IPA Rail Freight Seminar

12 September 2013 | Belgrade, Serbia

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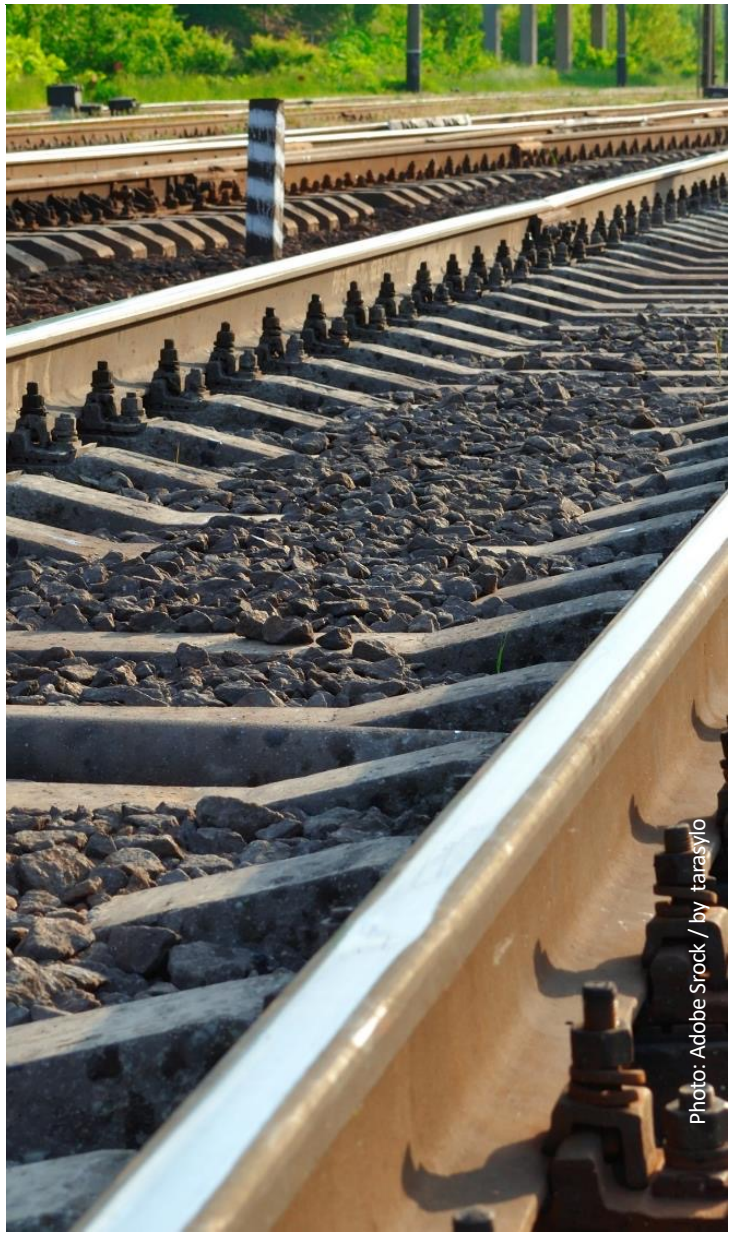
Exercise: Application of reporting methods on example related to transport of dangerous goods/freight transport



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Group exercises: Examples on occurence scenario building from

3 examples related to freight transport or transport of dangerous goods

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CSM ASLP taxonomy: Type A events

- **Collisions (A1):**
  Includes train collisions with another train/rail vehicle, obstacles, or other rail vehicles not forming a train.
- **Derailments (A2):**
  Involves scenarios where at least one wheel of a train or rail vehicles not forming a train leaves the rails.
- **Level Crossing Accidents (A3):**
  Accidents at level crossings involving trains, rail vehicles, pedestrians, and crossing vehicles or objects temporarily present on or near the track.
- **Accidents to Persons Involving Rolling Stock in Motion (A4):**
  Accidents to persons hit by a train or rail vehicle, objects attached or detached from the train or vehicle, persons falling from trains or vehicles, or hit by loose objects while onboard.
- **Fire or Explosion in Rolling Stock (A5):**
  Fire or explosion occurring in a train, rail vehicle, or its load.
- **Other Accidents (A0):**
  Includes electric shocks, cargo/freight falling from a height, dangerous goods accidents not related to another type A event, and other accidents not covered in the above categories.
- **Suicides and Attempted Suicides (A6 - Voluntary Reporting):**
  Acts to deliberately injure oneself resulting in death or serious injury.

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CSM ASLP taxonomy: Type B events

- **Operation Failures (B.1):**
  This includes all operation failures, whether they are due to infrastructure or train or rail vehicle operation. Examples are improper routing, signal passed at danger, over-speeding, etc. It involves sections B.1, B.1.1, B.1.2, and their subcategories.
- **Technical Failure of the Rolling Stock (B.2):**
  This involves all technical failures related to the rolling stock, such as failure of the wheelset, braking system, and other rolling stock failures like on-board signalling failure, odometry error, etc. It involves sections B.2, B.2.1, B.2.2, B.2.0, and their subcategories.
- **Technical Failure of the Infrastructure (B.3):**
  This includes all the technical failures of the infrastructure, for instance, track failure, structures failure, and other infrastructure failures like power supply equipment failure, overhead contact line failure, etc. It involves sections B.3, B.3.1, B.3.2, B.3.0, and their subcategories.
- **Other category B event types (B.0):**
  This includes other category B events that do not fall under the categories mentioned above, such as fire in proximity of rail infrastructure, unauthorized presence of staff/employees or other third parties on the railway system. It involves section B.0 and its subcategories.

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CSM ASLP taxonomy: Type C events

- **C.1. - Railway system performance**
  - C.1.1 - To provide power for train (or vehicle) operations
  - C.1.2 - To respond to incidents and occurrences
  - C.1.3 - To maintain, repair and extend the infrastructure
  - C.1.4 - To operate a train in normal operational situations
  - C.1.5 - To control train movements in all operational circumstances
  - C.1.6 - To prepare trains for service
  - C.1.7 - To support passenger movements and well-being at stations
  - C.1.8 - To check, inspect, maintain and repair rolling stock for service
  - C.1.9 - To design a structural subsystem
  - C.1.10 - To Install a structural subsystem

C.2 - External events - Environmental

  - C.2.1 - Earthquake
  - C.2.2 - Flooding
  - ... (and other sub-categories)

- **C.3 - External events - Security**
  - C.3.1 - Terrorism
  - C.3.2 – Assault

C.0 - Other un-coded category C event types

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CSM ASLP taxonomy: Contributing factors

- **CF.1 Performance Relevant Factor**
  - CF.1.1 Dynamic Situational Factors: Temporary characteristics influencing situations.
    Examples: Pressure, Complexity, Monotony, Work-rhythms, Environment.
  - CF.1.2 Dynamic Staff Factors: Temporary characteristics of individuals/teams influencing situations.
    Examples: Intentions, Attention, Fatigue, Stress, Awareness.
  - CF.1.3 Static Situational Factors: Lasting or repetitive situational elements.
    Examples: Design, Instructions, Communication Means, Tools, Context.
  - CF.1.4 Static Staff Factors: Lasting or repetitive individual/team characteristics.
    Examples: Experience, Personal traits, Motivation, Competencies, Decision-making.
  - CF.1.5 Relational Factors: Factors between staff or staff groups influencing situations.
    Examples: Communication, Relationships, Trust, Reinforcement, Involvement.

CF.0 Other Contributing Factors: Factors not covered by the above categories.

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CSM ASLP taxonomy: Systemic factors

- **SF.1 Leadership:**
  Factors that guide staff towards organizational objectives.
  Examples: Leadership and commitment, Safety Policy, Organizational roles and responsibilities, Consultation of staff, and other leadership aspects.
- **SF.2 Planning:**
  Factors that identify risks and establish safety objectives.
  Examples: Actions to address risks, Safety objectives and planning, and other planning aspects.
- **SF.3 Support:**
  Provides support for the safety management system.
  Examples: Resources, Competence, Awareness, Information and communication, Documented information, Integration of human and organizational factors, and other support aspects.
- **SF.4 Operation:**
  Develops and implements processes as per organizational safety policy.
  Examples: Operational planning and control, Asset Management, Contractors and suppliers management, Management of change, Emergency management, and other operational aspects.
- **SF.5 Performance Evaluation:**
  Monitors and audits processes in relation to objectives and resources.
  Examples: Monitoring, Internal auditing, Management review, and other performance evaluation aspects.
- **SF.6 Improvement:**
  Enhances safety performance and the safety management system.
  Examples: Learning from accidents and incidents, Continual improvement, and other improvement aspects.

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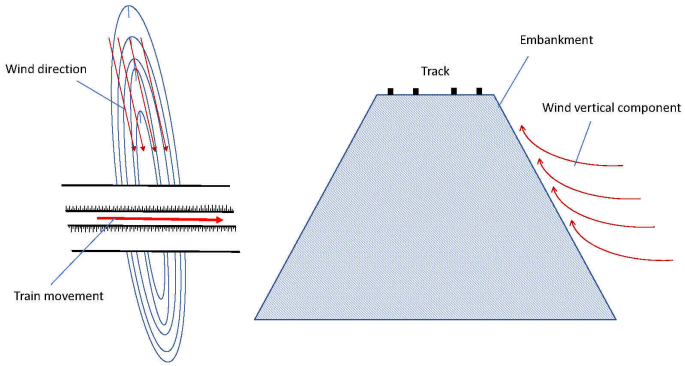
Example 1: Examples on occurence scenario building from

Freight train composed of 31 wagons loaded with 33 empty 40-foot containers suffered a breakdown of the load units. Five empty load units fell off their respective wagons towards the embankment of the opposite track due to an inefficient fastening system combined with an adverse particular weather situation (local high-speed winds with an important vertical component due to the local ground configuration). the RU held a Special Transport Authorisation (STA) for their circulation, allowing for 9.5-foot-high HC (High Cube) containers.

During the incident, one of the load containers hit an electrification pole, knocking it down and causing the decompensation of the catenary on the opposite track.

The incident was notified the next day by another train driver, as another train running through the same section in the opposite direction, suffered catenary hitch with the rear pantograph when passing by the location of the incident.

The load units that fell off from wagons that had been previously transformed, using a fastening system that consisted of stanchions. The other wagons of the formation had ISO spigots as fastening system, and they were not affected by the ascending vertical wind forces.



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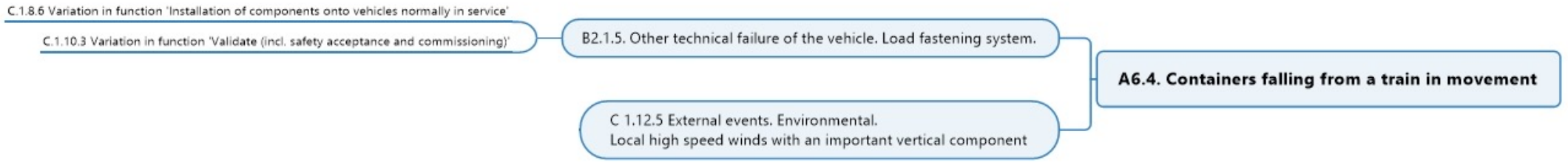
Example 1: Examples on occurence scenario building from



CF.1.2 Dynamic Staff Factors: Awareness

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Example 2: Examples on occurence scenario building from

A freight train consisting of a locomotive and 19 wagons, loaded with cars, derailed due to a rail breakage.
After continuing 2,6 kilometres with four wagons derailed, the train finally stopped.
No personal injuries occurred. However, the railway vehicles and the railway infrastructure were extensively damaged.
The derailment was caused by rail fatigue which, following a long loading period, propagated into a vertical crack and caused a broken rail.
The crack formation had not been identified or dealt with as part of the infrastructure manager's system for preventive maintenance.
The analysis performed on the broken rail identified marks of white painting at the location of important cracks, suggesting that the problem had been identified, but no further measures of rectification were taken on the line.

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Example 2: Examples on occurence scenario building from

SF4.1 Operational planning and control: Risk assessment

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Example 3: Examples on occurence scenario building from

- Train consisting in 22 tank wagons (series Z) loaded with oil products (first 4 wagons loaded with petrol and the next 18 ones with diesel).
- When running through a railway station, the local traffic inspector on duty observed fire in the upper part of the first wagon of the train.
- The local traffic inspector notified the driver and the operator from the Traffic Control Unit about the fire at the first wagon of the freight train.
- The Traffic Control Unit instructs the driver to stop the train in an area with easy access for a possible intervention of the specialised services.
- Firefighters brigade is alerted, and the fire is finally extinguished.

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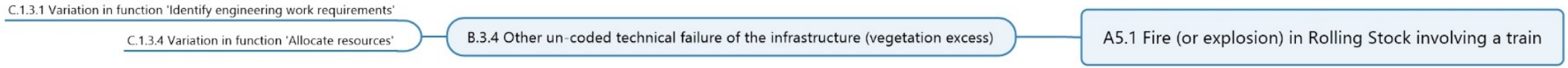
Example 3: Examples on occurence scenario building from



SF1.4 Consultation of staff and other parties

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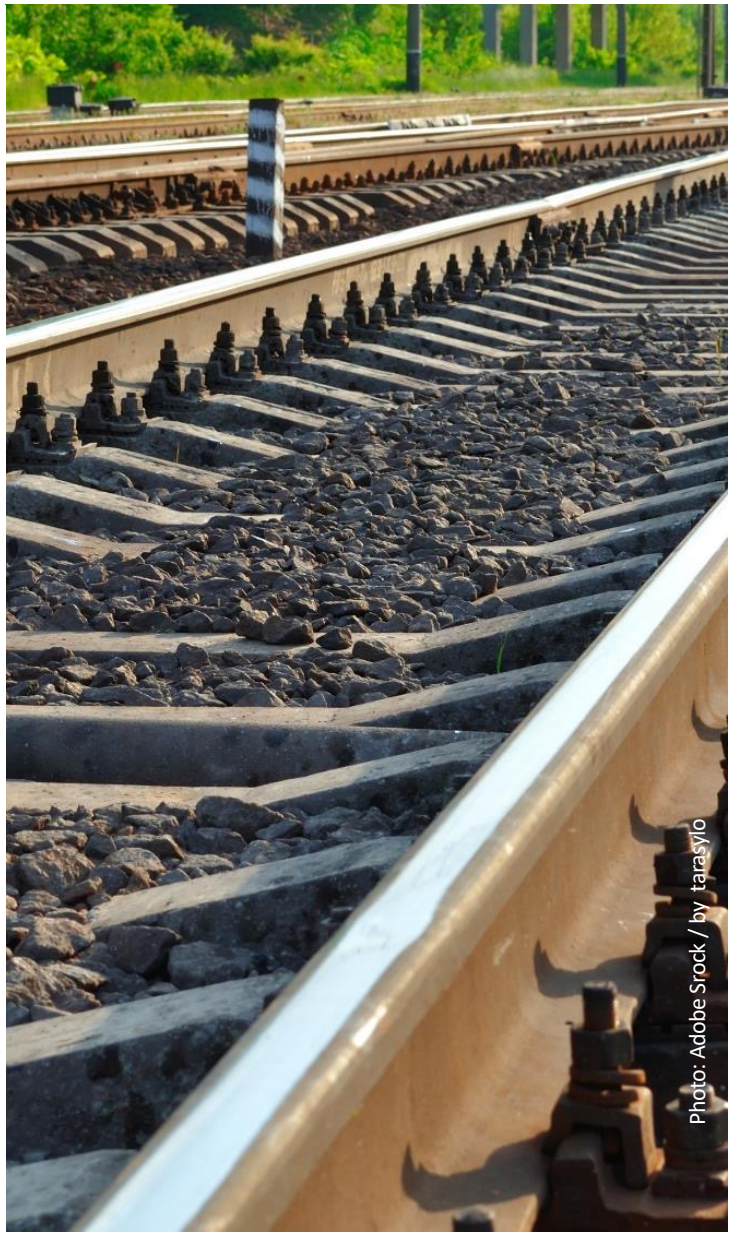
Exercise: Use of reporting method deliverables as input for the development of risk models



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Examples of practicle uses of risk models

1. Identifying High-Risk Events:

In case of multiple 'Signal Passed At Danger' (SPAD) events at different signals across the network, a risk model can allocate a risk score to each event based on factors such as speed, visibility, and past occurrences.

This can help in identifying signals that are associated with a higher risk of SPAD events, leading to targeted interventions such as enhanced signal visibility, additional warnings, or implementing automatic train control at those signals.

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Examples of practicle uses of risk models

2. Identifying High-Risk Assets + risk evolution over time:

For railway bridges across the network, a risk model can allocate a risk score to each bridge based on factors such as age, condition, load, and environmental factors.

This can help in identifying bridges that are at a higher risk of failure, leading to targeted interventions such as more frequent inspections, necessary repairs, or replacement of high-risk bridges.

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Examples of practicle uses of risk models

3. Operational Planning and Optimization:

For a busy urban rail network with multiple lines and high passenger demand, a risk model can allocate a risk score to different operational decisions such as train schedules, routing, or capacity allocation based on factors such as past delays, congestion, and passenger demand.

This can help in identifying operational decisions that are associated with a higher risk of delays or congestion, leading to optimized operations that minimize delays and maximize passenger throughput.

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Examples of practicle uses of risk models

4. Investment Planning and Prioritization:

For a railway operator considering different investment options such as upgrading tracks, acquiring new trains, or implementing a new signaling system, a risk model can allocate a risk score to each option based on factors such as potential impact on safety, reliability, and efficiency.

This can help in identifying investment options that maximize the return on investment while minimizing risks, leading to better-informed investment decisions.

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Group exercises: Example 1: SPAD Risk ranking

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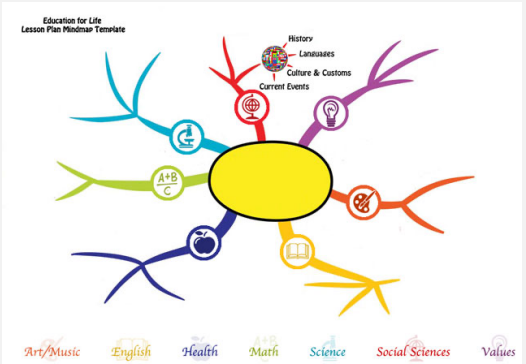
Exercise

Try to list some parameters that should be considered when developing a risk model for Signals passed at danger

=> Let us assume a SPAD occurrence takes place, which information would most likely be important to be able to allocate a risk score to this occurrence?



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Risk model example 1: SPAD Risk ranking

https://www.rssb.co.uk/safety-and-health/improving-safety-health-and-wellbeing/rail-risk-toolkit/spad-risk-ranking-tool

Risk score linked to SPAD

(0 – 28)

=

Score linked to reaching the danger point (DP)

(0 – 10)

+

Score linked to the potential consequences of a SPAD

(0 – 18)

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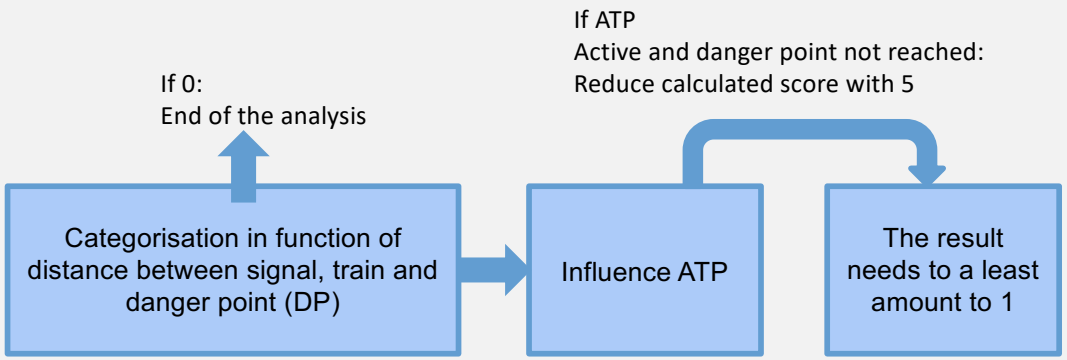
Risk model example 1: SPAD Risk ranking

Score linked to reaching the danger point



Range: 0-10

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Risk model example 1: SPAD Risk ranking

Risk score linked to SPAD

(0 – 28)

=

Score linked to reaching the danger point (DP)

(0 – 10)

+

Score linked to the potential consequences of a SPAD

(0 – 18)

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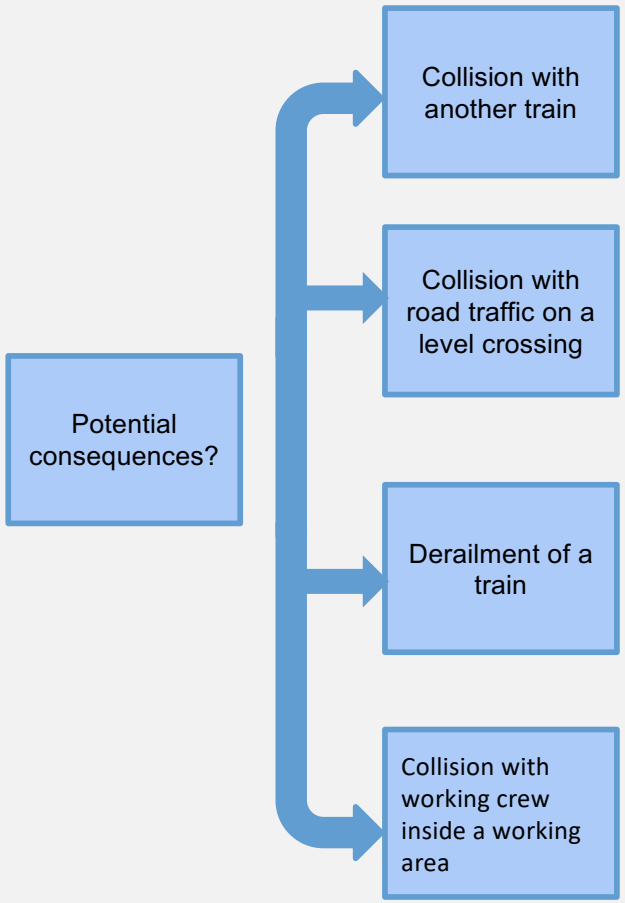
Risk model example 1: SPAD Risk ranking



Score= Collision speed score 0 - 10 + Material type score 1 - 5 + Occupation rate score 0 - 5

Score = 8

Score = Passenger train = Occupation rate score 0 – 6 + Derailment speed score 4 - 6

Freight train = 5

Score = 9

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Group exercises: Example 2: TDG Risk Management framework

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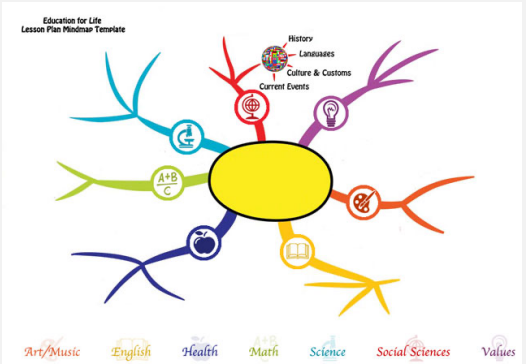
Exercise

Try to list some parameters that should be considered when developing a risk model for Transport of Dangerous Goods

=> Let us assume an operator wants to organise a transport containing goods along a certain route, which information would most likely be important to be able to allocate a risk score to this transport?



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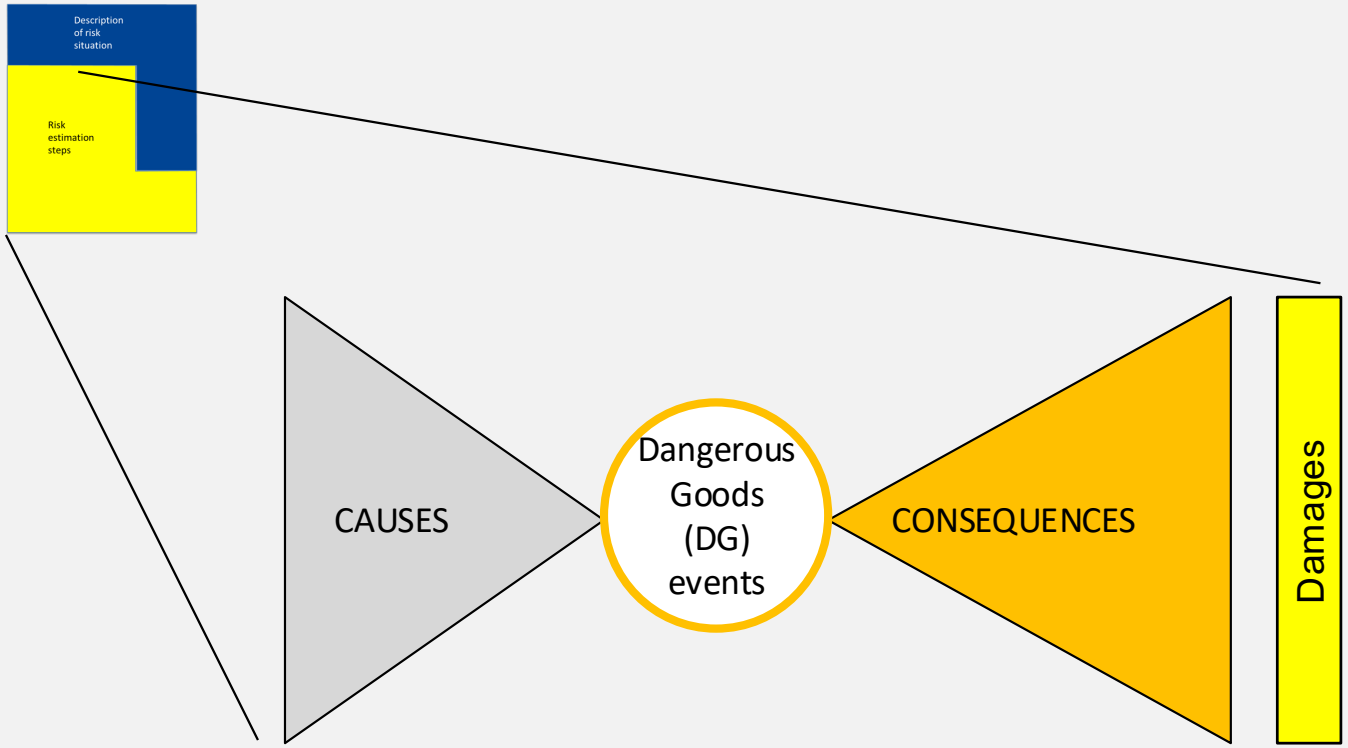
Bow-Tie



https://www.era.europa.eu/domains/operation/transport-dangerous-goods/risk-management-framework_en

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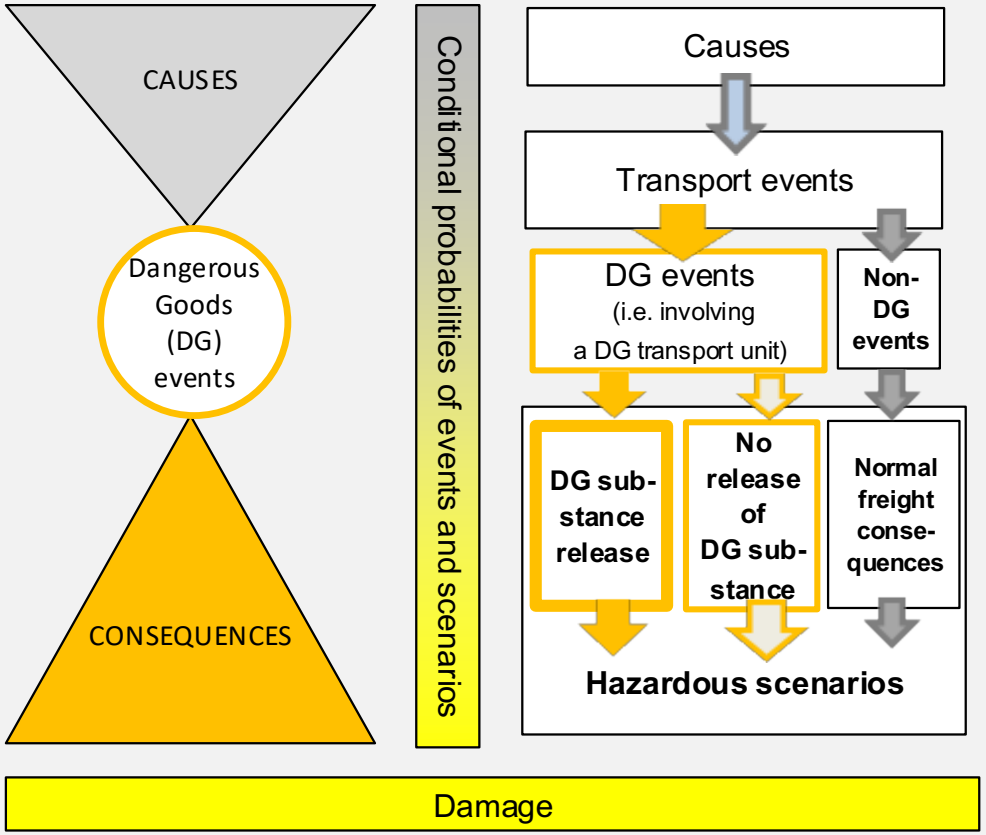
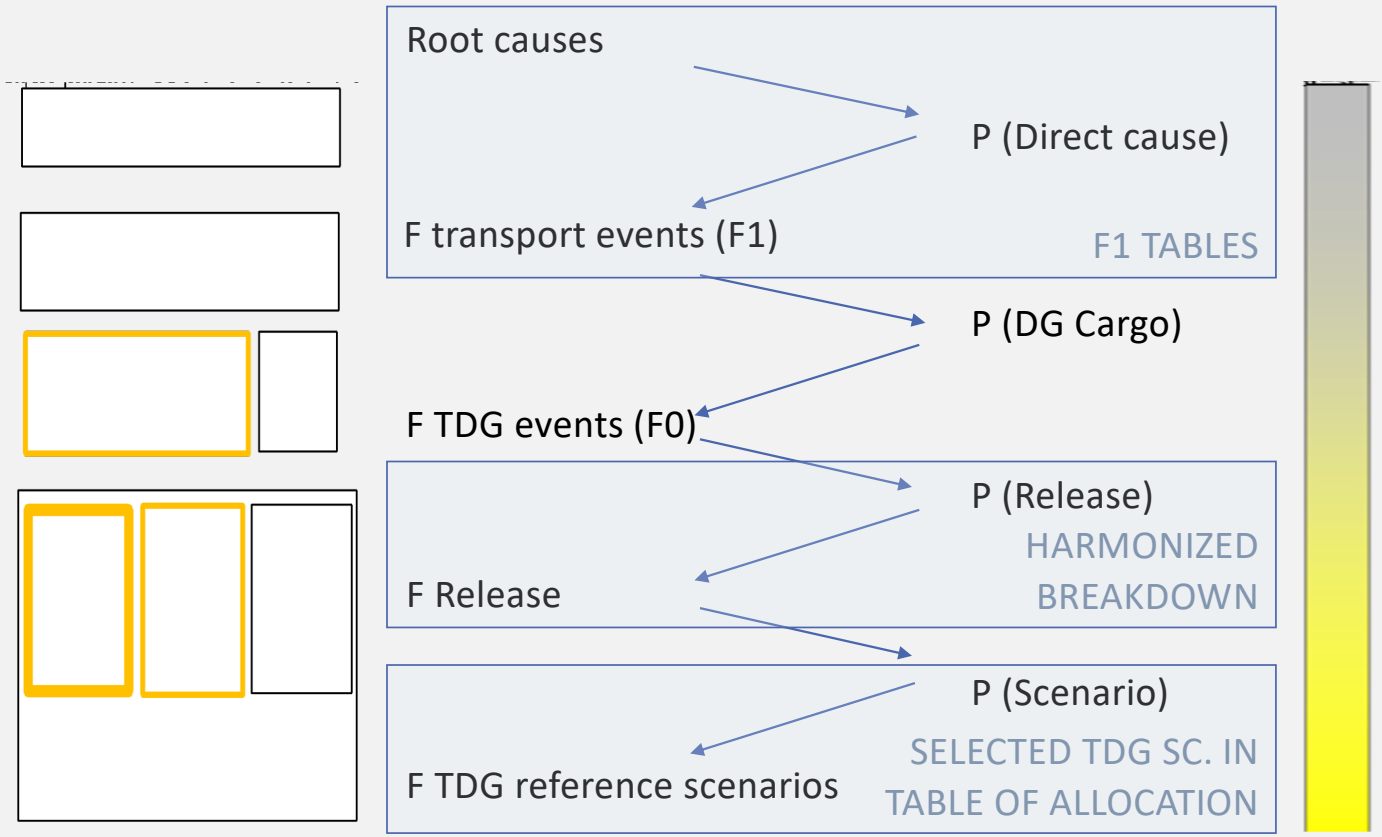
Events



Frequencies of events and TDG scenarios



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Risk indicators

	Impact on Human (health)	Impact on Assets	Impact on Operations	Impact on Environment
DG event with release	*R(DGR, N FAT)* *R(DGR, N INJ)*	*R(DGR, N ITEMS)* *R(DGR, COSTS)*	*R(DGR, N HRS)* *R(DGR, COSTS)*	*R(DGR, N SQM)* *R(DGR, COSTS)*
DG event without release	*R(DGNR, N FAT)* *R(DGNR, N INJ)*	*R(DGNR, N ITEMS)* *R(DGNR, COSTS)*	*R(DGNR, N HRS)* *R(DGNR, COSTS)*	*R(DGNR, N SQM)* *R(DGNR, COSTS)*
Normal freight events	*R(FRT, N FAT)* *R(FRT, N INJ)*	*R(FRT, N ITEMS)* *R(FRT, COSTS)*	*R(FRT, N HRS)* *R(FRT, COSTS)*	*R(FRT, N SQM)* *R(FRT, COSTS)*

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SMS implementation within operators: Critical questions linked with the domain of transport of dangerous goods/freight transport

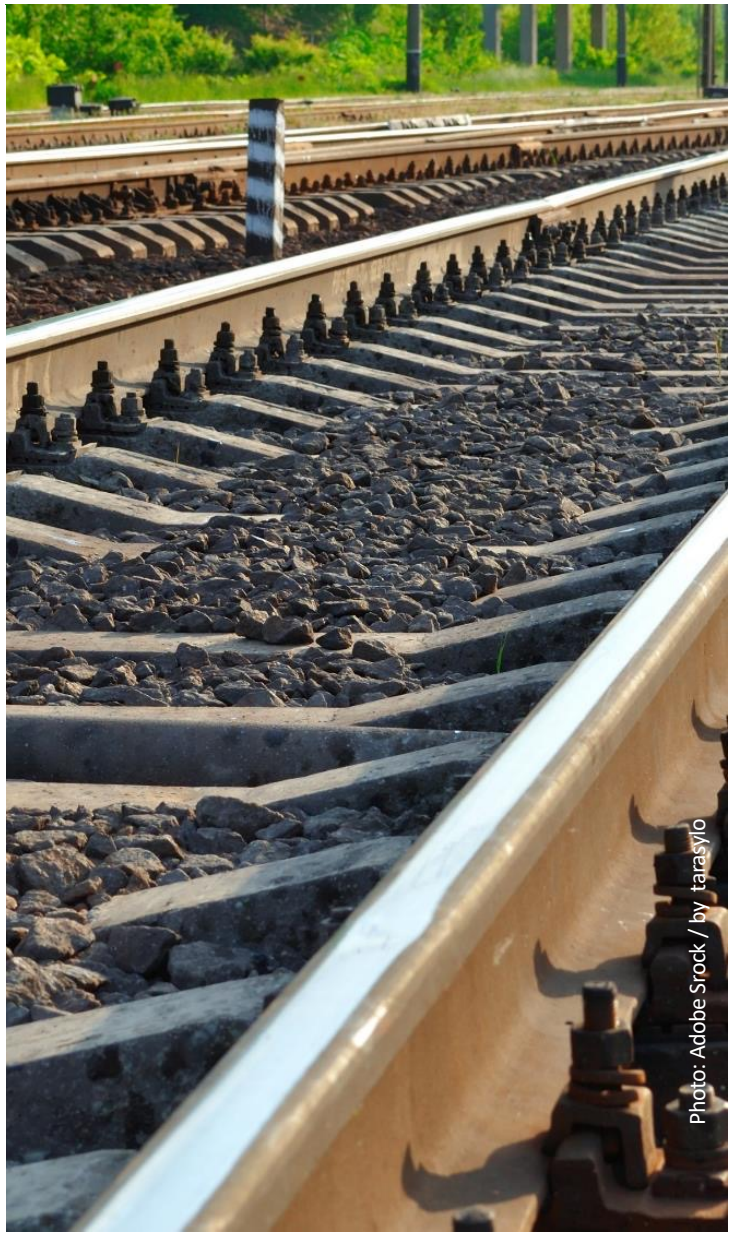

Photo: Adobe Srock / by tarasyio

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Questions for discussion

Disclaimer: The questions and scenarios presented in this quiz are designed to challenge participants to identify the most appropriate step when viewed in isolation. It's important to note that in real-world applications, a combination of approaches is often best. While the quiz may highlight one answer as the "most appropriate" in a given context, it's essential to recognize that all options have merit and can be integrated into a broader, holistic approach to safety and decision-making. This quiz is a tool for critical thinking and discussion, and it should not be interpreted as a strict guideline for action.

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Questions for discussion

1. **Scenario**: Your railway company is considering implementing an automated freight transport system using driverless locomotives. Before proceeding, you need to evaluate the safety risks associated with it.

Which approach best aligns with the CSM on SMS requirements?

A) Implement the system in a controlled environment, gather data on potential safety concerns, and then address them.

B) Conduct a preliminary risk assessment, start a pilot phase with limited operations, and then conduct a detailed risk assessment based on the pilot's findings.

C) Conduct a detailed risk assessment involving all relevant stakeholders, including technology experts, safety personnel, and affected communities, before any form of implementation.

D) Implement the system in phases, addressing safety concerns at the end of each phase based on feedback.

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D) Implement the system in phases, addressing safety concerns at the end of each phase based on feedback.

Already better (limited proactive risk assessment), but still reactive

Reactive approach: evaluation after initial implementation

Proactive approach involving a broad range of expertise domains

Reactive approach: evaluation after implementation of each phase

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Questions for discussion

2. Scenario: A new freight route is being proposed which passes through a densely populated area.

How should the potential risks be evaluated?

A) By conducting a technical assessment of the route and comparing it with established safety benchmarks.

B) By considering both the technical aspects and engaging with the local community to understand potential impacts and concerns , while also evaluating operational and human and organizational factors.

C) By analyzing historical data from similar routes and integrating findings with current safety standards.

D) By conducting a multi-faceted risk assessment that includes technical, environmental, and economic factors, but not directly engaging with the local community.

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C) By analyzing historical data from similar routes and integrating findings with current safety standards.

D) By conducting a multi-faceted risk assessment that includes technical, environmental, and economic factors, but not directly engaging with the local community.

Proactive approach involving a broad range of expertise domains

Only focused on technical aspects

Some specific risks linked to the specific context might be missed

Direct engagement with the local community might be beneficial to asses potential impacts on densely populated areas

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Questions for discussion

3. Scenario: Your railway company is planning to introduce a new type of freight wagon equipped with advanced automated braking systems.

Which of the following is the most appropriate first step?

A) Organize a comprehensive risk assessment workshop involving relevant stakeholders, including technology experts, safety personnel, and operational teams, to evaluate the wagon's safety and integration into the existing fleet.

B) Engage in detailed discussions with the manufacturer to understand the wagon's safety features, technical specifications, and any preliminary testing results.

C) Collaborate with the manufacturer to conduct joint tests on the tracks, evaluating the wagon's performance under various conditions.

D) Monitor the adoption of the new wagon type by peer railway companies, gathering insights from their experiences and potential challenges faced.

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Questions for discussion

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D) Monitor the adoption of the new wagon type by peer railway companies, gathering insights from their experiences and potential challenges faced.

Proactive approach involving a broad range of expertise domains

Might no cover aspects related to integrating the new wagon type into the existing fleet

Testing is important, but might not capture alle potential risks

Using insight from peers could be useful, but might not cover all aspecst involved

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Questions for discussion

4. Scenario: There's a report of frequent minor incidents on a particular freight route, such as minor derailments and signal malfunctions.

What's the best approach to address this?

A) Implement immediate corrective actions for each reported incident to ensure quick resolution.

B) Investigate each incident in isolation, focusing on the specific causes and conditions leading to each incident.

C) Enhance monitoring and data collection on the route to gather more detailed information about each incident, aiming for a more informed decision in the future.

D) Conduct a comprehensive risk assessment of the entire route, considering all incidents together, and identify systemic issues that might be contributing to the frequency of these incidents.

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Questions for discussion

4. Scenario: There's a report of frequent minor incidents on a particular freight route, such as minor derailments and signal malfunctions.

What's the best approach to address this?

A) Implement immediate corrective actions for each reported incident to ensure quick resolution.

Approach is too reactive

B) Investigate each incident in isolation, focusing on the specific causes and conditions leading to each incident.

Already better than option A due to extensive investigation of incidents, but still too reactive

C) Enhance monitoring and data collection on the route to gather more detailed information about each incident, aiming for a more informed decision in the future.

Broad data collection might lead to longer than necessary risk exposure

D) Conduct a comprehensive risk assessment of the entire route, considering all incidents together, and identify systemic issues that might be contributing to the frequency of these incidents.

Proactive approach involving a broad range of expertise domains

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Questions for discussion

5. Scenario: A stakeholder raises a safety concern about a particular freight operation, specifically about the loading mechanism which they believe might be prone to failures.

How should this concern be addressed?

A) Review recent operational data and maintenance logs related to the loading mechanism to check for any anomalies or signs of wear.

B) Conduct a risk assessment focused on the loading mechanism, involving technical experts and operational teams, to evaluate the validity of the concern, even if it's an isolated feedback.

C) Organize a feedback session with multiple stakeholders to determine if others share the same concern and to gather a broader perspective.

D) Monitor the loading mechanism closely during the next few operations to observe any potential issues in real-time.

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Questions for discussion

5. Scenario: A stakeholder raises a safety concern about a particular freight operation, specifically about the loading mechanism which they believe might be prone to failures.

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C) Organize a feedback session with multiple stakeholders to determine if others share the same concern and to gather a broader perspective.

D) Monitor the loading mechanism closely during the next few operations to observe any potential issues in real-time.

Too reactive (relying on existing data)

Proactive approach involving a broad range of expertise domains

Good approach, but might cause delay in adressing risks

Might not cover all risk scenario's + is reactive

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Questions for discussion

6. Scenario: Your railway company wants to expand its operations to a new country that has a unique topography and climate, different from your current operations.

Which of the following should be prioritized?

A) Collaborating with local experts to understand the safety regulations of the new country and how they pertain to the unique environmental conditions.

B) Conducting a market analysis to ensure the expansion is financially viable, while also considering basic safety standards.

C) Implementing the exact safety measures used in your current operations, assuming they will be universally effective.

D) Engaging in a pilot project in the new country to test operations and gather data, before fully understanding the local safety regulations.

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Questions for discussion

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C) Implementing the exact safety measures used in your current operations, assuming they will be universally effective.

D) Engaging in a pilot project in the new country to test operations and gather data, before fully understanding the local safety regulations.

Proactive approach involving a broad range of expertise domains

Financial viability is important, but existing safety standards might not be universally applicable

All safety measures might not be universally applicable

Starting a pilot without comprehensive understanding might lead to unforeseen risks

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Questions for discussion

7. Scenario: A new technology, an AI-driven predictive maintenance system, promises to enhance the efficiency of freight operations but is relatively untested in real-world railway scenarios.

What's the best approach?

A) Collaborate with the technology provider to set up a controlled pilot project, ensuring that existing systems remain in place as a backup.

B) Conduct a thorough risk assessment involving technology experts, operational teams, and safety personnel to evaluate the potential benefits and risks of the new system.

C) Engage in research and development to create an in-house version of the technology, ensuring full control over its features and implementation.

D) Monitor the industry closely, attending seminars and workshops, to gather insights on the technology's performance in other sectors before making a decision.

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Proactive approach involving a broad range of expertise domains

The pilot might not show how the system will interact with existing systems.

This approach might be time consuming and still requires a thourough risk assessment

Insights from the industry might be valuable, but might not directly apply to your railway company

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Questions for discussion

8. Scenario: There's a proposal to reduce the frequency of safety audits to cut costs, given that the past few audits have shown consistent compliance and no major issues.

How should this be approached?

A) Implement a dynamic auditing schedule, adjusting the frequency based on the outcomes of previous audits, while ensuring a minimum standard is maintained.

B) Evaluate the potential safety implications of such a decision by consulting with safety personnel, operational teams, and reviewing historical audit data to make an informed decision.

C) Propose a hybrid approach where full-scale audits are reduced in frequency, but introduce more frequent mini-audits focusing on high-risk areas.

D) Engage external safety consultants to provide a third-party perspective on the optimal frequency of safety audits for the company.

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Questions for discussion

Promotes a cautious, collaborative, and data-driven approach to decision-making, ensuring that safety remains the top priority

8. Scenario: There's a proposal to reduce the frequency of safety audits to cut costs, given that the past few audits have shown consistent compliance and no major issues.

It might inadvertently reduce the frequency of audits too much

How should this be approached?

A) Implement a dynamic auditing schedule, adjusting the frequency based on the outcomes of previous audits, while ensuring a minimum standard is maintained.

B) Evaluate the potential safety implications of such a decision by consulting with safety personnel, operational teams, and reviewing historical audit data to make an informed decision.

External expertise is important, but the external experts might not know the nuances of the current operational context

C) Propose a hybrid approach where full-scale audits are reduced in frequency, but introduce more frequent mini-audits focusing on high-risk areas.

Depth, consistency, and comprehensiveness of full-scale audits should not be compromised

D) Engage external safety consultants to provide a third-party perspective on the optimal frequency of safety audits for the company.

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Questions for discussion

9. Scenario: A safety incident occurs during freight operations, and initial investigations point to human error, specifically an operator's oversight during a critical procedure.

What's the best next step?

A) Organize a training session for the operator involved, focusing on the specific procedure where the oversight occurred.

B) Engage a technical team to evaluate if there were any equipment malfunctions or system failures that might have contributed to the incident, even if it appears to be human error.

C) Review the operator's past performance records to determine if this is a recurring issue and if further action is needed.

D) Conduct a comprehensive investigation to understand the root cause, considering system, operational factors, and potential gaps in training or procedure clarity.

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D) Conduct a comprehensive investigation to understand the root cause, considering system, operational factors, and potential gaps in training or procedure clarity.

Might overlook factors like training gaps, procedural clarity, or operational pressures

Does not address potential systemic issues

Offers a holistic approach, ensuring that both individual errors and broader systemic issues are addressed

Does not address potential systemic issues

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Questions for discussion

10. Scenario: There's a suggestion to involve the local community in safety discussions about a new freight route that will pass near several residential areas and natural landmarks.

How should this be approached?

A) Organize informational sessions for the local community to educate them about the safety measures in place, without actively seeking their feedback.

B) Involve the community in the final stages of planning, presenting them with the proposed route and safety measures, and gathering feedback for minor adjustments.

C) Engage the community from the early stages, organizing workshops and feedback sessions to integrate their concerns and insights into the planning process.

D) Set up a digital platform where community members can submit their concerns and suggestions, reviewing them periodically without direct engagement.

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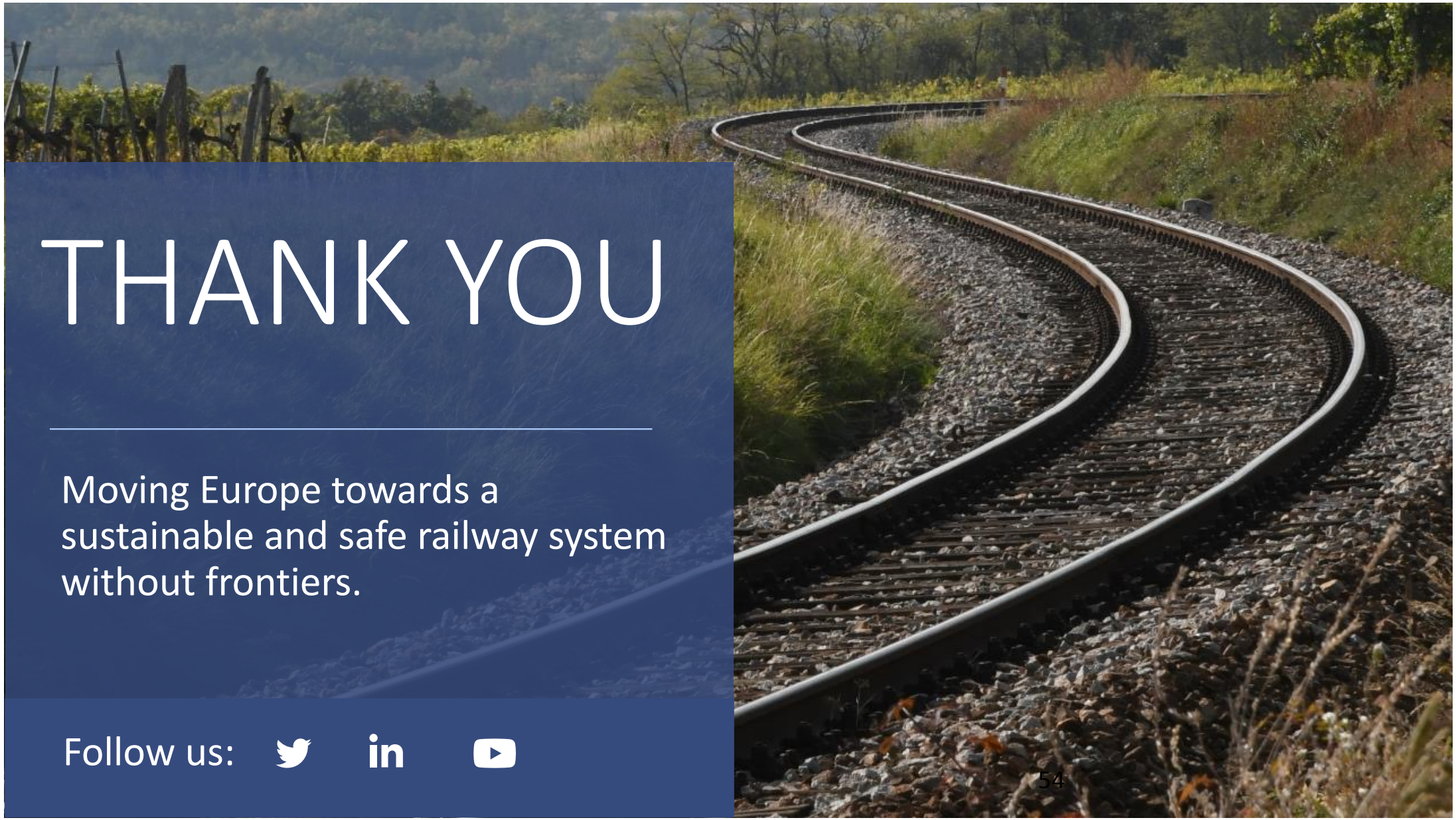
D) Set up a digital platform where community members can submit their concerns and suggestions, reviewing them periodically without direct engagement.

Involvind the community rather late, might be too late to influence safety decisions

The local community might highlight potential safety issues or risks that the company hasn't considered.

Offers a proactive and inclusive approach, ensuring that the community's concerns and insights are integrated from the beginning

Might not capture the nuances or depth of the community's concerns and insights



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