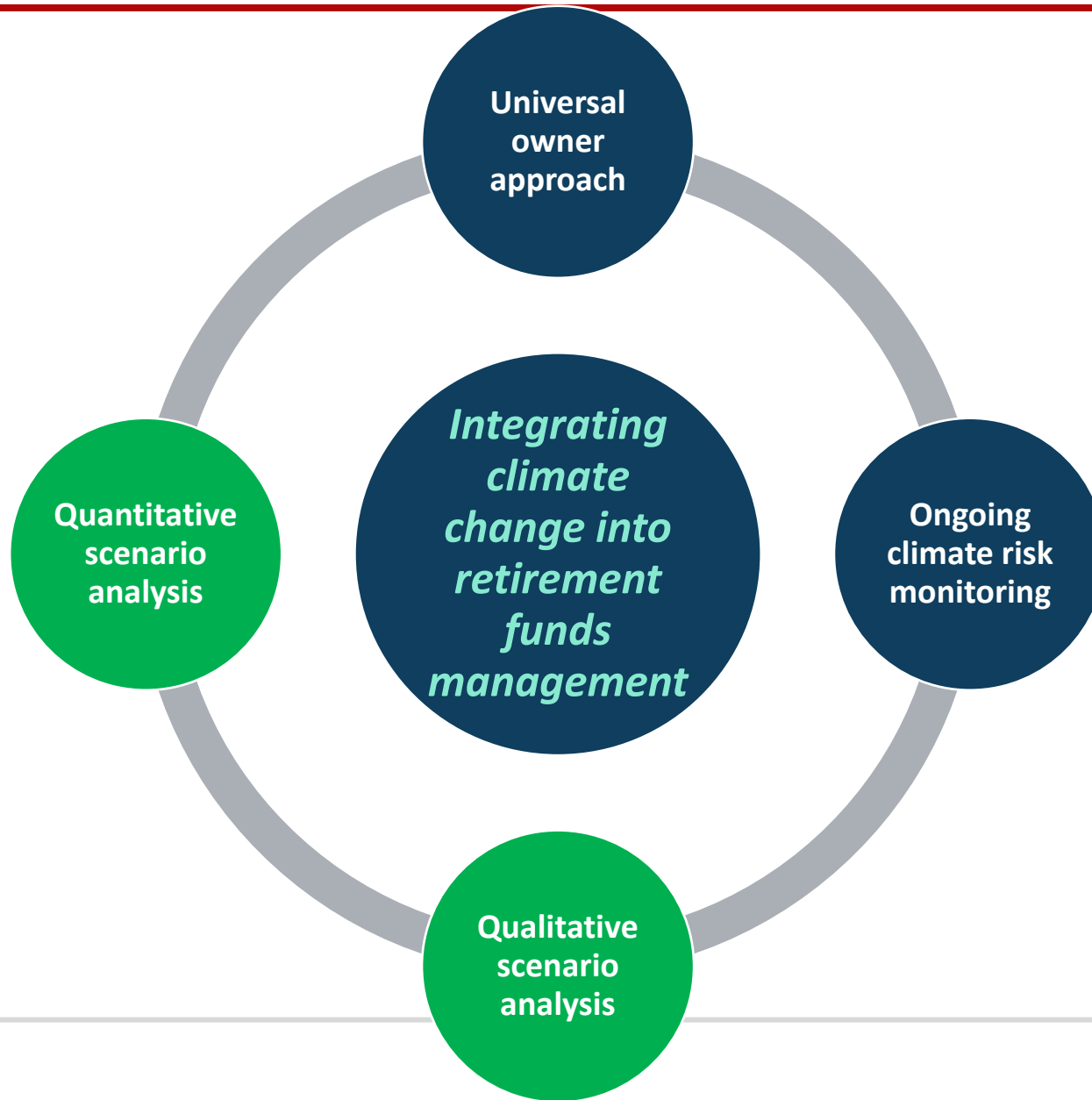


# Summary of framework – 4 key areas

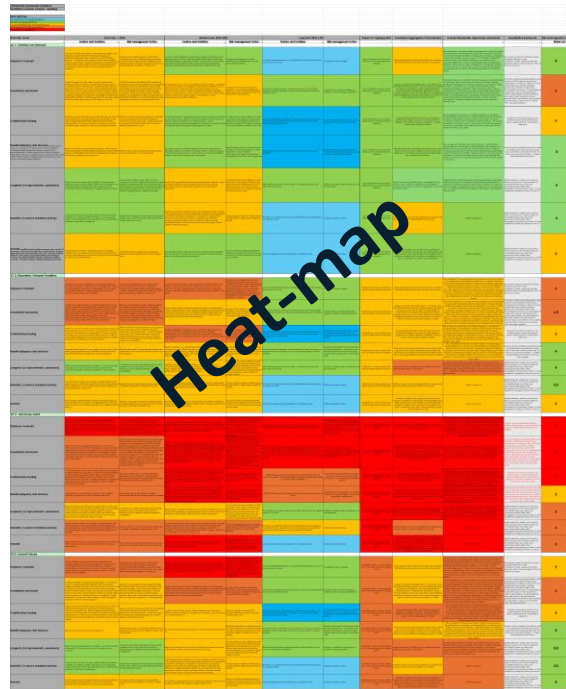
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# Qualitative scenario analysis – Heatmap development



- A complete picture - narrative scenarios – timescales & deepening knowledge
  - Describe financial health under Global Reference Scenarios
  - Mapping to nature of scheme asset & liabilities over time
  - Practical steps where complexities and uncertainties loom large
    - Climate risks transmission to Scheme risks
    - Impact on valuation assumptions; design; parameters; costs
  - Heat map highlights important aspects –
    - Forerunner to Quantitative analysis
    - Communication to stakeholders
    - Learnings and structured information;
    - Ongoing investigation & management
    - Enhancement and monitoring



**Control cycle**

# Qualitative scenario analysis: template



Climate Risk Assessment Guidance							R-A-G Alert Key	
Qualitative Scenario Analysis : HeatMap							immaterial or no adverse impact	
Hot-house world Scenario							low risk of adverse impact	
							low to moderate risk of adverse impact	
							moderate risk of adverse impact	
							high risk of severe impact	
Main Risk Levers	Short term < 2030 /Medium term 2030-2050 /Long term 2050-2100		Impact of Tipping points	Correlation/Aggregation/Concentration	Overall Climate/Risk Opportunity Assessment	Quantitative framework	Risk Heat Signature Scale	
	Feature and Evolution	Risk management Action					Rated out of 10	
Employer Covenant								
Investments and Assets								
Contributions/Funding								
Benefit adequacy and structure								
Longevity (i.e improvements- pensioners)								
Mortality ( in-service members/actives)								
Morbidity								

Liability model drivers

Evaluate how each driver impacts

Describe risk management action

Assess further impact of tipping points

Correlation or risks

Overall Risk and Opportunity Assessment

Heat signature, bird's eye of urgency and severity, enables stewardship & decision making

# Qualitative scenario analysis: DC Fund Example in Hot House World



Hot-house world		
Investments and Assets: Large DC Fund in Cement Sector		
Time Horizon	Driver Feature and Evolution	Fund Risk Management Action
Short term < 2030	<ul style="list-style-type: none"> <li>• Destructive (acute) climate change impacts real economy BUT</li> <li>• Equity and capital markets have delayed impacts in their valuations, until the longer-term</li> </ul>	<ul style="list-style-type: none"> <li>• Board incorporates into risk-appetite and risk budgeting.</li> <li>• Focus needed more on risk reduction from emerging climate risk impacts not yet priced in the markets.</li> <li>• Shift to a more conservative core, with a climate-adaptive seeking satellite strategy</li> </ul>
Medium term 2030-2050	<ul style="list-style-type: none"> <li>• Asset valuations will see severe decline</li> <li>• Breakdown in traditional correlations between markets, increased volatility, illiquidity and credit risks, flows between capital and equity markets disrupted</li> <li>• Real Economies breakdown leading to loss of productive capacity</li> <li>• Central banks struggle to balance growth and inflation.</li> <li>• Exacerbated risk aversion behaviour among investors &amp; in turn global volatility across different regional markets.</li> </ul>	<ul style="list-style-type: none"> <li>• Investment strategy will need to allow for higher costs of portfolio management.</li> <li>• Premiums for entry into pockets of viable markets.</li> <li>• Boards need to actively seek &amp; price investment guarantees, more costly structured products, or climate insurance wrappers.</li> <li>• Need to engage with regulatory authorities regarding regulatory asset limits.</li> </ul>
Long term 2050-2100	<ul style="list-style-type: none"> <li>• Markets struggle to deliver significant real returns over long periods.</li> <li>• Retail and out-of fund post-retirement options subject to increases in volatility and sequencing risks,</li> <li>• Funds may still struggle to provide matching or better value in-fund.</li> <li>• With general industrial decline where climate change impacts are not mitigated, a low growth, low inflationary world may emerge.</li> </ul>	<ul style="list-style-type: none"> <li>• Post-retirement glidepath may be better managed in-fund, if Boards build an effective long-term strategy and asset governance framework.</li> <li>• Long-term post-retirement investment strategies, innovative drawdown products and hybrid annuity products.</li> <li>• Alternative and direct investments</li> </ul>

- Portfolio Management <<< Breakdown in traditional correlations, illiquidity, extreme volatility, credit-spreads
- Asset valuations and investment growth, volatile, severely impacted (stranded assets)
- Fund risk management action –more conservative, restrictive, costly
- TARGET income replacement ratio and related metrics are still at similar levels
- Post-retirement glidepath becomes more important –hybrid drawdown products & other in-fund innovations needed
- As more data becomes available, the qualitative scenarios need to be updated and reviewed.

# DC Fund Example in Hot House World: translate to quantitative



Impact of Tipping points	High, non-linear multiple Impacts
Correlation/Aggregation/Concentration	Investment driver is correlated with employer covenant;
Overall Climate/Risk Opportunity Assessment	<ul style="list-style-type: none"> <li>• Requires granularity and continuous granular monitoring</li> <li>• Access to robust, comprehensive internal models &amp; DATA</li> <li>• Lack of global policy driven environment, requires a conservative approach to measuring and mitigating downside risks.</li> <li>• A Strong Self regulatory risk management framework, needed in absence of global legislative and policy change</li> </ul>
Quantitative framework	<ul style="list-style-type: none"> <li>• Double Stochastic, extremely long term, incorporate tail-measures of uncertainty</li> <li>• Use of Complex Climate models and Transmission models into traditional risk buckets</li> <li>• Data granularity especially over long-term, means use of AI driven models with its own risks</li> <li>• Need to allow for different levels of success scenarios of Fund risk management action</li> </ul>
Risk Heat Signature Scale	9

- Consider models which input
  - Economic growth, inflation – vector over time– link with salary increase & Expected returns
  - Salary increase assumptions –need to allow for covenant, climate impact on demographics
  - Expected returns –time-vector; central but with range uncertainties
  - Expected (unexpected changes in) mortality – impacts post-retirement annuity rates/drawdown profiles
- Quantitatively describe the uncertainty around the implications of climate change.
  - Extreme value, and more modelling around tail-risks and events
- Highlight the uncertainty around the impact of adaptation.
  - Especially from fragmented regional divergences
  - Ability to access pockets of viable investments



## Investments and Assets- Some key considerations

- Consider use of risk adjusting actuarial valuation bases adjusting for “fair-value” of assets
  - Matching, cashflow driven instruments become more fundamental than balanced portfolio management
  - More closely related to managing employer covenant –matching assets where covenant deteriorates
  - Impact of risk benefit funding drivers
  - Managing pensioner account and assets
  - Reserving for longevity risks, or use of indexed, matching instruments
  - Solvency levels are a basic metric
-

# Quantitative scenario analysis – funding levels & IRR's



## DC funds

XYZ Retirement Fund - Projected Replacement Ratios (for illustration only)

	Base	Orderly net-zero 1.5°C warming	Disorderly net-zero 1.5°C warming	Limited Action 2.0°C - 3.0°C - <u>warming</u>	High warming >4.5°C warming
Standard mortality assumptions	76%	71%	58%	53%	50%
Reduced mortality improvements	76%	71%	58%	55%	53%
Reduced longevity (low)	76%	71%	58%	56%	56%
Reduced longevity (high)	76%	71%	58%	58%	63%

Source : Alexforbes proprietary calculations for illustration

## DB funds

ABC Pension Fund - funding levels across various climate scenarios (for illustration only)

	Base	Orderly net-zero	Disorderly net-zero	Limited Action	High warming
Standard mortality assumptions	100%	96%	91%	87%	82%
Reduced mortality improvements	100%	96%	93%	89%	86%
Reduced longevity (low)	100%	96%	93%	91%	92%
Reduced longevity (high)	100%	96%	100%	104%	123%

Source : Alexforbes proprietary calculations for illustration

- Consider assumptions for range of scenarios
- Explore and illustrate uncertainty
- Compare asset and liability impact

# Summary of framework – 4 key areas

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