold	Hypothermia	Taking necessary cloths to counter coldness. May use heater if available in the vehicle	Low
	Vehicle	Vehicle condition	Vehicle condition may lead to crash	Tyres must be in good condition. ABS system & brakes should be well maintained. Overall maintenance should be sound.	High
	Driver	High alertness for extreme driving condition	May lead to driver fatigue causing micro-sleeps	Sound sleep before the trip. Take rest wherever possible. Taking tea / caffeine drinks	Low
Driving at night	Road	Poor visibility, foggy weather	May lead to crash / road mishap due to poor visibility	Use fog lamp if available. Drive slow. Extra precaution at junctions & sharp turns.	High
Taking sharp turns	Road	Narrow road, Presence of gorge	Possibility of crash, road mishap	Blow horn. Use high beam at night. Careful while taking the turn and look for road signs if available.	High

Figure 4: Risk Control Matrix for Route 1

3.3. Analysis of Route 1

Route Analysis				
Section	Route Data	Risk Factors	Control Measures	Risk Rating
1	Dimapur Depot Exit Gate	T-junction with 2 way traffic	Use convex mirrors installed to monitor traffic & use indicators of vehicle	High
2	Dimapur Depot - Signal Tinali	Other drivers	Recommended speed limit 40 KMPH	Low
3	Signal Tinali	Road intersection	Recommended speed limit 10 KMPH, Driver carefully with indicators	High
4	Signal Tinali - Kalibari Road Junction	Bumper to bumper traffic	Drive slow, keep distance	Medium
5	Kalibari Road Junction	T-junction	Drive slow, use indicators	High
6	Near Charitra Complex	Sharp turn	Use horn, drive slow	High
7	Near Charitra Complex - Dolls Cafe	Bumper to bumper traffic	Drive slow, keep distance	Medium
8	Near Dolls Cafe	Narrow Road intersection	Use horn, drive slow with indicators	High

Section	Route Data	Risk Factors	Control Measures	Risk Rating
9	Near Dolls Cafe - GS Road T junction	Bumper to bumper traffic	Drive slow, keep distance	Medium
10	Kalibari GS Road T junction	T-junction	Drive slow, use indicators	High
11	Kalibari GS Road junction - GS and Golaghat Road junction	Bumper to bumper traffic	Recommended speed limit 30 KMPH	Medium
12	GS and Golaghat Road junction	T-junction	Drive slow, use indicators	High
13	GS and Golaghat Road junction - Tragopan junction	Bumper to bumper traffic	Recommended speed limit 20 KMPH	Medium
15	Tragopan junction	Road intersection	Follow traffic signal, use indicators	High
16	Tragopan junction - Over bridge end	Other drivers	Recommended speed limit 30 KMPH	Low
17	Over bridge end	Road intersection	Follow traffic signal, use indicators	High
18	Over bridge end - Burma Camp junction	Bumper to bumper traffic	Recommended speed limit 20 KMPH	Medium

Section	Route Data	Risk Factors	Control Measures	Risk Rating
19	Burma camp junction	Road intersection	Follow traffic signal, use indicators	High
20	Burma camp junction - New Dhansiri bridge end	Other drivers	Recommended speed limit 40 KMPH and extra vigil in the turn before the bridge	Low
21	New Dhansiri bridge end point	4 lane starting point	Drive slow & carefully	Medium
22	New Dhansiri bridge end point - Near Maruti Suzuki Arena	Other drivers	Drive carefully in the slow lane, use indicators while changing lanes, careful at road junctions	Low
23	Near Maruti Suzuki Arena - Dimapur Airport Junction	Road construction / 2 lane road	Drive slow, use indicators when necessary, Extra careful at night time to see road diversions	Medium
23	Dimapur Airport Junction	Road intersection	Follow traffic signal, use indicators	High
24	Dimapur Airport Junction - Nuland Road Junction	Other drivers	Drive carefully in the slow lane, use indicators while changing lanes, careful at road junctions	Low

Section	Route Data	Risk Factors	Control Measures	Risk Rating
25	Nuland Road Junction	Road intersection	Follow traffic signal, use indicators	High
26	Nuland Road Junction - 4 Lane end point at Chumukedima	Other drivers	Drive carefully in the slow lane, use indicators while changing lanes, careful at road junctions	Low
27	4 lane end point	2 lane road begins	Drive slow, use indicators when necessary, Extra careful at night time to see road diversions	Medium
28	4 lane end point - Patkai Bridge	Other drivers	Drive carefully, speed limit recommended is 40 KMPH	Low
29	Patkai Bridge	Narrow bridge	Drive carefully, speed limit recommended is 20 KMPH, wait for other vehicles to pass if needed	Medium
30	Patkai Bridge - Kukidolong	Hilly road, slippery road (if it rains), Multiple sharp turnings	Avoid night driving, watch carefully for land slides, Maintain ABS properly, keep distance, use horn, use high beam at night while taking turning, extra attention to road	High

Section	Route Data	Risk Factors	Control Measures	Risk Rating
31	Kukidolong - Vivolie Service Station	Other drivers, road construction	Speed limit recommended is 40 KMPH, look for road signs like diversions	Medium
32	Vivolie Service Station - Medziphema Auto Centre	Other drivers	Drive carefully	Low

3.4. En-route considerations for route 1

Since the distance and time taken from Dimapur Depot to Chumukedima is not that significant. There is not much scope for planning of rest stops or meal stops in between. However, if a TT needs to cross section 30 of the route analysis given in the previous subsection, special precautions need to be taken. TTs bound to cross section 30 may plan their rest stop or meal stop at Chumukedima town. There are multiple restaurants / hotels / dhabas available. Night halt may also be planned at any dhaba / hotel or IOCL retail outlet at Chumukedima.

List of police stations are given below for route 1:

Sl No.	Station Name	Address	Co-ordinates	Contact No.
1	Suburban Police Station	Lhomithi Colony, Signal Bosti, Dimapur, Nagaland 797112	25.897255, 93.720761	+91-3862-232198
2	East Police Station	Bank Colony, Police Colony, Dimapur, Nagaland 797117	25.907489, 93.731220	+91-3862-227607
3	Diphupar Police Station	Diphupar, 4th Mile, Dimapur, Nagaland 797115	25.870889, 93.764570	+91-3862-243194

Sl No.	Station Name	Address	Co-ordinates	Contact No.
4	Chumukedima PS	Ward-4, Chumukedima, Dimapur, Nagaland 797112	25.819615, 93.783930	+91-3862-243195

The addresses and contact numbers of important hospitals / health centres are given below:

1. **District Hospital Dimapur**, Civil Hospital Colony, Dimapur, Nagaland 797112. (+91-9366013602)
2. **Zion Hospital**, Purana Bazar, Dimapur, Nagaland 797112. (+913862224117)
3. **Dimapur hospital and research centre**, Purana Bazar, N.H 29, Dimapur, Nagaland 797116. (+913862224041)
4. **Diphupar SC** (9436261732)
5. **Chumukedima PHC** (9612733241)

The list of tank truck repair / maintenance shops are given below:

1. **Perfect Tyre Service**, Burma Camp, opp. Power House Colony, Dimapur, Nagaland 797112 (+917085618804)
2. **Mustaq truck workshop**, Burma Camp, Dimapur, Nagaland 797117.
3. **Deluxe Tyre Service**, Purana Bazar, Dimapur, Nagaland 797116.
4. **National Tyre Works**, Naharbari, Kohima road, Dimapur, Nagaland 797117.
5. **Auto Care**, National Highway 29, Kohima Road, Chumukeidma, Dimapur, Nagaland 797112 (+918131885158)

3.5. Post trip considerations for route 1

Tank truck drivers should plan their return journey for destinations covered in this JRM study beforehand. It should begin with post trip vehicle inspection and necessary inspection. Drivers should notice changes in road condition, weather or any other changes to the driving environment to the Dimapur Depot officials after return. Any near miss happening must also be reported.

4. CONCLUSION

We have successfully conducted JRM study for route 1 (from Dimapur Depot to Medziphema) in this study. JRM study is a continuous process where feedback from drivers, near misses, changing road conditions, changing weather conditions etc. to be monitored and updated regularly. There are more routes for Dimapur Depot, where JRM study need to be carried out. This study has been written in LaTeX and it has been kept in the GitHub repository <https://github.com/iocldimapur/JRM-study>. Any change and update in future can be found in this repository .

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