PML Assessment for Engineering Insurance

18 May 2021

Philani Mbatha & Nyiku Nkuna

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Housekeeping

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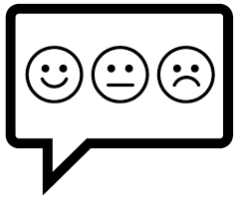
Slides will be made available

Switch Off Camera

Chat function for questions



Feedback

Agenda

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01 | Definition

02 | Purpose

03 | PML Factors

04 | Assessments

05 | Special Aspects on Construction Sites

06 | Case Study

1 Definition

Image: Aeriform / Ikon Images / Getty Images

Definition

MPL	Maximum Possible Loss
MPL	Maximum Probabale Loss
MPL	Maximum Potential Loss
PML	Possible Maximum Loss
PML	Probable Maximum Loss
MAS	Maximum Amount Subject
MML	Maximum Monetary Loss
NML	Normal Monetary Loss
NML	Normal Maximum Loss
NLE	Normal Loss Expectancy
LLP	Large Loss Possibility
LLP	Large Loss Probability
ELLP	Expected Large Loss Poss.
ELLP	Exp. Large Loss Probability
EML	Estimated Maximum Loss

EPML	Est'd Probable Maximum Loss
EPML	Est'd Possible Maximum Loss
MFL	Maximum Foreseeable Loss
UML	Ultimate Maximum Loss
AML	Absolute Maximum Loss
TPL	Total Probable Loss
TPL	Total Possible Loss
MLE	Maximum Loss Expectancy
AS	Amount Subject
PS	Percent Subject
VS	Value Subject
LE	Loss Expectancy
LE	Loss Estimation

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PML – Probable Maximum Loss

Definition

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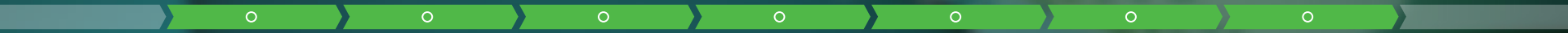
Probable
‘prɒbəb(ə)l”

likely to happen or be the case

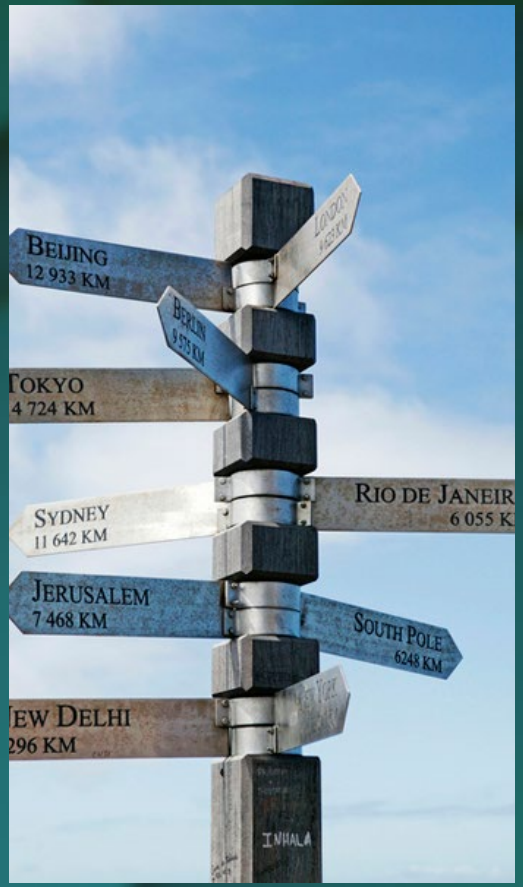


Possible
pɒsɪb(ə)l

able to be done or achieved, or able to exist

Likelihood - **the chance that something will happen**

Definition



Munich Re – Probable Maximum Loss

- The loss is based on a single event and not in the combination of independent events. However, the single event is deemed to encompass all consequential losses arising under unfavourable but not improbable circumstances in an unbroken chain of causes, e.g. property damage caused by an earthquake and increased by a following fire.
- The insured risk is in its most vulnerable condition
- The insured risk is in its most exposed condition, most of the values are at risk
- Active automatic protection systems are rendered inoperative
- Manual loss mitigation measures by operators, personnel, fire fighters, should not be considered
- Passive protections are effective
- Gross negligence of human beings should be assumed

PML – Definition

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PML Scenario

Image: Aeriform / Ikon Images / Getty Images

Example: *A bridge is damaged by a fire following an accident involving a fuel truck, leading to structural weakening. 3 days later a earthquake will then destroy the bridge entirely.*

Is this a PML scenario?

2 Purpose

Image: Aeriform / Ikon Images / Getty Images

PML - Purpose

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PML considerations are part of company internal processes and individually regulated, some reasons for the implementations of a PML assessment process as follows:

Optimizing capacity deployment
Net retention / Reinsurance capacity

Regulating underwriting limit and authority

Eliminate artificial shortage of capacity

Portfolio steering – Diversification - Strategy

Important Pricing component for Non-Proportional placements

PML - Purpose

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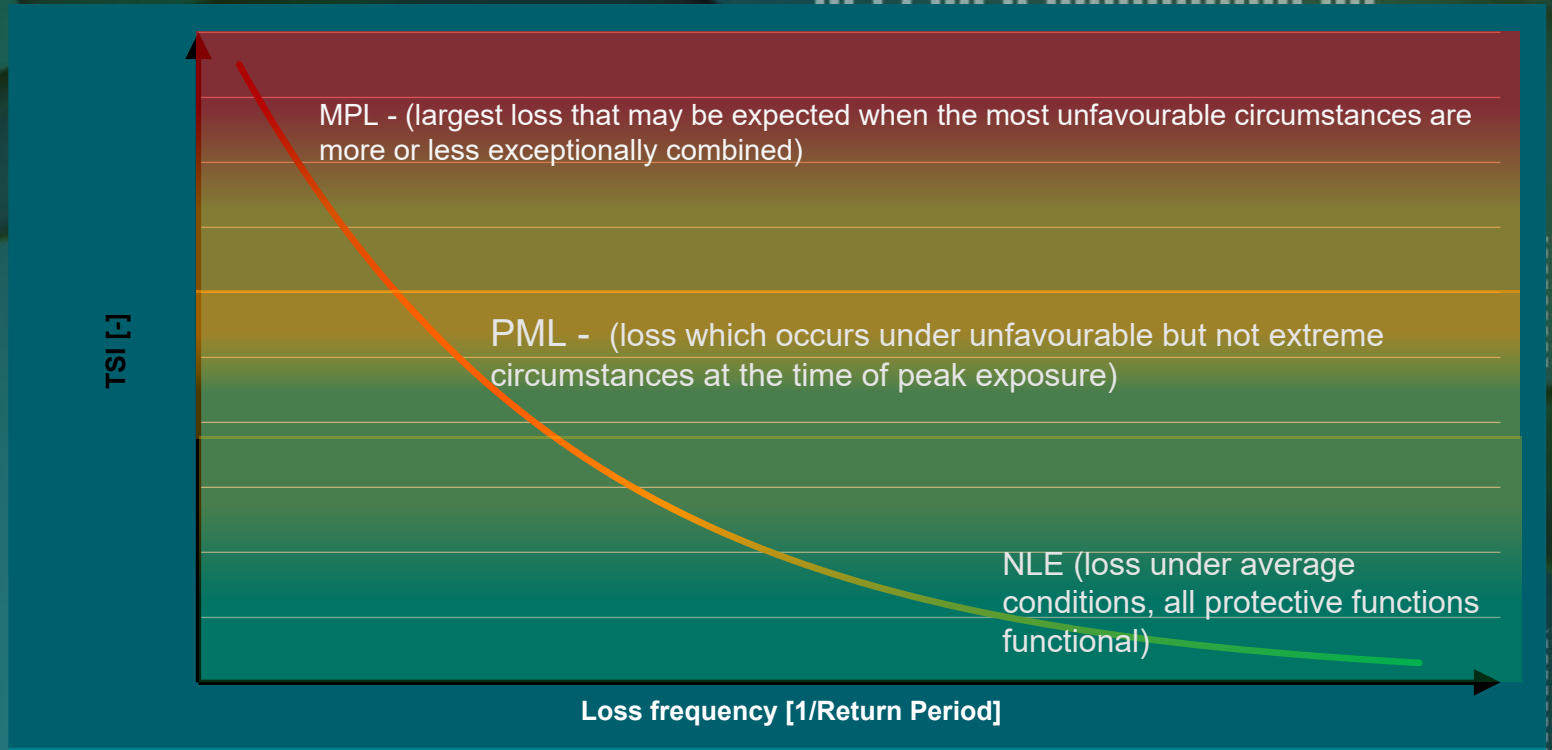
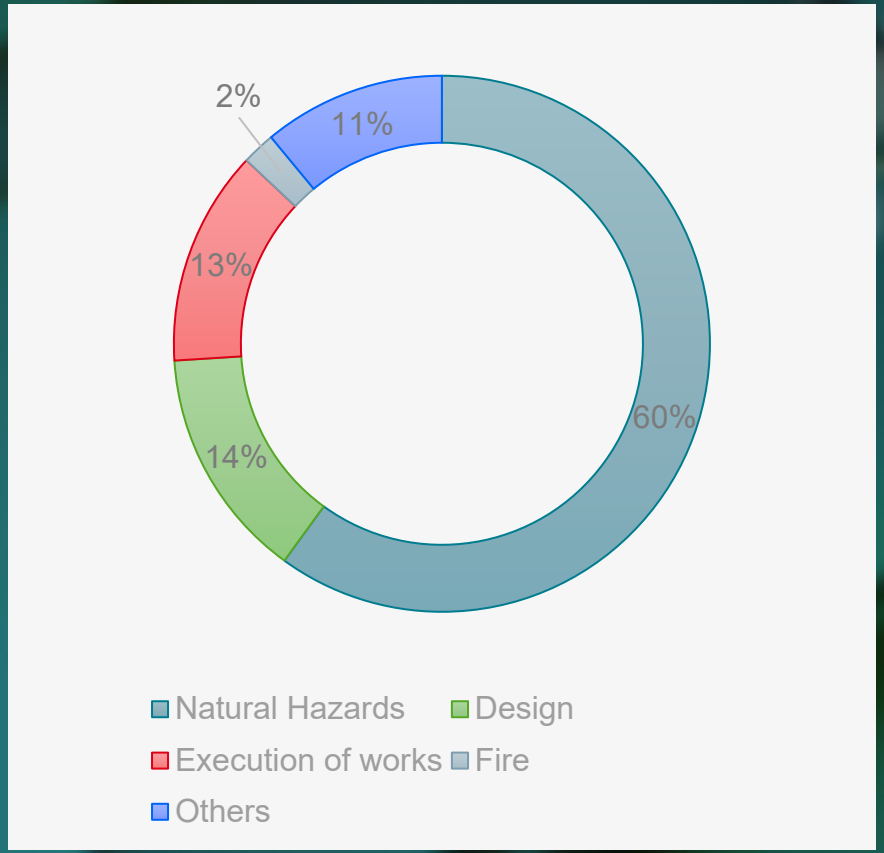


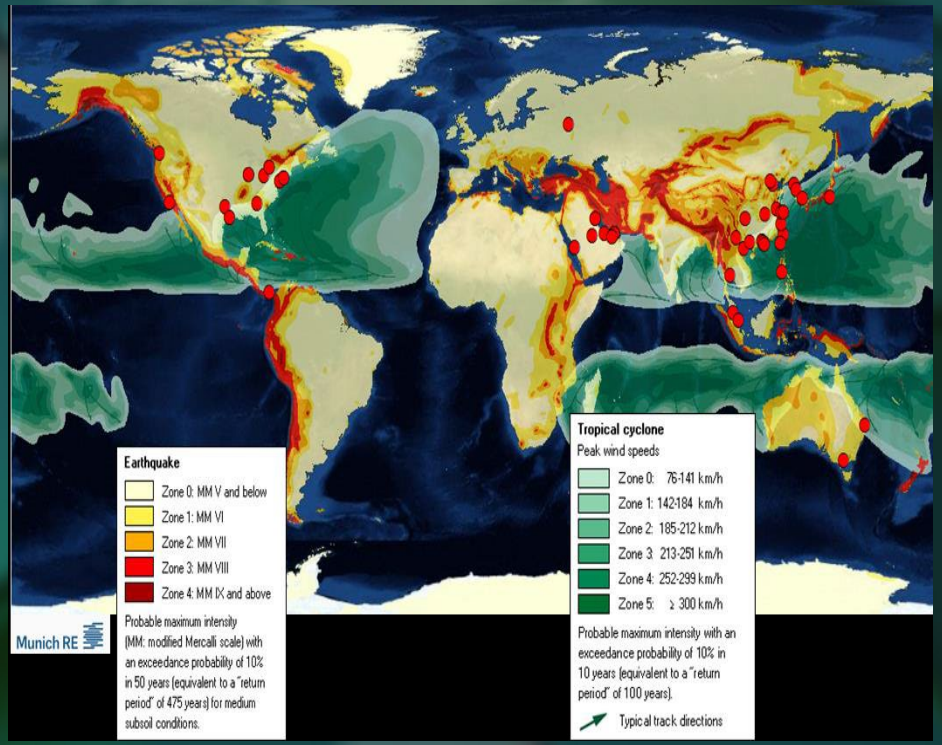
In summary, the PML is the loss which occurs under unfavourable but not extreme circumstances at the time of peak exposure.

3 PML Factors

Image: Aeriform / Ikon Images / Getty Images

Major Challenges
Major Exposures / Hazards





PML Factors
CAR - Loss Examples

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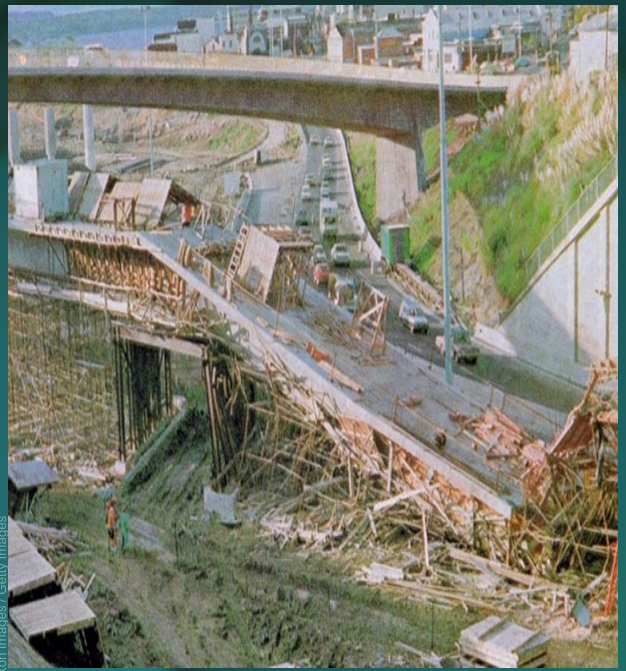

Image: Aeriform / Ikon Images / Getty Images

PML - Factors

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Courtesy : Grenfell Tower

Fire Scenario

For some engineering risks the calculation basis is 100% loss (total loss) of the insured values of a defined fire area. Reductions can only be granted with intimate knowledge of the technical facts and conditions. The justification for a PML lower than 100% is an adequate fire area separation or use of inflammable parts or construction materials.

The concept of fire areas is, however, difficult to apply to large industrial complexes where detailed layout descriptions do not exist or fire separation areas are not clearly identifiable. These engineering risks have, however, often very limited combustible loading and consist of large open areas forming effective fire breaks. Due to the above reasons, the fire loss potential in such plants (e.g. power plants, metals processing, inorganic chemicals, etc.), whether it be project business or operational business, is relatively limited and the fire PML often negligible compared to other scenarios.

PML - Factors

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Defects / Faulty Design Scenario

Defects and faulty design are usually taken care of by special clauses and should be taken into consideration subject to the type of design cover (e.g. DE 1-5 or LEG 1-3) or any sublimit where applicable (e.g. construction of roads, tunnels, pipelines, etc.).

IOL

Gautrain costs sky-high at R30bn - Gauteng

The escalating costs were revealed in the Gautrain Management Agency's 19th ... to open for several months because of water seepage problems. ... "Water ingress in the Rosebank to Park station tunnel is a material issue for ...

29 Jul 2011

https://www.pressreader.com › the-mercury-south-africa

Call for probe into Durban terminal corruption - PressReader

09 Oct 2019 — **Transnet** director says R463m paid to pipeline contractor who botched the ... to bypass the **defective** accumulator **tanks** at the Coastal Terminal.

PML - Factors

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Machinery Breakdown Scenario

Machinery breakdown (MB) losses occur more frequently, but trigger a smaller loss on average. In most cases, the damaged machine can be repaired. Risks with a large portion of the TSI in a single piece of equipment (e.g. gas turbines, large transformers, compressor trains, etc.) are prone to high PMLs.

PML - Factors

Image: Aeriform / Ikon Images / Getty Images

Dust Explosion

Dust explosions are a familiar hazard in the woodworking, metalworking, plastics processing, chemicals, paper, agricultural food and related industries. In a dust explosion, a mixture of dust particles ignites in the air. For this to happen, the particles must consist of combustible material, be smaller than about 500 µm, and their individual concentration in the air be between the lower explosion limit (LEL) and the upper explosion limit (UEL). The smaller the particles and the finer they are distributed in the air, the greater the risk of explosion. Dust explosions can cause a chain reaction that could lead to a total loss.

PML - Factors

Image: Aeriform / Ikon Images / Getty Images

Earthquake/Earth Movement (incl. Subsidence, Landslides, etc.)

Munich Re “World Map of Natural Hazards is used to determine earthquake intensities and the resulting PML. For objects located in MR Zone 3 or higher, additional information, such as a soil investigation report or other risk influencing factors should be obtained in order to derive a realistic PML.

PML - Factors

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Image: Aeriform / Ikon Images / Getty Images

Windstorm

Munich Re “World Map of Natural Hazards” is used to determine windstorm intensities and the resulting PML. Objects located in zones with peak wind velocities higher than approx. 200 km/h (tropical cyclone Zone 3, extra tropical storm zone 4) should be assessed on an individual basis.

The PML exposure during erection/construction is often higher than during the following operational phase. Particularly exposed are structures with large “sail” areas such as hangars, tanks or tall steel structures, etc. erected on site. Damage to and caused by construction equipment (e.g. cranes) should also be considered. The construction schedule should be carefully evaluated in terms of progress at times of local windstorm seasons.

PML - Factors

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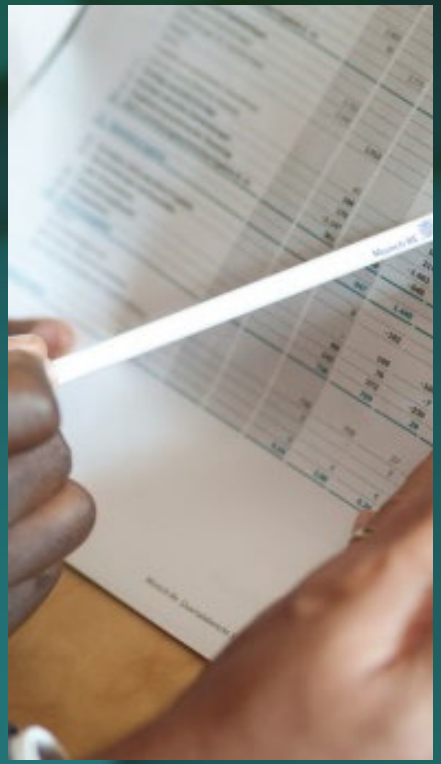
Image: Aeriform / Ikon Images / Getty Images

Strike, Riot and Civil Commotion Scenario

Covers for strike, riot and civil commotion (SRCC) should always be sublimited and are thus normally not relevant for PML considerations.

PML - Factors



PML Component “Loss of Profit”

As a rule, the calculation basis is 100% loss of the total sum insured minus time excess for loss of profit. Exceptions should be assessed individually and deviations from this Best Practice documented.

PML - Factors

Image: Aeriform / Ikon Images / Getty Images

PML Component “Third-party Liability”

The cover for third-party liability in engineering risks should always be limited. The PML calculation should assume a 100% loss of the TPL limit.

PML – Scenarios for PML Assessmnet

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Bridges	• Collapse • Settlement of foundation
Hydropower	• Failure of temporary structure, overtopping • Powerhouse • Access ways • Settlement / collapse
Tunnel	• Collapse • Flooding
Infrastructure	• Flooding • As per the above items for the highest valued structure
Industrial plants	• Fire in the largest complex

4 Assessments

Image: Aeriform / Ikon Images / Getty Images

PML - Assessment

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The complexity of engineering risks makes the engineering PML assessment a highly specialised procedure where expert knowledge is indispensable. Up-to-date knowledge of both the individual risks and the industries themselves is required for profitable underwriting. The following considerations have to be taken into account in writing engineering business on a PML basis:

- PMLs are individual estimates which, though based on prevailing circumstances, above all depend on the judgement of the underwriter concerned.
- The underwriter needs to collect, assess and evaluate all scenarios with the potential to cause a PML.
- Natural perils, fire and explosion should be considered PML scenarios by default.

PML - Assessment

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PML Exceedance

The determination of inadequate PMLs for objective reasons (e.g. underestimation of new hazards, overestimation of protection measures) and subjective reasons (desire for more capacity) is always possible, and there is no guarantee that an estimated PML will not be exceeded by an actual loss.

PML - Exceedance

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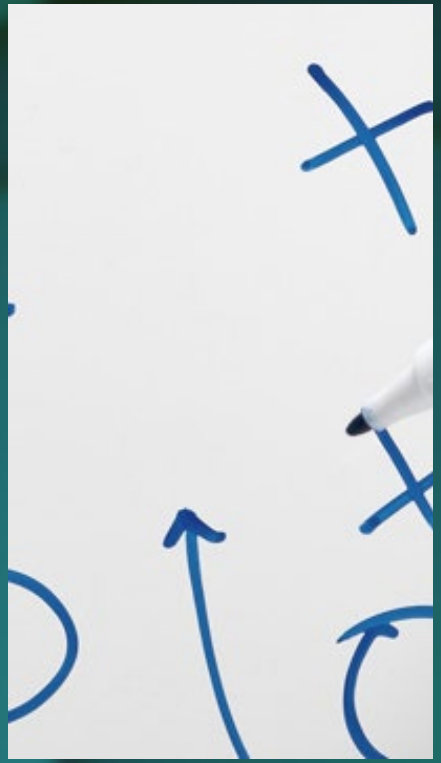

PML Exceedance

The underwriter should consider the following possibilities of avoiding wrong PML estimates:

- Requesting extensive risk information
- Ensuring that there is the same understanding of the PML definition and scenario
- Applying limits of liability
- Introducing minimum PMLs for specific highly exposed risks such as tunnels, refineries, gas turbines, etc.
- Introducing minimum PMLs on a total sum insured (ALoP and PD) basis
- Requesting regular updates on changes in the risk In order to revaluate the PML, if necessary.

PML – Assessment

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Collection and brief assessment of relevant scenarios

For example, fire, explosion, natural perils, machinery breakdown, etc.

Detailed evaluation of selected scenarios

Description of PML scenario, calculation of resulting loss incl. sublimits, etc.

Selection of scenario with highest PML

For example, flood

Documentation

Written summary of findings

PML - Assessment

After assessing the PML of each applicable scenario, the underwriter selects the one with the highest monetary PML and calculates the PML of the selected scenario in more detail.

- This should include a description of the PML scenario, followed by a calculation of the total monetary loss.
- The calculation should include all potential claims cost, i.e. apart from the actual material damage and loss of profits also additional sublimits and risk-specific features with an influence on the overall PML.
- Changes in the estimated contract value over the period of the contract, such as inflation and/or automatic increase clauses, should also be considered when estimating the PML.

PML - Assessment

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Main cover		Probable maximum loss in monetary terms
Property damage	A	x% of TSI/ECV for PD
Third-party liability	B	100% of limit
Advanced loss of profit/business interruption	C	Sum insured for ALoP/DSU/BI – Time excess [days] x Average daily value
Sublimits		
Debris removal and demolition cost	D	x% of TSI/sublimit or fixed value
others	E	x% of TSI/sublimit or fixed value
Additional costs		
Inflation	F	x% of TSI/ECV for PD
others	G	x% of TSI/ECV for PD
Total sum = Total PML in original currency	H	A+B+C+D+E+F+G
Exchange rate		
Total sum = Total PML in € (100%)		H in [EUR]

The PML assessment should be documented by describing the PML scenario and PML calculation and forms part of the underwriting documentation.

5 Special Aspects on Construction Sites

Image: Aeriform / Ikon Images / Getty Images

Special Aspects on Construction Sites

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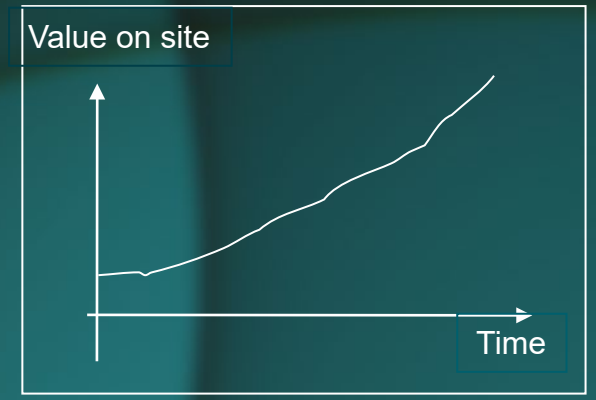
Main PML scenario: “major fire on the last day before completion”



Special circumstances for the PML consideration:

- Ever changing site conditions (progress):
- Housekeeping, storage of combustible material
- Fire fighting/ fire prevention system (sprinkler, detectors) not yet functional
- Open mechanical and electrical shafts
- Large number experienced and inexperienced contractors & workers
- Hot works
- Temporary installations with lower standards than permanent ones

Special Aspects on Construction Sites

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Main PML scenario: “major Earthquake a day before occupancy”

- Do we consider the damper a and rule out Earthquake ?
- Risk value based on estimations and no final values available

- Highest value at completion

Special circumstances for the PML consideration: Tuned mass damper

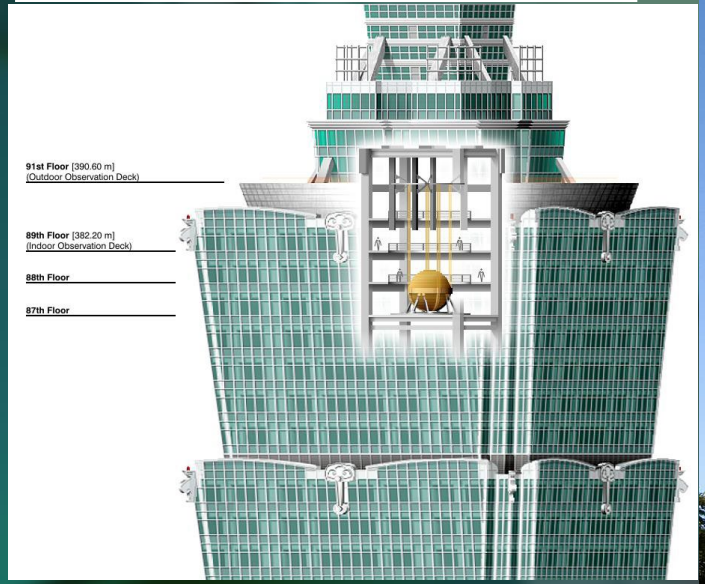

Image: Aeriform / Ikon Images / Getty Images

6 Case Study

Image: Aeriform / Ikon Images / Getty Images

Summer City Resort

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Image: Aeriform / Ikon Images / Getty Images

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Project Information SUMMER CITY PROJECT

Summer City Project is a prestigious and fully integrated mixed-use scheme in the Republic of Holiday Island, a small country in the Indian Ocean.

Project description

The overall development comprises a residential tower, two world class hotels with 4 and 5 stars, an office tower and an underground car parking area.
The car park consists of 2 parking areas below ground. The residential tower and the 4 Star Hotel are built on top of the car park. The 5 Star Hotel as well as the Office Tower are separate structures in the vicinity.
The construction material will be mainly concrete. The contractor is experienced and well known in this area.

Geology

Holiday Island is a sandy island about 2 to 3 meters above sea level. Soil conditions are sandy with some lime stone pockets. A geological study has been conducted on the project site and it was concluded that pilling foundations are necessary for all buildings.

Time schedule

All buildings are being constructed simultaneously over a period of 3 years with the same completion date.

Fire fighting system

All of the buildings, including the car park, will be provided with an automatic sprinkler system. There are no fire walls or fire doors inside the buildings and the car park.

Location

Holiday Island has a size of 200 km^2 and 1,257,000 inhabitants. The beaches are sandy and shaded by palm trees. Summer City Project is located on the seafront surrounded by several hotel complexes, all about 100 meters away.

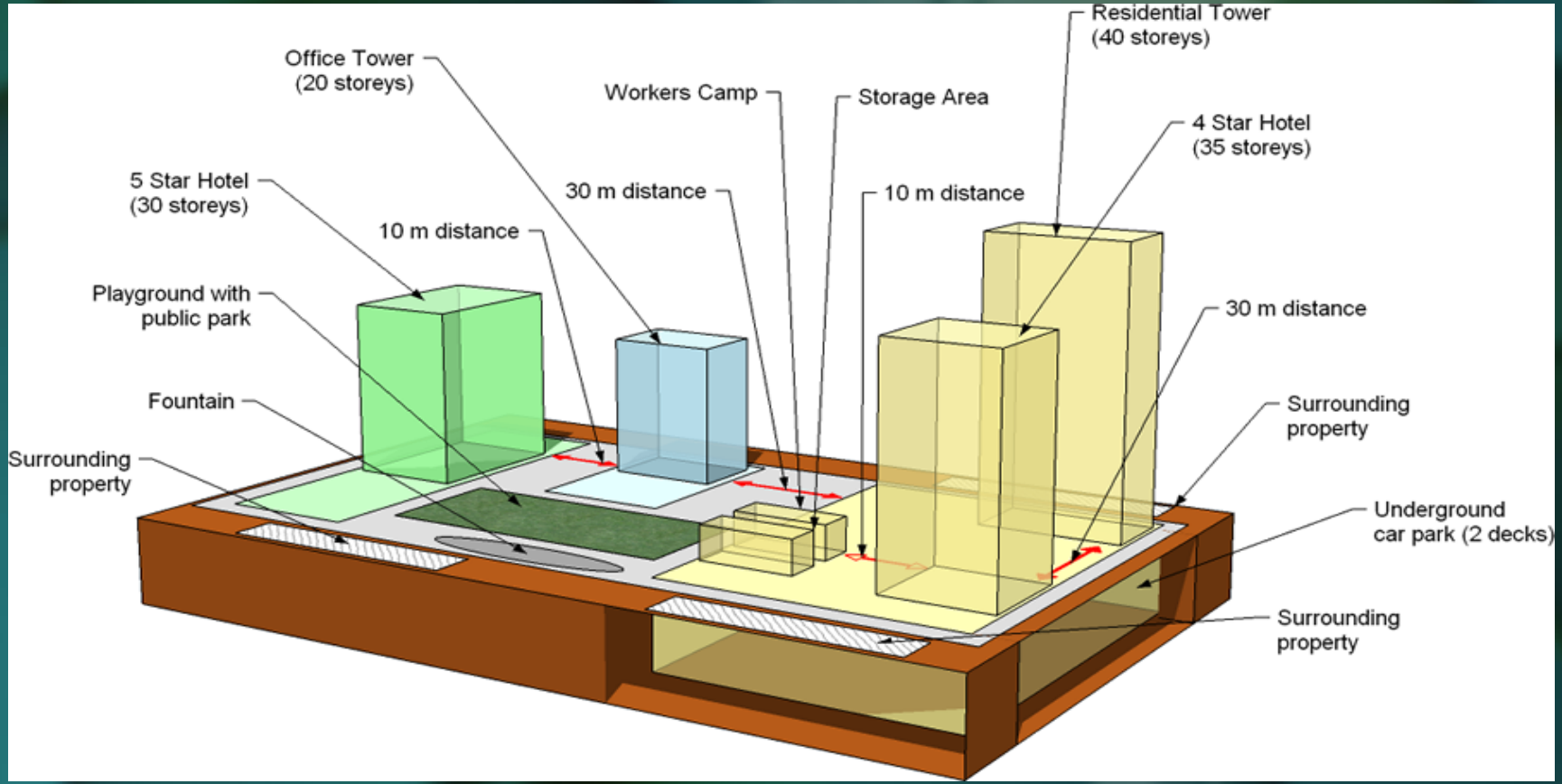
Natural hazards

According to the Munich Re Natural Hazard Exposure Map, the exposure of the project site to natural hazards is as follows:

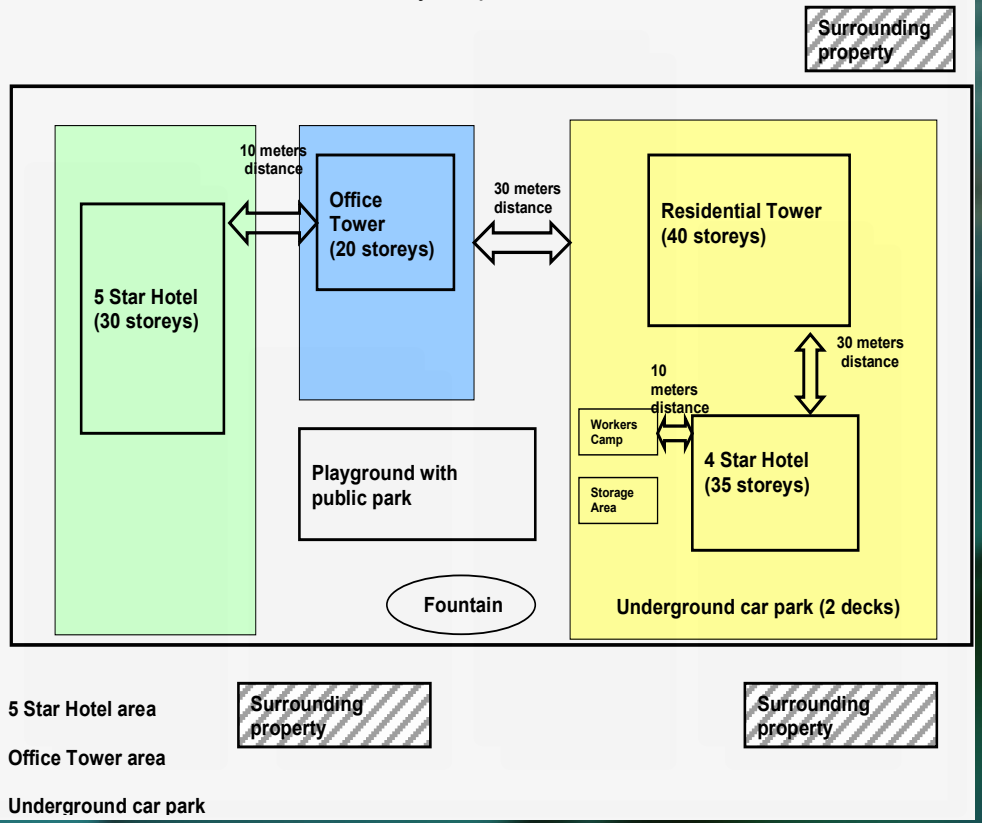
WIND	**3 severe**	(1 moderate, 2 medium, 3 severe, 4 extreme)
EARTHQUAKE	**1 strong**	(0 imperceptible, 1 strong, 2 very strong, 3 destructive, 4 devastating)
FLOOD	**1 low**	(1 low, 2 medium, 3 high)

Background information

The political situation in the Republic of Holiday Island, which became independent and turned a democracy in 1957, is stable. The country is very prosperous with an extensive public welfare system, a low unemployment rate, and a remarkable evenly distribution of income throughout the population. Since natural resources are scarce, the economy heavily depends on tourism which employs nearly 70% of the Republic's work force.



SUMMER CITY PROJECT – layout plan



BREAKDOWN OF CONTRACT VALUE – SUMMER CITY PROJECT

Car park	100 Mio. USD
Residential Tower (40 storeys)	300 Mio. USD
Office Tower (20 storeys)	120 Mio. USD
5 Star Hotel (30 storeys)	200 Mio. USD
4 Star Hotel (35 storeys)	250 Mio. USD
Total project value	**970 Mio. USD**

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Type	:	- Construction All Risks - Third Party Liability - Advance Loss of Profit
Form	:	Standard MR CAR Policy and Endorsements
Original Insured	:	ABC Properties (the "Principal") and/or Contractors and/or Sub-Contractors and/or Consultants and/or Suppliers engaged on the Project Site in respect of their Site activities only
Reinsured	:	123 Insurance Company
Title of Project	:	SUMMER CITY Project consisting of construction of an integrated Commercial Residential Complex including the following projects: - Underground car park (2 decks) with - Residential Tower (40 storeys) and - 4 Star Hotel (35 storeys) on top - 5 Star Hotel (30 storeys) and the - Office Tower (20 storeys) are separate structures in the vicinity.
Territorial Limits	:	Holiday Island
Period	:	3 years including testing and commissioning from (date to be agreed). Plus 12 months maintenance period.
Sum Insured	:	**Section 1 – Material Damage:** USD 970,000,000/- **Section 2 – Third Party Liability:** USD 5,000,000/- **Section 3 – Advance Loss of Profit:** USD 50,000,000/- Indemnity Period 12 months **Total insured value: USD 1,025,000,000/-**

Conditions / Endorsements	:	001 - Strikes, Riots & Civil Commotion – limit USD 5 Mio., e.e.l . & in agg. MR 002 - Cross Liability Clause MR 004 – Extended Maintenance – 12 months MR 005 – Time Schedule 4 weeks MR 006 - Overtime, night work - limit: 20% max. USD 1 Mio. e.e.l. MR 013 - Property in Offsite Storage – limit USD 5 Mio. e.e.l. MR 014 - Terrorism Exclusion Clause MR 102 - Underground Cables, Pipes and other facilities Clause MR 107 - Camps and stores – limit USD 500,000 e.e.l. MR 110 - Safety measures concerning flood and inundation MR 111 - Removal of Debris after landslides – 10% of loss max USD 10 Mio. e.e.l. MR 112 - Special Conditions concerning fire-fighting facilities and fire safety on construction sites MR 113 - Inland Transit – limit USD 5 Mio. e.e.l. MR 114 - Serial Losses MR 119 - Surrounding Property – Limit USD 500,000 e.e.l. MR 120 - Vibration, Removal or Weakening of Support Clause; Limit: USD 1 Mio. e.e.l., Deductible: USD 50,000 e.e.l. MR 121 - Special Conditions Concerning Piling Foundation and Retaining Wall Works. ▪ Professional Fees (Architects, Surveyors, Engineers etc.) – limit USD 500,000- e.e.l. ▪ 72 Hours Clause ▪ Nuclear and War and related perils exclusion (General Exclusions) – CL 370 ▪ Pollution and Contamination Exclusion Clause – NMA 1685 ▪ Automatic increase 10% of TSI, subject to additional pro rata premium ▪ Property in Offsite Storage – limit USD 5 Mio. e.e.l. ▪ Temporary Repairs Clause – limit USD 1 Mio. e.e.l ▪ Plans & Documents Clause – Limit USD 1 Mio. e.e.l. ▪ Automatic Reinstatement of Sum Insured – at pro rata additional premium

PML

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PML

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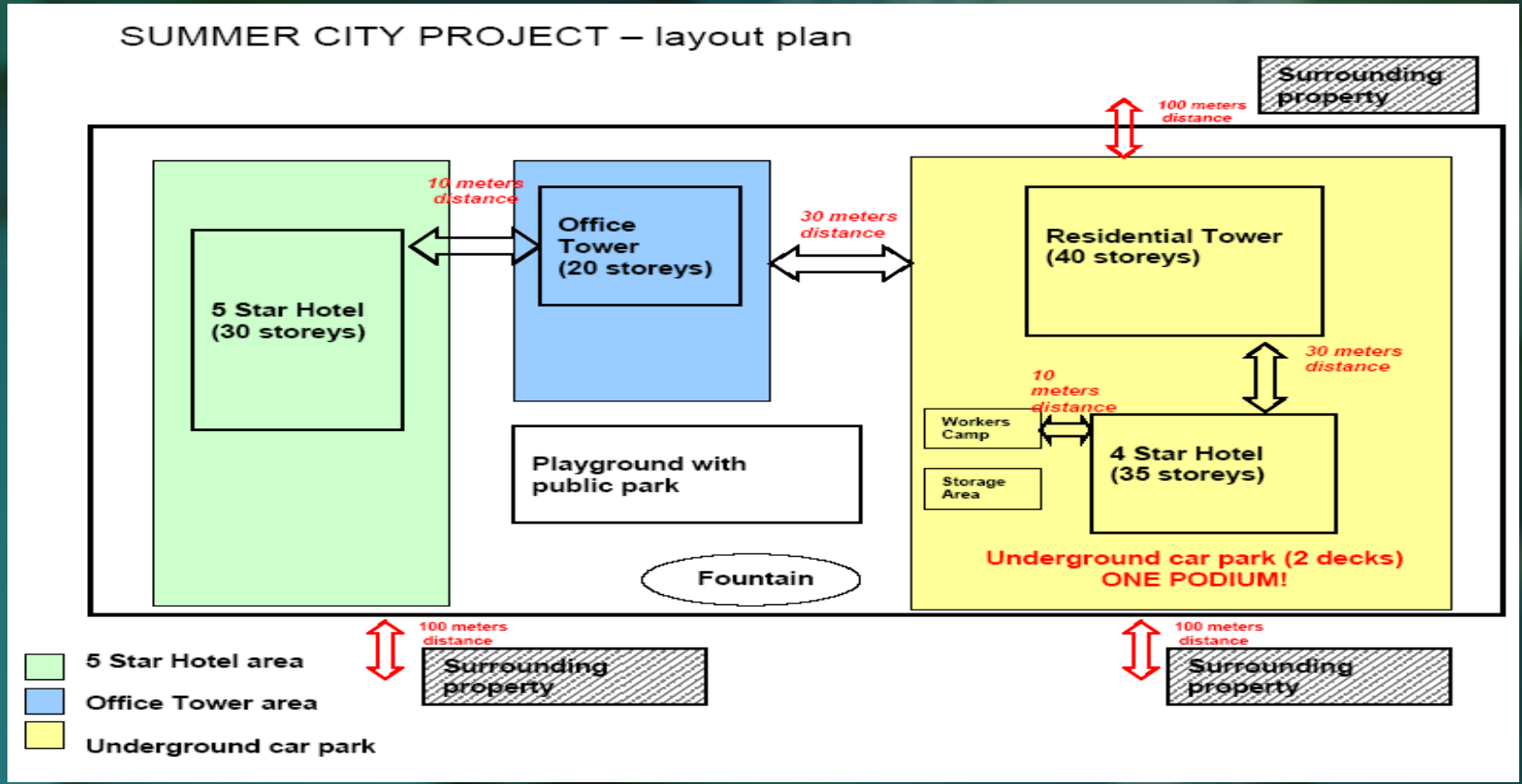

PML

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CASE STUDY: "SUMMER CITY PROJECT"

worst case scenario:	Fire breaks out in basement just before hand-over of the complited project	
T.S.I.	1,025,000,000	USD

Property Damage	**S.I / limit in USD**	**PML in %**	**PML in USD**
Car park	100.000.000	100%	100,000,000
Residential Tower	300.000.000	100%	300,000,000
Office Tower	120.000.000	0%	0
5 Star Hotel	200.000.000	0%	0
4 Star Hotel	250.000.000	100%	250,000,000
Increase in values		10% of LA	65,000,000
		Subtotal	715,000,000

Third Party Liability	**S.I / limit in USD**	**PML in %**	**PML in USD**
	5.000.000	100%	5,000,000

ALoP	**S.I / limit in USD**	**PML in %**	**PML in USD**
	50.000.000	100%	50,000,000

Extensions / Endorsements	**S.I / limit in USD**	**PML in %**	**PML in USD**
Professional fees	1,500,000	100%	1,500,000
Overtime	1,000,000	100%	1,000,000
Surrounding Property	500,000	100%	500,000
Debris Removal	10,000,000	100%	10,000,000
Camps and Stores	500,000	100%	500,000
		Subtotal	13,500,000

TOTAL PML in USD	783,500,000
PML %	76.44%

PML

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The PML is a key figure in Property Insurance.

- Have a clear understanding of the PML definition.
- Natural perils, fire and explosion should be considered PML scenarios by default – Various PML scenarios.
- Understanding the risk and knowing its background and environment is crucial to identify the determining PML scenario – information required.
- Consider all costs determining PML, extensions apart of the MD & BI values – Scope of cover.
- Each risk has to be evaluated individually as no standardized method for PML calculations exists.

Know your risk before you write it.

Coutersy :London.eater.com

“NO CONSTRUCTION PROJECT IS RISK FREE. RISK CAN BE MANAGED, MINIMISED, SHARED, TRANSFERRED OR ACCEPTED. IT CANNOT BE IGNORED.” - SIR MICHAEL LATHAM, 1994

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Thank You

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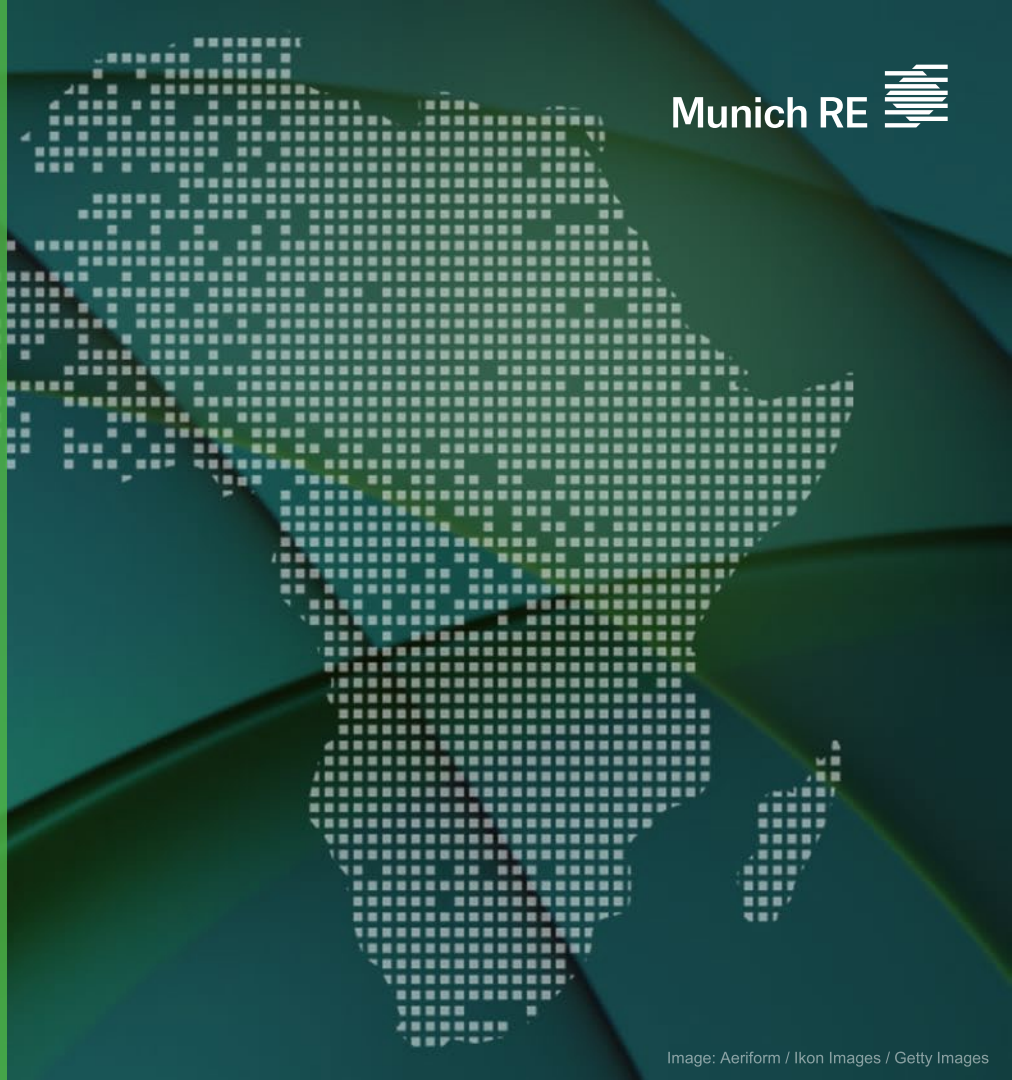

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