HOW TO OPTIMIZE YOUR LOGISTICS & SUPPLY CHAIN FOR RESILIENCE?

C4L Conference

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DHL Consulting

Agenda

1 DHL Consulting

2 Supply Chain Design Methodology

3 Supply Chain Resilience

4 Conclusion

DHL Consulting overview

DHL Consulting service portfolio

Supply Chain Strategy

- SC strategy development
- Network design
- SC risk assessment
- SC IT strategy & roadmap development
- M&A and post-merger integration
- Omni-channel & e-commerce strategy development

Supply Chain Transformation

- SC health check
- Digital maturity assessment
- Operating model design
- Transformation program management
- Sustainability assessment
- Sales & operations planning
- After market & reverse logistics planning
- Outsourcing & LSP assessment

Operational Excellence

- Operational audits & benchmarking
- Warehouse design & optimization
- Supply Chain and in-plant process design & optimization
- Inventory optimization
- Transport optimization
- IT vendor evaluation
- SC Academy training

100
consultants

4

Bonn, Germany

Singapore

Shanghai, China

Miami, FL

offices with local language skills

> 1,200
management and logistics consulting projects

20
years of professional consulting experience

Why DHL Consulting?

Business Consulting Skills

Seasoned strategy consultants ensure that your Supply Chain **enables your business strategy**

Analytical, data-driven approach and implementable solutions that deliver **tangible results**

Logistics Expertise

Worldwide logistics expertise of the DPDHL group across 220 countries

Industry leading Supply Chain **tools and databases** with a focus on digitalization

Customer-Centricity

Independent entity within DPDHL, trusted by industry leaders for providing **objective** and **neutral advice**

Proactively involving your organization to develop **customized, future-proof** solutions

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Terminologies

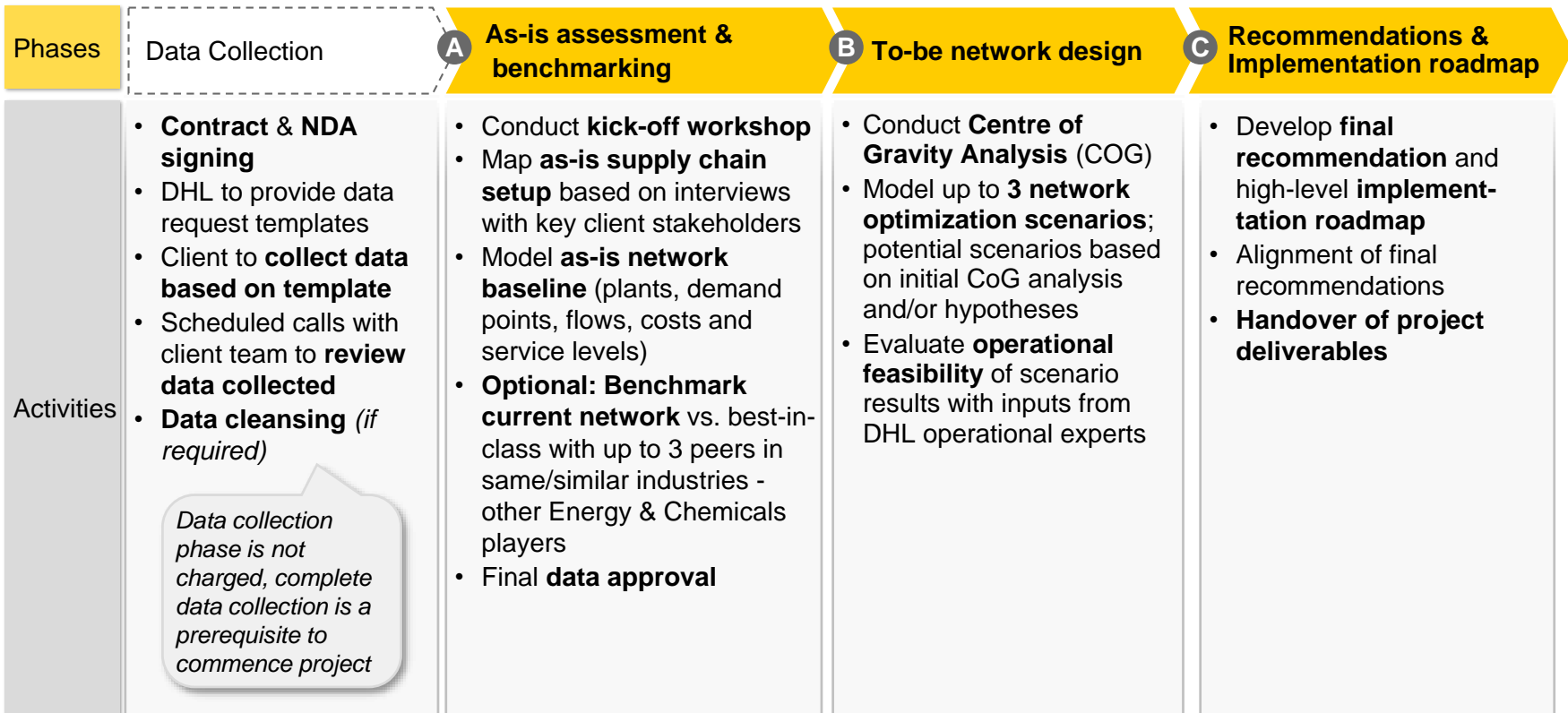| Supply Chain	»	" A logistics network, consisting of network nodes and transport legs "

Resilience	»	" Ability of a system to return to its original state or move to a new, more desirable state after being disturbed "

Typical Network Optimization Project Approach

Proposed project for a holistic review of the current network preceded by a data collection

Phases	Data Collection	A As-is assessment & benchmarking	B To-be network design	C Recommendations & Implementation roadmap
Activities	• **Contract** & **NDA signing** • DHL to provide data request templates • Client to **collect data based on template** • Scheduled calls with client team to **review data collected** • **Data cleansing** *(if required)* *Data collection phase is not charged, complete data collection is a prerequisite to commence project*	• Conduct **kick-off workshop** • Map **as-is supply chain setup** based on interviews with key client stakeholders • Model **as-is network baseline** (plants, demand points, flows, costs and service levels) • **Optional: Benchmark current network** vs. best-in-class with up to 3 peers in same/similar industries - other Energy & Chemicals players • Final **data approval**	• Conduct **Centre of Gravity Analysis** (COG) • Model up to **3 network optimization scenarios**; potential scenarios based on initial CoG analysis and/or hypotheses • Evaluate **operational feasibility** of scenario results with inputs from DHL operational experts	• Develop **final recommendation** and high-level **implementation roadmap** • Alignment of final recommendations • **Handover of project deliverables**

Source: DHL Consulting

Project Deliverables
(A) As-Is Assessment & Peer Benchmarking

This phase will deliver a baseline understanding and costing of the client's as-is supply chain set-up with a list of improvement opportunities

| Phases | Data Collection | A As-is assessment & benchmarking | B To-be network design | C Recommendations & Implementation roadmap |

Key deliverables

As-is diagnostics report

- High-level map of as-is end-to-end logistics setup with physical and information flows
- Fully validated baseline with breakdown of as-is direct logistics cost, volumes, supply and demand points, etc.
- Supply chain priority setting

Optional: Peer benchmarking

- Current SC performance and costs with global competitors with regard to top-in-class transportation, storage and handling costs
- Other benchmark dimensions would be added if required by the client

Supply chain mapping

ILLUSTRATIVE

Supply chain priority setting

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Supply chain cost baselining

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Network setup benchmark

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Source: DHL Consulting

Project Deliverables
B To-Be Network Design

This phase will deliver a to-be CoG[1] analysis, a to-be scenario modeling, sensitivity analyses and a comparative assessment of scenarios

Phases	Data Collection	A As-is assessment & benchmarking	B **To-be network design**	C Recommendations & Implementation roadmap

Key deliverables

Center of gravity (CoG) analysis
- COG analysis of future demand
- Potential to-be DC locations

Logistics impact assessment of distribution model change in selected countries
- Projection of inventory and throughput volumes
- Additional costs of warehousing & distribution
- Reduction in distributor margin
- Other pros & cons such as direct market access

To-be scenario modeling (up to 3 scenarios)
- Would be based on kickoff discussion with client

Sensitivity analysis & comparative assessment
- What-if scenarios (up to 2) and impact of change in input parameter on e.g. cost
- Comparative assessment of to-be scenarios

CoG[1] analysis

Scenario modeling

Sensitivity analysis

Comparative assessment

Source: DHL Consulting; 1) Center of Gravity

Project Deliverables
C Implementation Roadmap

This phase will deliver a final recommendations on the to-be network set-up and a roadmap to guide the client in the next stage of implementation

Phases	Data Collection	**A** As-is assessment & benchmarking	**B** To-be network design	**C** Recommendations & Implementation roadmap

Key deliverables

Recommendations on optimal logistics network based on e.g.

- Direct logistics cost effectiveness (quantified)
- Lead time and service level (quantified)

Implementation roadmap (high-level) covering e.g.:

- High-level implementation timeline of recommended logistics network
- Pre-requisites and required efforts from client for each milestones defined

Hand-over project deliverables e.g.

- All analyses, calculation files
- Knowledge transfer session
- Post-project clarification of questions

Implementation roadmap

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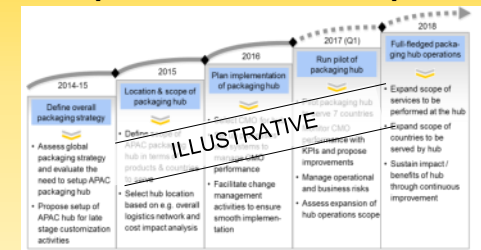
Milestones & pre-requisites

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Source: DHL Consulting

Key Criteria for Supply Chain Design Optimization

Optimization criteria in a network design project is often either service increase or cost decrease
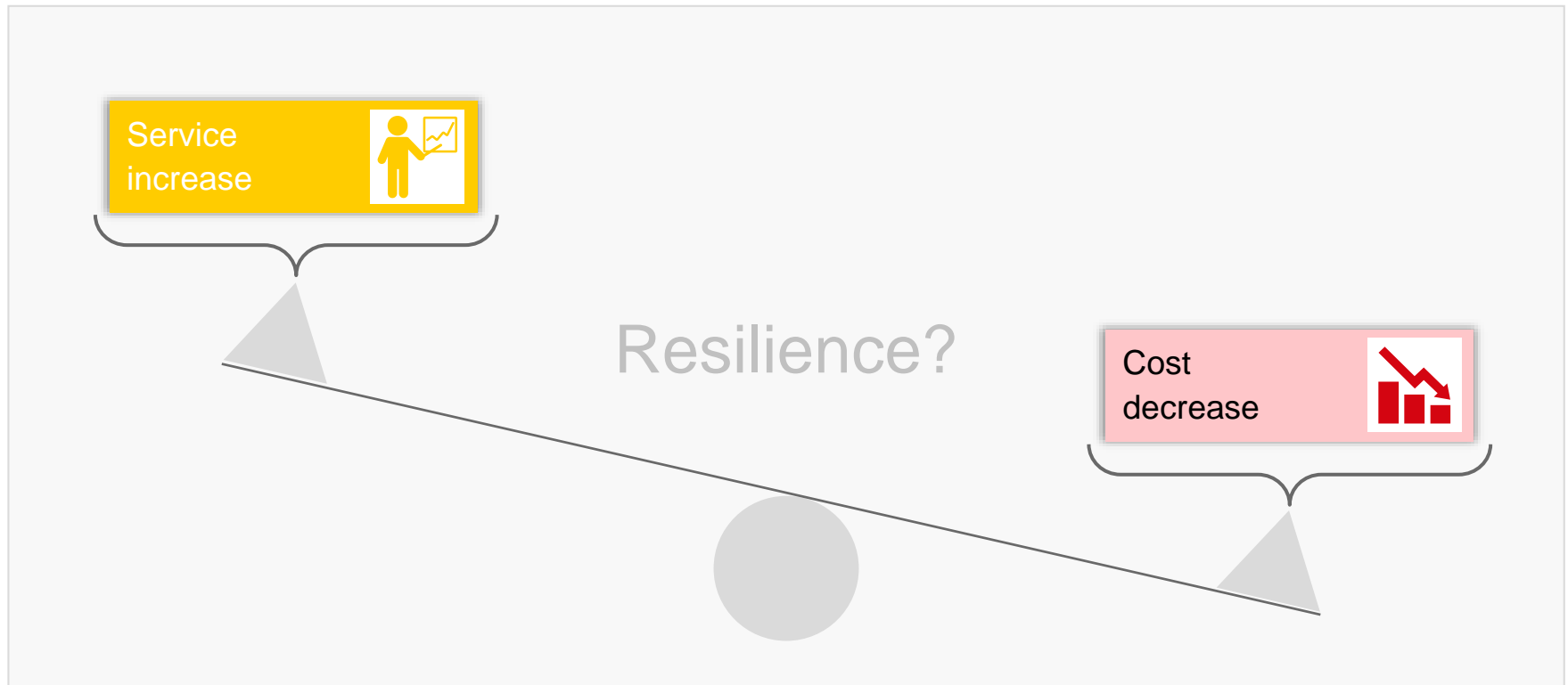
Service Increase

Approx. 6 warehouses for Western and Middle Europe cover a 24-hours service level

9 hours x
50km/h = 450km

900km

2.400km

2.400km

Cost Decrease

● Customer   ▲ CoG

CoG analysis supports scenario definition phase of network studies; testing validity of current setup & narrowing option space for to-be scenarios

Single center of gravity	Dual center of gravity

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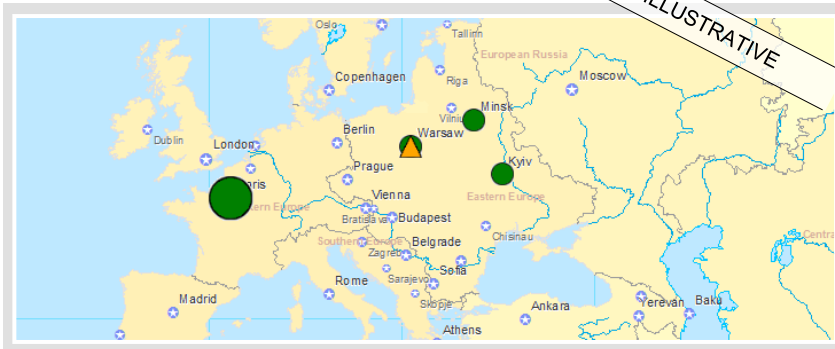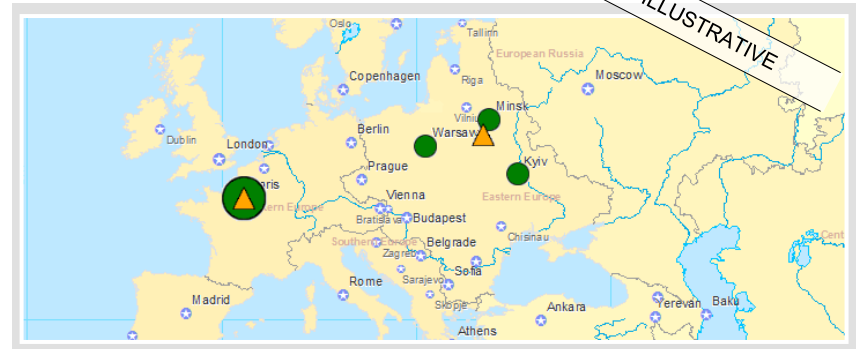
Center of gravity, known as Greenfield analysis within LLamasoft Supply Chain Guru, calculates the **theoretically optimal DC location(s)** based on minimizing the weighted average distance travelled within the network

Can be calculated based on **demand and/or supply** through the following aggregate formula: **Minimize $\sum Distance * Demand$**

Source: DHL Consulting; 1) Center of Gravity

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SUPPLY CHAIN RISK TRENDS

The world is a risky place. Companies need to better understand how to protect their Supply Chains.

Source: DHL Resilience360

Resilience in Europe

When you think, that we are safe regarding Supply Chain risks in Europe …

Source: DHL Consulting

SUPPLY CHAIN RISK TRENDS

69%

of firms say they **do not have full visibility** into their Supply Chain[1]

63%

of organizations **do not use any technology** to analyze, track and monitor the performance of their Supply Chains[2]

73%

of board members surveyed identified **reputational risk** as the area where they felt most vulnerable, **but only 39% had a plan to address a reputational crisis**[3]

Source: DHL Resilience360; 1) Supply Chain Resilience Report 2017; 2) BCI Supply Chain Resilience Report 2018; 3) Deloitte Risk Advisory Report

Supply Chain Risks

There are over 100 different supply chain risks to consider
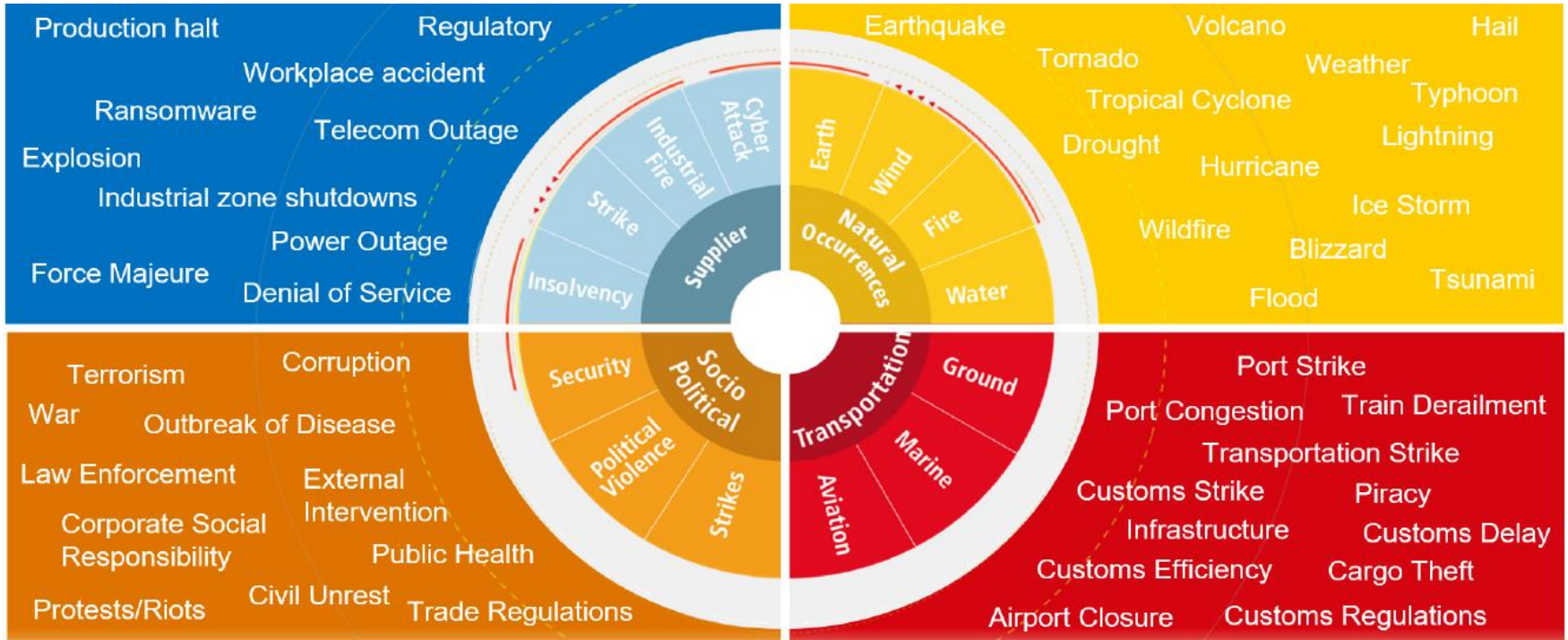
Source: DHL Resilience360

Impact on Performance after a Disruption

The initial impact of a disruption is postponed when it hits the organization

The disruption profile

Performance

1. Preparation

8. Long-term impact

4. Initial impact

6. Preparation for recovery

7. Recovery

3. First response

2. Disruptive event

5. Time of full impact
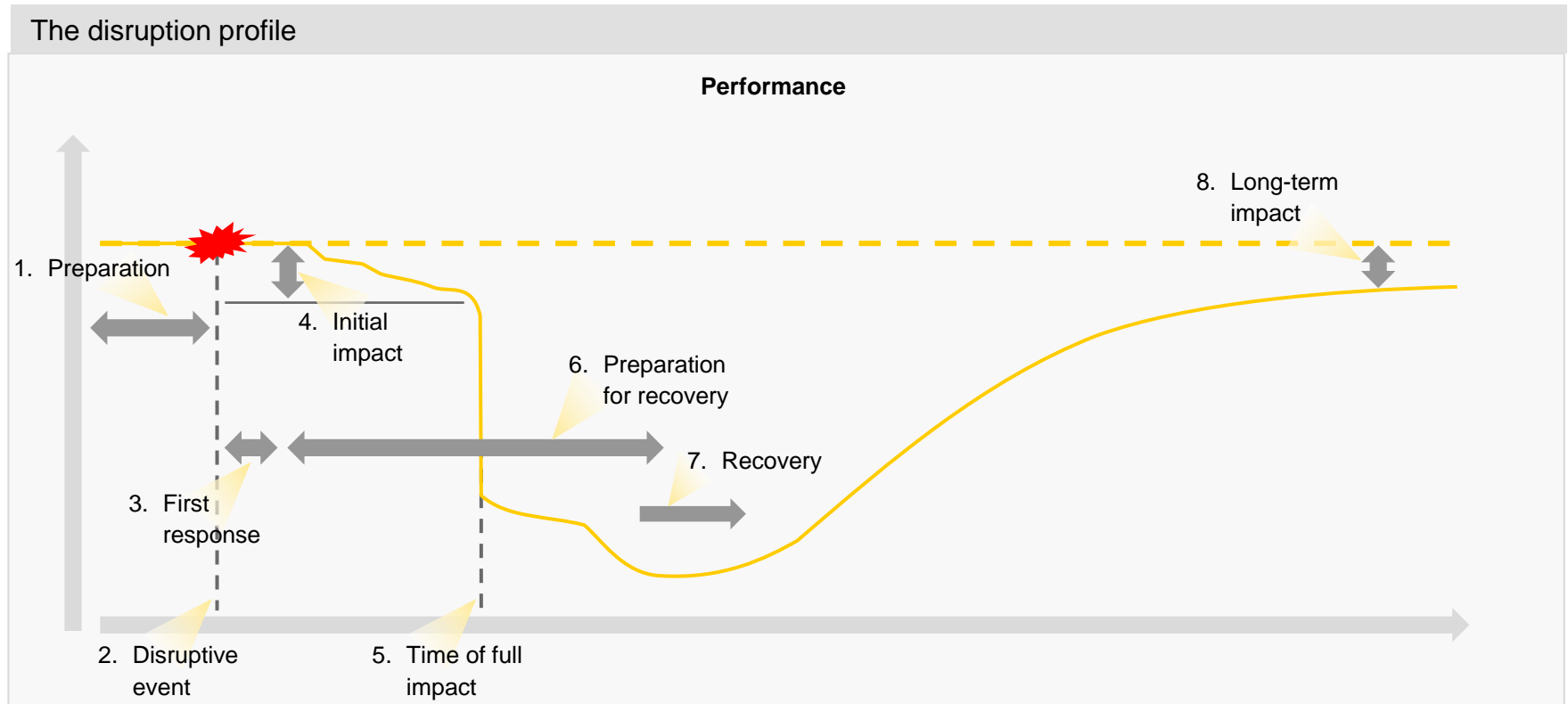
Source: Sheffi & Rice Jr. (2005)

Methodology: Time-to-Recover

A supply chain resilience model enables much lesser time-to-recover (TTR)

Time-to-Recover & Time-to-Survive

Typical recovery timeline

Stage 1: Business-as-usual
Resilience – Proactive Supply Chain Risk Mitigation

Stage 2: Recovering from a Supply Chain Disruption
Agility – Early detection and quick response to minimize damage
Effect of Visibility Systems
Effect of e.g. capacity and inventory buffers

Stage 3: Business-as-usual
Recovery – Damage control through last line of defense; Insurance cover

Business impact (loss of revenue, profitability or market share)

T   B1   A1   B2   A2
Discovery Time   **Recovery Time**

— Impact of Supply Chain Disruption on organization A which has no risk mitigation system
— Impact on Enterprise B that has mitigated Supply Chain risk and is continuously monitoring for disruptions

Time-to-Recover & Time-to-Survive

- **Time-to-Recover (TTR):** The time for a node in the Supply Chain to return to full functionality after a disruption
- **Time-to-Survive (TTS):** The maximum duration that the Supply Chain can match supply with demand after a node disruption

$$TTR(j) < TTS(j) \text{ for all nodes } (j)$$

Robust Supply Chain

Source: Sheffi & Rice Jr. (2005)

The Journey to Supply Chain Resilience

Resilience360 offers 9 modules for a holistic Supply Chain risk management process

VISUALIZE			MONITOR		ANALYZE			MITIGATE
Visualize Supply Chains	Locate Product	Locate Shipment	Detect Events	Track Supplier Distress	Assess Risk	Collect Partner Data	Act on Real Insights	Manage Supply Chains
Where are we?	Where are my materials?	Where is our stuff?	What's going on?	Are my partners OK?	Am I exposed?	How prepared are they?	What should we do?	How do we solve the problem?
Network Visualization	Bill of Materials	Shipment Visibility	Incident Monitoring	Supply Watch	Risk Assessment	Transparency Portal	Analytics	Collaboration Center

Source: DHL Resilience360

Country Risk Assessment
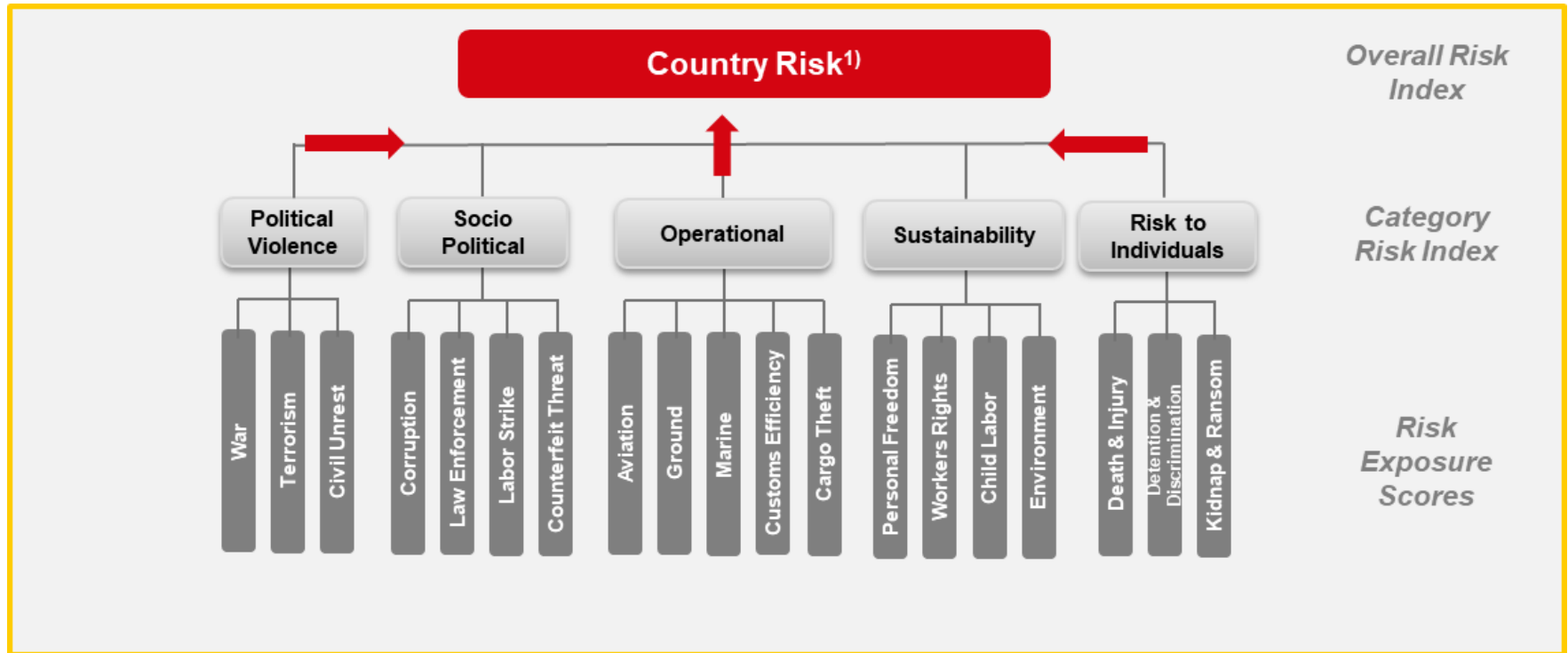
Source: DHL Resilience360; 1) 19 country-related risk scores

Detailed Overview on current Country Situation: Luxembourg

COUNTRY RISK

Luxembourg ▼

| Overview | Incidents | Indicators | Nodes | Public Holidays | Economic / Logistic Data | Reports (0) |

Risk Overview

Following the recent general election, it is likely that Prime Minister Xavier Bettel will renew the centrist/centre-left coalition between the DP, LSAP, and the Greens for a second administrative term. It is highly likely that Luxembourg will remain a key driver of European integration. The new government is also likely to ensure a continuation of the currently favourable investment environment and build on the recently implemented corporate tax reductions while trying to attract b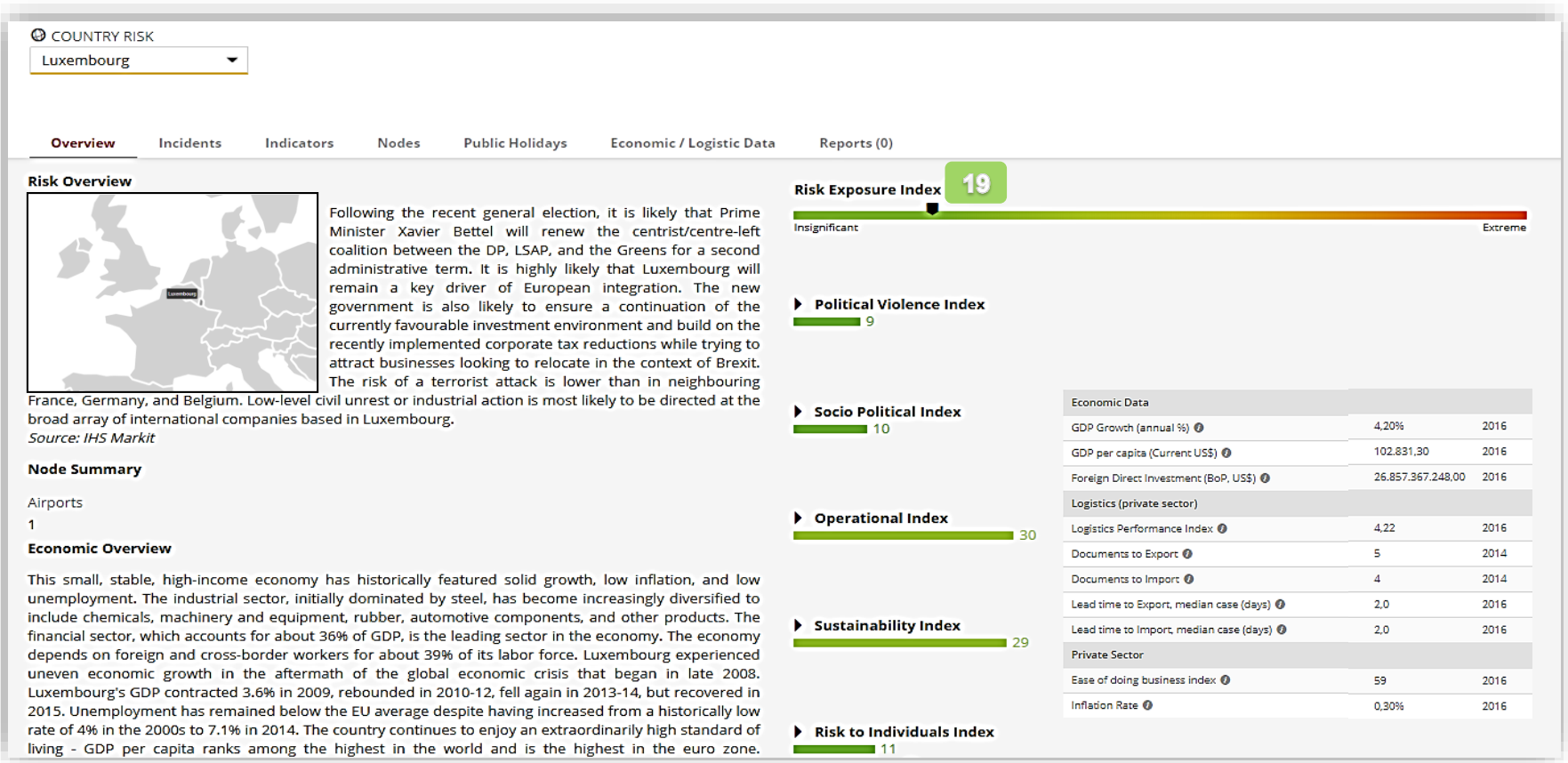usinesses looking to relocate in the context of Brexit. The risk of a terrorist attack is lower than in neighbouring France, Germany, and Belgium. Low-level civil unrest or industrial action is most likely to be directed at the broad array of international companies based in Luxembourg.

Source: IHS Markit

Node Summary

Airports

1

Economic Overview

This small, stable, high-income economy has historically featured solid growth, low inflation, and low unemployment. The industrial sector, initially dominated by steel, has become increasingly diversified to include chemicals, machinery and equipment, rubber, automotive components, and other products. The financial sector, which accounts for about 36% of GDP, is the leading sector in the economy. The economy depends on foreign and cross-border workers for about 39% of its labor force. Luxembourg experienced uneven economic growth in the aftermath of the global economic crisis that began in late 2008. Luxembourg's GDP contracted 3.6% in 2009, rebounded in 2010-12, fell again in 2013-14, but recovered in 2015. Unemployment has remained below the EU average despite having increased from a historically low rate of 4% in the 2000s to 7.1% in 2014. The country continues to enjoy an extraordinarily high standard of living - GDP per capita ranks among the highest in the world and is the highest in the euro zone.

Risk Exposure Index 19

Insignificant   Extreme

▶ **Political Violence Index**
9

▶ **Socio Political Index**
10

▶ **Operational Index**
30

▶ **Sustainability Index**
29

▶ **Risk to Individuals Index**
11

Economic Data		
GDP Growth (annual %)	4,20%	2016
GDP per capita (Current US$)	102.831,30	2016
Foreign Direct Investment (BoP, US$)	26.857.367.248,00	2016
Logistics (private sector)		
Logistics Performance Index	4,22	2016
Documents to Export	5	2014
Documents to Import	4	2014
Lead time to Export, median case (days)	2,0	2016
Lead time to Import, median case (days)	2,0	2016
Private Sector		
Ease of doing business index	59	2016
Inflation Rate	0,30%	2016

Source: DHL Resilience360

Country-specific incident lists captures relevant Risks for the previous two Years

Source: DHL Resilience360

Country Risk Score Comparison

Luxemburg — 19
- Risk Exposure Index: 19 (Insignificant → Extreme)
- Political Violence Index: 9
- Socio Political Index: 10
- Operational Index: 30
- Sustainability Index: 29
- Risk to Individuals Index: 11
- Incidents Over Time

Germany — 32
- Risk Exposure Index: 32 (Insignificant → Extreme)
- Political Violence Index: 25
- Socio Political Index: 27
- Operational Index
- Sustainability Index: 18
- Risk to Individuals Index: 35
- Incidents Over Time

France — 42
- Risk Exposure Index: 42 (Insignificant → Extreme)
- Political Violence Index: 35
- Socio Political Index
- Operational Index
- Sustainability Index: 11
- Risk to Individuals Index: 43
- Incidents Over Time

Netherlands — 28
- Risk Exposure Index: 28 (Insignificant → Extreme)
- Political Violence Index: 20
- Socio Political Index: 25
- Operational Index: 44
- Sustainability Index: 24
- Risk to Individuals Index: 34
- Incidents Over Time

Belgium — 31
- Risk Exposure Index: 31 (Insignificant → Extreme)
- Political Violence Index: 26
- Socio Political Index: 14
- Operational Index: 48
- Sustainability Index: 19
- Risk to Individuals Index: 37
- Incidents Over Time

Other countries:

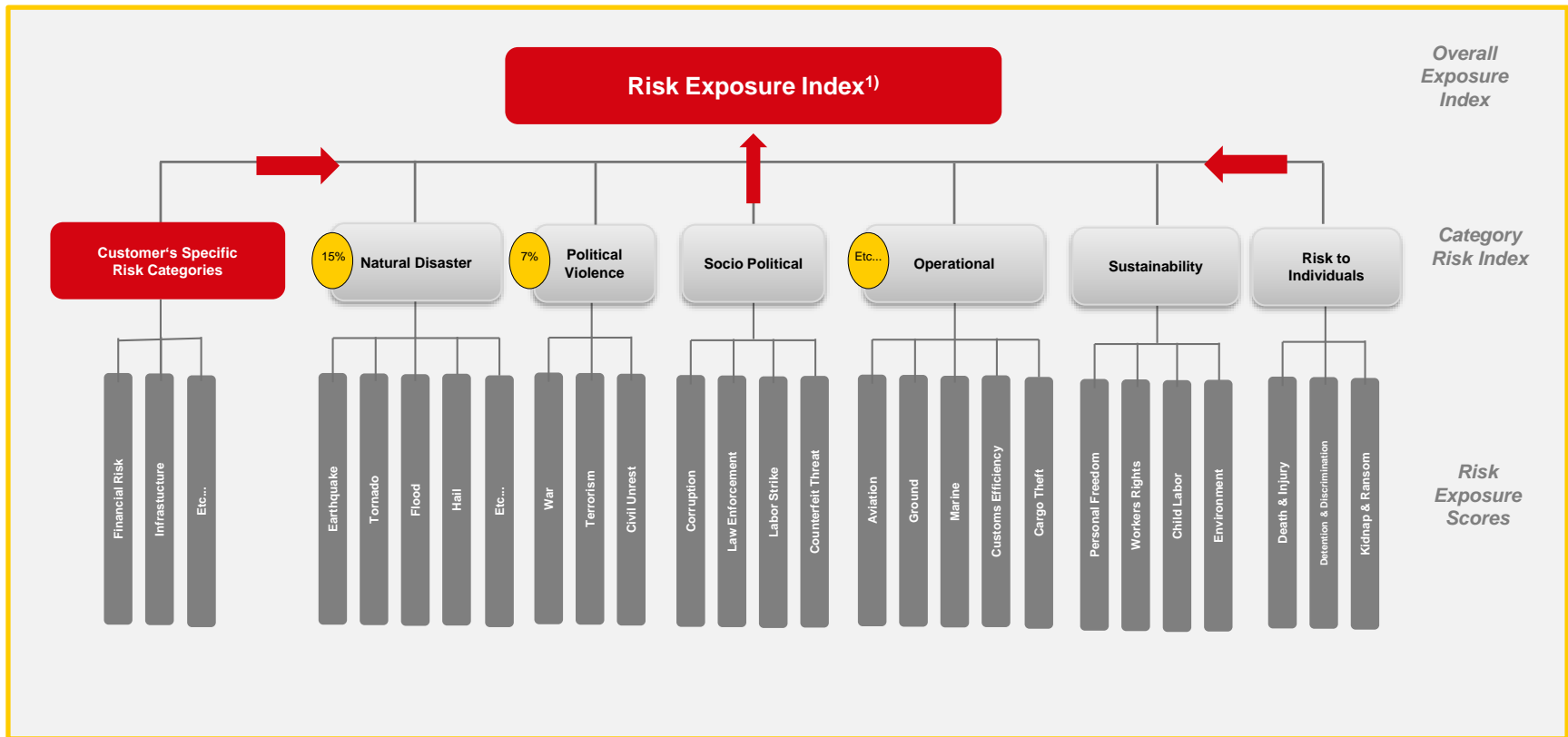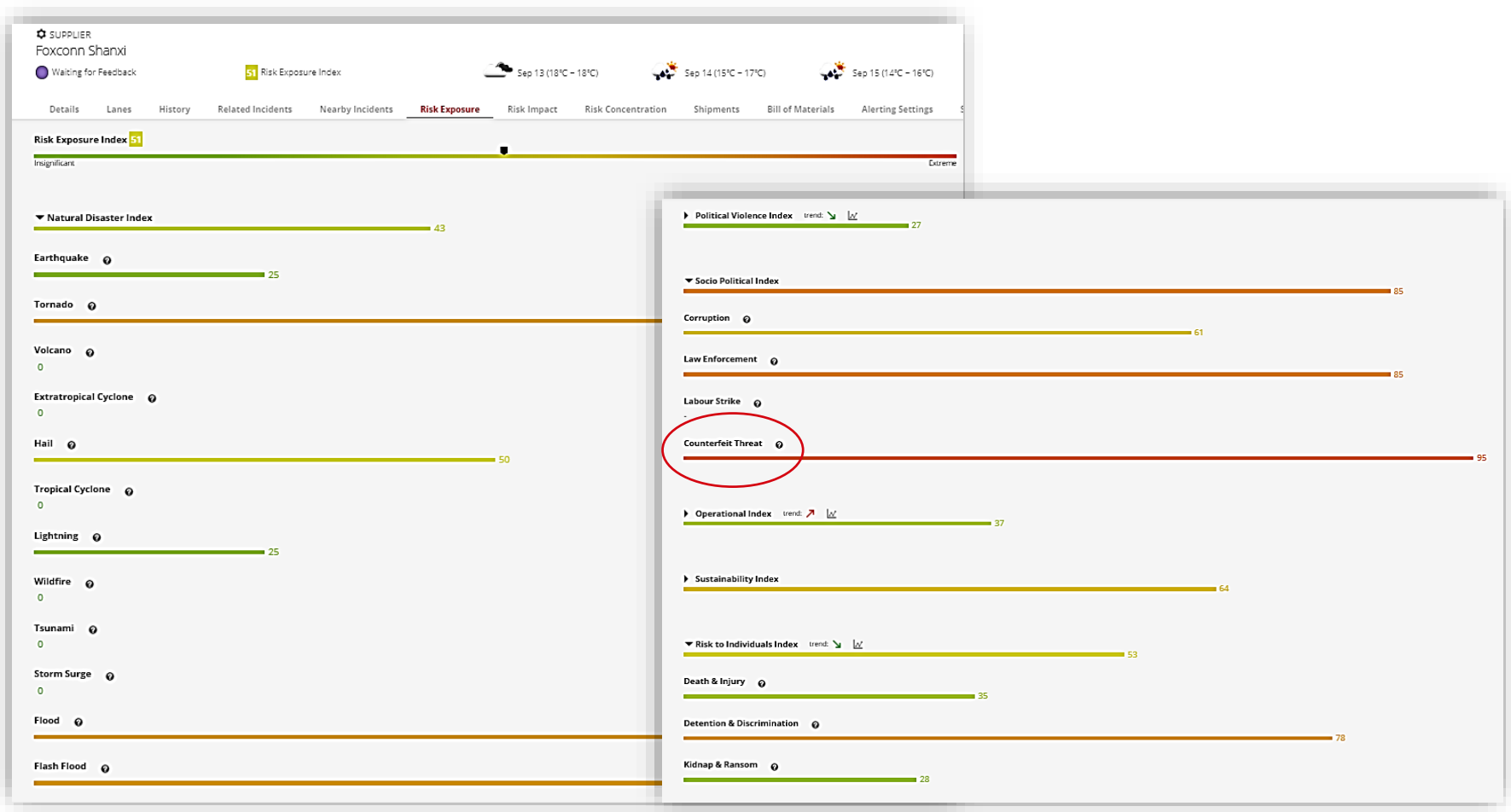| Country	Score
USA	42
CHINA	59
CZECH REP	25
INDIA	64
LIBYA	85

Source: DHL Resilience360

Supplier Assessment and Network Node Comparison

Source: DHL Resilience360; 1) 31 risk scores which can be weighted on risk category level.

Supplier Assessment Example:
Foxconn China

Source: DHL Resilience360

Network Node Comparison Example:
Alternative Airports SJJ vs. IST vs. PDV

↖ COMPARE
SJJ - Sarajevo International Airport, IST - Atatürk International Airport, PDV - Plovdiv International Airport

Details   Incidents   **Risk Exposure**   Risk Impact

Node Name	SJJ - Sarajevo International Airport	IST - Atatürk International Airport	PDV - Plovdiv International Airport
Street			
City	Sarajevo	Istanbul	Plovdiv
Postal Code			
Country	Bosnia and Herzegovina	Turkey	Bulgaria
Risk Exposure Index	49	55	38
Natural Disasters Index	44	29	39
Earthquake	50	75	75
Tornado	50	50	50
Volcano	0	0	0
Extratropical Cyclone	25	25	25
Hail	75	25	50
Tropical Cyclone	0	0	0
Lightning	25	0	25
Wildfire	0	0	0
Tsunami	0	0	0
Storm Surge	0	0	0
Flood	75	0	75
Flash Flood	75	50	25

↖ COMPARE
SJJ - Sarajevo International Airport, IST - Atatürk International Airport, PDV - Plovdiv International Airport

Details   Incidents   **Risk Exposure**   Risk Impact

Node Name	SJJ - Sarajevo International Airport	IST - Atatürk International Airport	PDV - Plovdiv International Airport
Socio Political Index	66	84	41
Corruption	62	60	60
Law Enforcement	56	77	33
Labour Strike	-	70	-
Counterfeit Threat	77	98	24
Operational Index	53	64	41
Aviation	35	58	30
Ground	48	60	40
Marine	-	45	30
Customs Efficiency	58	45	65
Cargo Theft	63	75	50
Sustainability Index	54	54	28
Personal Freedom	27	38	22
Workers Rights	45	75	45
Child Labour	42	44	0
Environment	76	54	40
Risk to Individuals Index	44	66	42
Death & Injury	48	75	45
Detention & Discrimination	48	75	45
Kidnap & Ransom	35	35	35

Source: DHL Resilience360

Continuous Real-Time Incident Monitoring

DHL's sensors and data base have the ability to provide quick real-life information about supply chain disruptions

Source: DHL Resilience360

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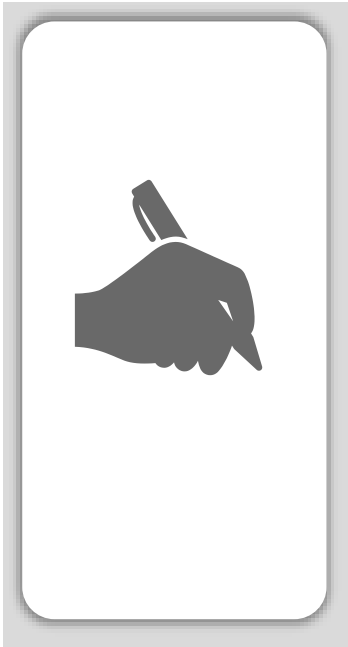|	
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Conclusions

- **Re-evaluate your supply chain design** more frequently
- Choose **the right parameters** for the optimization
- Assess countries, suppliers and network nodes of your supply chain properly towards **resilience**
- Set up a **model for continuous supply chain risk monitoring**

Source: DHL Consulting