

Solvency II: 2022 Year-End Standard Formula Exercise Guidance Notes

September 2022

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1 Contact Details

In the first instance agents should check whether the technical specifications included in the Delegated Acts, as listed in Section 5 (and linked in the calculation template) or the rest of this guidance provide sufficient detail to answer any questions. In addition to this, the FAQs provide information for this exercise and these will be updated as needed. Any questions not answered by other sources set out may be sent to SFReturns@lloyds.com.

2 Introduction

2.1 Background

A standard formula return as at 2022 year-end is required to be submitted by agents by **Friday 25 November 2022**. This guidance sets out the requirements for the submission and the completion of version 9.2 of the calculation template found on the Capital Guidance → Standard Formula SCR section of the Capital and Reserving area of [Lloyds.com](https://www.lloyds.com). Section 2 covers general requirements and basis for submission, Section 3 provides detail on the required inputs for each sheet and Section 4 provides sources of additional information.

Demonstrating that the market is able to calculate a standard formula SCR and further, comparing to internal model derived SCRs, is a key Solvency II requirement.

The standard formula SCR calculation template is available on [Lloyds.com](https://www.lloyds.com). The calculation template provides:

- A practical and adaptable tool to use.
- The ability to derive results on a consistent basis and format in a timely fashion.
- Greater transparency in assessing data inputs and bucketing/categorising the results of the calculation.
- The ability to scenario, stress and sensitivity test the standard formula.

The template will produce a standard formula Solvency Capital Requirement (SCR) on two asset bases – see section 3.3 below - and the Minimum Capital Requirement (MCR).

Upon receipt of completed syndicate templates, Lloyd's conducts a high-level validation of the returns and may question syndicates on the data supplied. This does not mean the submitted information is incorrect. It is a necessary part of the Lloyd's process to ensure understanding and integrity of syndicate data and results. Lloyd's will flag any results that appear to be unusual with syndicates through the above validation. Feedback will be provided on how syndicate results vary by peer groups.

Agents should recognise that whilst the template is designed to be an appropriate base for a standard formula exercise, it does contain some areas of approximation and Lloyd's subjective interpretation of requirements. Further details of these approximations and interpretations are set out in section 3.

2.2 Participation in the 2022 Year-End Standard Formula Exercise

All syndicates submitting an LCR and/or SBF for the 2023 year of account should supply a standard formula return. This includes life, non-life, RITC and run-off syndicates, but does not include Syndicates in a Box. Submissions are required at syndicate level and so special purpose arrangements (SPAs) must also complete a separate return.

2.3 Changes from Previous Exercises

2.3.1 Recent changes prior to the 2022 year-end exercise

Ahead of the 2021 year-end Standard Formula exercise, updates were made to the Spread Risk module for amendments given in Delegated Regulation (EU) 2018/1221 of 1 June 2018 which impact the spread risk capital requirement on securitisation positions..

Delegated Regulation (EU) 2018/1221 of 1 June 2018 were created to consolidate and apply consistency for capital requirements for securitisations. The "Spread Risk" tab of the template has been updated to reflect changes set out in this regulation. Notably, the regulation allows for stresses differentiated by credit quality step (credit rating) and now also by duration. The classifications of securities have also been updated to be consistent with other regulations to be Senior and Non-Senior Simple Transparent and Standardised (STS) securities, re-securitisations and others.

2.3.2 2022 year-end exercise

The template has been updated for financial information to 2022 Q2; updates relate to EIOPA yield curves, exchange rates and the symmetric adjustment for equity risk. No other changes have been made this year.

These changes are also detailed within the 'Version History' sheet of the calculation template.

2.4 Lloyd's validation checks

Lloyd's conducts validations post submission and can require resubmissions/responses for incomplete sections or unexplained movements. To expedite this process please provide comments where validation tests in the template fail or where there has been material movement in the SCR. The validation checks performed by Lloyd's are as follows:

- Sign off: to ensure the Sign-off and Declaration section in the 'Information' tab is completed.
- Validations in template: to make sure appropriate comments are provided in the 'Validations' tab of the Standard Formula submission where a validation test fails.
- LCR and QMA checks: to check figures in the Standard Formula submission reconcile to the LCR and QMA. These checks are also included in the 'Validations' tab of the template.
- NAV check: Basis 2 net asset value is expected to be zero.
- Cat risk net to gross ratio: to check that the ratios are reasonable and sit within the 0-100% range, i.e. ratios are non-negative and net<gross.
- Cat risk mitigation: to check at a high level the consistency of reinsurance recoveries compared with ceded premiums.
- Comparison to last year: to understand reasons for material changes to reporting of the SF SCR by comparing to the previous year's submission

2.5 Submission of Results

Completed calculation templates should be submitted electronically by **Friday 25 November 2022** to the "MRC Syndicate Capital Setting" folder of SecureShare as per market bulletin. One excel file submission template (with links to external files removed) should be submitted for each syndicate using the standard naming convention "2022YESF_SYND_v9.2.xlsx", where "SYND" represents the individual syndicate number (4 digits) and "v10" represents the version number of the spreadsheet downloaded from lloyds.com.

Submissions should be uploaded to the "MRC Syndicate Capital Setting" folder on SecureShare.

Agents should ensure they are using the most up to date version of the template to avoid any errors in their submissions, please check lloyds.com regularly for any updates. Lloyd's will notify agents where updates are made through the FAQs published on the on the Capital Guidance → Standard Formula SCR section of the Capital and Reserving area of lloyds.com.

3 Requirements for the Calculation Template

3.1 General Requirements

The excel template provided on Lloyds.com should be **completed based on the projected balance sheet as at 31st December 2022**.

The template is intentionally set out in a standard format to enable all data and results to be exported for the analysis performed by Lloyd's and for submission to the PRA. The data and results extraction process assumes the template structure is the same as that released on lloyds.com. To avoid changes to the template, Lloyd's has protected the workbook where necessary. However, where the ability exists, please do not change the structure of the template.

Throughout the template the following colour convention has been used:

- yellow cells relate to input values;
- green cells are calculated amounts including results; and
- grey cells are parameters or blank/not required cells.

Agents should ensure that technical provisions and other financial amounts submitted for the standard formula reconcile to those provided in the Lloyd's Capital Return (LCR) and the Quarterly Monitoring Return A (QMA). This is included as a sense check on the 'Validations' sheet.

Note that, as per previous standard formula exercises, much of the premium risk calibration is based on premium amounts. Operational risk, catastrophe risk and the MCR also use premium inputs as volume measures. All premium amounts collected in the return should be **gross of acquisition costs**.

Please note that if certain risk modules of the standard formula SCR are considered by the agent to be zero (e.g. life underwriting risk for non-life syndicates and vice-versa) these should be left blank. Please do not delete these tabs. Lloyd's expects syndicates to at least fill in market risk, counterparty default risk, operational risk and one segment of underwriting risk.

3.2 Basis of Submission and Lloyd's Expectations

Agents are required to **report all figures in thousands and converted to Sterling**. Where conversion from underlying currencies is required, agents should use the same exchange rates as used in preparation of their 2023 LCR. For reference these rates are also provided in the 'Exchange Rates' sheet in the calculation template. All monetary amounts which feature in the calibration of the calculation have been converted by Lloyd's at these mid-year rates (primarily £1=€1.16).

This return requires Director sign-off on behalf of the managing agent's board but is not required to be audited. Lloyd's requires managing agents to check the returns for reasonableness prior to submission to ensure accuracy and consistency of the information provided and reasonableness of the outputs. As a minimum this checking should include populating the validations tab and commenting on any discrepancies. In addition to the 'Validation' sheet tests, Lloyd's will also be conducting a number of validation tests on the submissions to ensure credibility of the data provided.

3.3 Assets Supporting Syndicates

In order to derive both the syndicate standard formula and the Lloyd's aggregate standard formula results, financial investment amounts are required on two different bases as described below.

- **Basis 1:** This includes financial investments held to support accrued syndicate surplus/deficits plus any amounts held by fully aligned syndicates as 'Funds in Syndicate' (FIS) rather than posting Funds at Lloyd's (FAL). This basis is required for Lloyd's to estimate its aggregate standard formula SCR as this includes risks arising on surplus assets. The total projected assets to year-end 2022 should be provided in the "Market Risk Total" tab. This is then used to create a scaling factor that is applied to the Basis 2 inputs in order to calculate Basis 1 investments. All assets are increased proportionally by the same factor irrespective of asset class, currency or duration.
- **Basis 2:** Financial investments should be input such that the member balances (on a Solvency II basis) at the valuation date are nil (a validation has been added to the template to verify this), this is in line with the opening position used to calculate the internal model SCR. **All inputs for financial investments in the calculation template should be on this basis.** Lloyd's will consider the results of this basis to be the syndicate's standard formula SCR and MCR, for comparison with the syndicate internal model SCRs.

The two asset bases primarily affect the market risk module, however, since the Basic Solvency Capital Requirement (BSCR) feeds into operational risk and the full standard formula SCR amount feeds in to the Minimum Capital Requirement (MCR) these amounts are also affected, and results are produced on both bases. Lloyd's recognises that in certain circumstances syndicates may not have any surplus financial investments (e.g. Special Purpose Arrangements); in this instance no scaling will occur between Basis 1 and Basis 2.

3.4 Look-Through Approach

Agents are requested that the valuation of the standard formula SCR in relation to assets invested in collective investment vehicles or other indirect exposures uses a look-through approach to the underlying investments in these funds where possible. Note that investments in related undertakings are excluded from this. Alternative methods to the look-through approach are set out in the Delegated Acts and may be applied where appropriate, e.g. assuming the vehicle invests in such a combination of assets (as permissible by its mandate) to maximise the capital requirement or consideration of all these schemes within the Equity risk sub-module. However, agents should note that these alternative approaches may result in higher capital charges for the syndicate.

3.5 Solvency II Classes of Business

Much of the standard formula for underwriting risk and the MCR is calculated at a Solvency II class of business level. This requires much of the data for these risk elements to be entered by Solvency II class of business. Descriptions of these classes can be found in the 'Lines of Business' tab and in the annex to the Delegated Acts. Lloyd's has also produced a mapping of risk codes, transaction types (per QGD) and annuity flags (per TPD) to assist agents with this mapping. This is available on the Underwriting section of lloyds.com, a link is provided in Section 5.

3.6 Geographical Region Information

Geographical diversification credit is permissible within much of the underwriting risk module. To estimate this, several premium and claims related measures are required to be split by 18 geographical regions. The allocation of countries to each of the regions is listed in the 'Region Information' tab. Managing agents may use any reasonable basis to allocate business to geographic area. This may include data on location of risk or claims. For multi-region policies spanning more than one of the geographic segments, agents should consider materiality (or whether there would be a dominant region for the risk) and allocate in a reasonable way.

Note that for European natural catastrophe risk, CRESTA zone level diversification benefit is also permissible where syndicates opt to use the full rather than simplified calculation. Furthermore, the definition of the countries to include within 'France' varies. Further detail can be found in the European natural catastrophe risk sum insured input tabs.

For natural catastrophe risk, please use geographical region 5 (Central & Western Asia) for Russia and the Ukraine. There are no factors for these countries under European natural catastrophe risk; as such Lloyd's will include these within the non-European calculation.

3.7 Premium Risk Volume Measures

The template collects the premium risk volume measures in line with a strict interpretation of the Delegated Acts. Although there have been revisions to the regulations relating to this component, Lloyd's interpretation continues to be that there is a gap in the exposures considered, but this is consistent with the regulatory reporting basis.

3.8 Application of Outwards Reinsurance

All volume measures used to calculate the premium and reserve risk component of underwriting risk for non-life and NSLT health classes are net of reinsurance and no mitigation calculations are required. In limited circumstances the standard deviation factor for premium risk can be reduced by 20% to allow for non-proportional reinsurance. This reduction is permissible under direct and proportional Solvency II classes of business for Motor Vehicle Liability, Fire & Property and General Liability. Lloyd's has assumed this applies in all cases.

The approach for allowing for recoveries within catastrophe risk elements is less well prescribed. Agents should use reasonable assumptions in estimating their reinsurance recoveries; for example, allocate loss to class of business and geographical region where there is the largest exposure or highest probability of claim where applicable.

The Lloyd's template permits risk mitigation to be applied at varying levels of the non-life and health catastrophe risk calculation and aggregation (see NL Cat Risk Total and Health Cat Risk Total sheet). This adds to the flexibility of the template in that it allows credit to be taken for programmes covering multiple regions (for natural catastrophe risk) or perils. However, users should be careful to avoid double counting of cover across perils and/or regions and ensure that the net result is consistent with their understanding of the programme operation (as far as possible) in practice. Simple examples have been provided in Appendix A setting out the potential complexities and options for applications of risk mitigation programmes. EIOPA has also provided [guidelines](#) on the application of reinsurance to

catastrophe risk. Please also note that this is an area where uncertainty in the requirements exists; these requirements may change or become more prescriptive over time.

Some principles have been given for reinsurance assumptions below:

- Losses by peril can be assumed to be stand-alone, independent and mutually exclusive events for all segments. Note, “independence” does not imply that only one of the peril events occurs, there is some probability attached to multiple events occurring in the formula. While allowance for mitigation can be made at the granular peril/event level users need to be careful not to double/ over-count the mitigation impact once these losses are aggregated.
- In all cases including for all inputs by region/ country/ CRESTA zone in the nat cat sections, the gross loss/capital requirement post-country/region diversification should be used as the amount to base the reinsurance recoverable on. However, where necessary syndicates should assume a country/region giving rise to the gross loss in order to estimate the mitigation.
- Windstorm, flood and hail perils for EU Natural Catastrophe risk include specific scenarios where two losses are assumed based on proportions of the diversified ‘specified losses’. The losses within each scenario are consecutive and independent and it is to be assumed that no further risk mitigation is purchased between these two losses.
- Mitigation for health catastrophe risk is input by country for mass accident and accident concentration perils assuming the country losses are independent. Pandemic mitigation is however input at a total level after combining charges for medical and income protection losses. Lloyd’s believes this is in line with the technical specifications.

3.9 Assumptions and Simplifications

The calculation template makes a number of assumptions and simplifications in order to reduce the number of inputs and underlying ‘sub-modules’ required for the calculation. Lloyd’s believes these simplifications are in line with Article 88 of the Delegated Acts on proportionality.

Where agents feel the simplifications are not appropriate, in particular where a full calculation is expected to produce materially different results, then a full calculation could be conducted (in line with the Delegated Acts) by the agent following their own workings. In this instance agents should contact Lloyd’s for approval. Where this is accepted, the key results affecting the overall calculation could be overwritten in the calculation template and the underlying calculations and accompanying explanation provided with the submission. Lloyd’s will review the attached workings for reasonableness and consistency with the technical specifications.

The main simplifications are described below:

- **Non-Proportional Reinsurance reduction to Premium Risk standard deviations:** As noted in 3.8, the Delegated Acts allows for a 20% reduction in the premium risk standard deviation for Fire & Property, General Liability and Motor Vehicle Liability direct and proportional classes. Lloyd’s has assumed this reduction applies in all cases.
- **Non-Proportional Health Catastrophe Risk:** The health catastrophe risk module is unlikely to be suitable for firms writing non-proportional health business. Lloyd’s recognises that the granularity of the inputs required in the three Health Catastrophe Risk scenarios (Mass Accident, Concentration and Pandemic) is unlikely to be available for non-proportional health reinsurers. As such, Lloyd’s has included an additional shock of 250% of the Gross Earned Premium in the next 12 months to make an allowance for this. This shock is in line with non-life non-proportional catastrophe risk. Therefore, the option exists to apply either the 250% premium shock or include this business within the three scenarios.
- **Duration input for Interest Rate Risk:** Lloyd’s collects the asset duration within Interest Rate risk rather than a full listing of the cashflows occurring on the assets included in this module.
- **Risk Mitigating Effect of reinsurance in Counterparty Default Risk:** In line with Article 107 of the Delegated Acts, Lloyd’s has applied the simplification for Risk Mitigating Effect of reinsurance to simplify the calculation and inputs required for the calculation. This derives a Gross Underwriting Risk SCR from which the Net Underwriting Risk SCR is deducted to estimate the allowance of reinsurance on the SCR. This amount is the apportioned across the current reinsurance exposures in line with the outstanding recoverables. Please see 4.14 for further detail.

Lloyd’s understands that certain areas of the standard formula will not be material to all syndicates. The template currently requires inputs in respect of each risk module as fully as possible. If an agent deems that, for a particular risk (sub-) module, the work required to complete an area of the template is disproportionate to the expected

contribution to the overall standard formula SCR (this expectation may be based on prior standard formula exercises or the expected results from this template), the following approaches could be taken:

- The agent may use the collection template as it stands but simplify the inputs. This may include (for example) allocating all amounts to one geographical region, duration bucket or making simplifying assumptions around certain inputs. Please note that this is likely to result in a higher standard formula SCR for the syndicate.

In this instance please provide a comment on the Information tab to explain what has been done and the reasoning for this. If the agent is in doubt as to the appropriateness of a simplification, please contact Lloyd's via SFReturns@lloyds.com to discuss the issue.

- Secondly, the agent may wish to simplify the workings by providing alternative data or estimates on which to model the SCR for that (sub-) module for the syndicate. Please contact Lloyd's via SFReturns@lloyds.com with justification of how this element is deemed immaterial, why the above approach could not be applied and a proposal for an alternative modelling approach. Lloyd's may then (following discussion) allow certain simplifications and/or alternatives to be applied.

3.10 Treatment of Annuities stemming from Non-Life and Health contracts (including PPOs)

Agents with exposure to annuities stemming from non-life and health contracts should model these entirely within the life underwriting risk module. This will capture the inherent longevity (and other) risks in these contracts. Please see the Delegated Acts (link provided in section 5) for the approach to model the risks within these contracts.

3.11 Loss Absorbing Capacity of Technical Provisions and Deferred Taxes

The loss absorbing capacity of technical provisions and deferred taxes relate to circumstances where the defined losses and shocks of the standard formula SCR can be compensated for by a simultaneous decrease in the technical provisions for future discretionary benefits or deferred taxes, or a combination of the two. Lloyd's does not believe that these circumstances are applicable to the majority of the contracts written at Lloyd's and as such would not have a material impact on the standard formula SCR.

In all cases in the calculation template the gross and net (of loss absorbing capacity) have been set as equal.

3.12 Risks Not Captured by the Calculation Template

The following risks are not captured within the template produced for this exercise.

- **Health 'Similar to Life Techniques' (SLT) Risk:** Previous exercises at Lloyd's have indicated that there is no exposure to this risk and so this is excluded from the calculation template.
- **Ring Fenced Funds:** Ring Fenced Funds relate to circumstances where own funds have a reduced capacity to fully absorb losses on a going-concern basis due to restrictions on certain contracts for policyholders or risks. These are not captured in the template.
- **Pools:** The Counterparty Default Risk section of the Delegated Acts has been extended significantly to consider the risks associated with counterparties belonging to different members of pooling arrangements. No explicit allowance has been made for these in the Lloyd's template as Lloyd's does not believe that these are material. If relevant, these risks can be captured by treating counterparties belonging to the same pooling arrangement as single name exposures.
- **Intangible Asset Risk:** Lloyd's does not consider there to be material exposure to intangible assets at a syndicate or market level and as such no SCR component will be calculated for this in the estimation of the Basic Solvency Capital Requirement (BSCR).

3.13 Lloyd's Interpretation of Formula and Data Requirements

In producing the calculation template Lloyd's has made several assumptions and applied judgement on the interpretation of the requirements. These areas are:

- Application of risk mitigation to catastrophe risk: The Lloyd's template allows mitigation to be entered at varying levels of the catastrophe risk calculation and aggregation. This should reduce the need for agents to allocate recoveries to underlying perils for example on aggregate or whole account covers. It does however move away from a strict reading of the Delegated Acts which discusses each peril's charge as a stand-alone assessment of the 'loss in basic own funds'. Lloyd's believes credit can and should be taken for mitigation purchased at higher layers or covering larger segments of the business. See section 3.8 and Appendix A for further information.
- 'Loss in basic own funds': Our interpretation of the 'loss' in basic own funds is the change in own funds which arises due to the shock or stress and not any additional own funds which would need to be raised over and above the existing amounts at the valuation date.

- Other non-life catastrophe risk: A strict reading of the Delegated Acts would require mitigation to be calculated once losses are aggregated across risk groups, whereas Lloyd's are allowing this to be done by risk group individually. The approach taken is felt to be more appropriate given the disparate risk groups used in this calculation. Please see 4.10.16 for further information.
- Health catastrophe risk mitigation: Given the income protection component of pandemic risk, Lloyd's is requesting mitigation to be entered once, for all regions, medical expense and income protection losses are combined. This is different from the Concentration and Mass Accident Risks where mitigation is entered at a country level in line with the requirements. Please see section 4.11 for further information.

These areas where judgement has been applied and which could be subject to change in the future.

4 Sheet by Sheet Guidance on Calculation template

This section provides information on the calculation template. Lloyd's has used the final version of the Level 2 Delegated Acts (DA) with the latest amendments as the basis for the production of the template. The technical specifications are available on the European Commission's website, a link is provided in Section 5. EIOPA's specifications include full details of the intended inputs and basis for calculation. If there are uncertainties on the data required in each section, Lloyd's recommends agents consult these specifications prior to contacting Lloyd's.

4.1 Information Tab

This tab collects and provides high level submission information:

- Summary Details – These include the managing agent and syndicate as well as key personnel which Lloyd's should contact with queries on the submission. These contacts will also receive the feedback results produced by Lloyd's.
- Sign-off and Declaration – This section includes the details of the Director taking responsibility for the return. The completion of details here means confirmation of the sign-off of the return.
- Scope and Purpose – This provides high level information on the reasons for the exercise and template and sources of additional information.
- Disclaimer – This includes important details regarding Lloyd's liability relating to this template and its intended use.
- Key – This provides details of the colour coding of cells used throughout the template.

4.2 Version History

This details the version history of the template, describing the changes from previous versions including providing links to the relevant technical specifications.

4.3 Comments

This is a free-text section which allows agents to input comments and notes on the data provided. Lloyd's requests that agents use this section fully to avoid unnecessary questions from Lloyd's on unusual results and provide commentary on specific methods, assumptions or simplifications used in completing the template.

4.4 Validations

This tab contains the validations which syndicates and Lloyd's can use to ensure reasonableness of the results and consistency of inputs both within the template and with other returns such as the QMA and LCR. While most of the validations are formulae based on inputs into the spreadsheet, some require inputs by the agent from the QMA and/or the LCR.

Please note that these validations are designed as a sense check and may not all pass. Please provide a comment in all cases where any validation has failed.

4.5 Standard Formula Structure

This tab is for information only and gives a pictorial representation of the standard formula SCR structure. The colour coding here is used for the individual calculation sheets in order to aid the navigation of the spreadsheet.

4.6 Exchange Rates

This sheet is for information only; it provides the 30 June 2022 exchange rates for use in this exercise. Inputs into the spreadsheet should be converted in pound Sterling using these exchange rates.

4.7 Overall Results

No inputs are required on this sheet; it links to results of the underlying calculations. It shows the high-level risk component amounts of the standard formula SCR as well as the underlying sub-risks. The pre- and post-corridor MCR and EWI are also shown. Results are shown on both bases as described in section 3.3.

4.8 BSCR

No inputs are required on this sheet; it derives the Basic Solvency Capital Requirement (BSCR) from the underlying risk component values in other sheets. Results are shown on both bases as described in section 3.3. Please see Article 87 of the DA text for details of the calculation.

4.9 Non-Life (NL) and Health NSLT (Not Similar to Life Techniques) Underwriting Risk Tabs

4.9.1 NL & Health UW Risk Total

No inputs are required on this sheet which aggregates the non-life and Health NSLT Underwriting Risks, bringing together premium & reserve, catastrophe and lapse risks using defined correlation matrices. Please see Articles 114 (NL) and 144 (Health) of the DA text for details of the calculation.

4.9.2 Non-Life & NSLT Health P&R

This tab collects technical provisions and volume measures to facilitate the derivation of premium and reserve risk including geographical diversification. Premium risk is the risk arising from fluctuations in timing, frequency and severity of claims from business to be earned in the SCR time horizon. Reserve risk is the risk arising from fluctuations in timing and amounts of claim settlements from business that has already been earned at the opening balance sheet. Please see Articles 115 – 117 (NL) and 146 – 148 (Health) of the DA text for details of the calculation.

- Premium and Reserve Risk Calculation – This aggregates the inputs below to estimate the stand-alone SCR for non-life and health NSLT premium and reserve risk including the geographical diversification benefit where applicable. The standard deviation parameters prescribed in the DA text are fed in from the 'Premium and Reserve Risk Params' sheet. Premium risk standard deviation parameters for Motor Vehicle Liability, Fire & Property and General Liability classes have been reduced by 20% to allow for non-proportional reinsurance. The gross of reinsurance calculation here is used to facilitate the calculation of Counterparty Default Risk.
- Technical Provisions – A high level summary of the syndicate's non-life and health related technical provisions split by Solvency II class of business should be provided (direct and proportional classes have been grouped). Note that non-life and health annuities may also be provided on this sheet; this will then automatically feed through to the Life Underwriting Risk sheet and the MCR calculation. At a total level these amounts should reconcile to the technical provisions in the LCR.

The table separates claims and premium provisions by insurance losses and premium (gross of acquisition costs and acquisition costs separately), for gross and reinsurance. It also separates ULAE and non-ULAE expenses, reinsurance bad debt and risk margin. Note as per the specifications for the TPD, the RI acquisition cost column is not included in the net best estimate calculation to avoid a double count.

- Premium Volume Measures – The tables within this section collect earned premium data split by Solvency II class of business (direct and proportional classes have been grouped) split by the 18 global geographical regions. At a total (across region and class of business) level all of these premium amounts should reconcile to those included in the SCR modelling. The following earned premium amounts are collected:
 - Net (of reinsurance) Earned Premium in the previous 12 months – This is the net of reinsurance, gross of acquisition costs premium estimated to be earned premium in the 2022 calendar year. The total figure should reconcile with the forecast earned premium from QMA109 form column A line 9 (at 2022Q2).
 - Net (of reinsurance) Earned Premium in the next 12 months – This is the net of reinsurance, gross of acquisition costs premium estimated to be earned in the 2023 calendar year.
 - Gross (of reinsurance) Earned Premium in the next 12 months – This single column is not being collected by region but is needed by Solvency II class to facilitate the calculation of Counterparty Default Risk. This is the gross of reinsurance and acquisition cost premium expected to be earned in the 2023 calendar year.
 - Net (of reinsurance) Premium expected to be earned after the next 12 months in respect of contracts bound at 2022 year-end - This is the net of reinsurance, gross of acquisition costs premium estimated to be earned from the 2024 calendar year onwards on contracts which are bound at 2022 year-end. There are two key elements to this volume measure: (a) Premium to be earned from 2024 onwards on multi-year contracts bound but not incepted prior to 2022 year-end; and (b) Premium to be earned on contracts bound and incepted at 2022 year-end. These amounts should be discounted to 2022 year-end using the risk-free yield curves.
 - Net (of reinsurance) Premium to be earned after the next 12 months, in respect of contracts not bound at 2022 year-end but bound by 2023 year-end - This is the net of reinsurance, gross of acquisition costs premium estimated to be earned from 2024 calendar year onwards, after the 12 month

anniversary of the binding of the contract, on contracts which are not bound by 2022 year-end but are expected to be bound at 2023 year-end. These amounts should be discounted to 2022 year-end using the risk-free yield curves. This should be considered separately for one year (or less) and multiyear contracts (only 30% of the latter is considered in the exposures for the one-year SCR).

- Reserve Volume Measures - The table within this section collects the reserve related volume measure split by Solvency II class of business (direct and proportional classes have been grouped) split by the 18 global geographical regions. The measure is:
 - Discounted Net (of reinsurance) Claims Provisions within Technical Provision Best Estimate (PCO) – This is the net (of reinsurance) losses (including binary events), with allowance for future premiums, expenses and reinsurance bad debt included within the claims provisions (i.e. earned business only) of the best estimate technical provisions. This should exclude any associated risk margin.

4.9.3 Non-Life & NSLT Health Lapse

Lapse risk is the risk that the profit which is assumed to be included within the technical provision future premiums does not materialise due to policy lapses and discontinuance. Agents should provide details of the profit assumed to be included within the net future premium amounts in the projected net technical provisions at 2022 year-end. This is assumed to be future premiums within technical provisions less future anticipated claims and expenses relating to this business. This should be split by business which has already incepted and is contractually obliged but unaccepted at the valuation date. The expected profit calculation should only include business for which premiums are expected to exceed claims plus expenses.

Lloyd's anticipates that incepted business will have relatively little (or even negative) profit included within technical provisions as most premium will have already been received (and therefore is not included within technical provisions); as such insurance losses are likely to dominate these provisions. In determining where future profit is included within technical provisions, agents should apply principles of proportionality. Ideally the identification of this profit should be on a policy by policy basis however agents may undertake this on the basis of groups of policies, if deemed appropriate under Article 35 of the Delegated Acts. The data collection is also split by non-life and health NSLT classes of business.

Please see Articles 118 (NL) and 150 (Health) of the DA text for details of the calculation.

4.9.4 Premium and Reserve Risk Params

No inputs are required on this sheet. It contains the parameters for premium and reserve risk calculations. These have been revised in line with latest regulations.

4.10 Non-life Catastrophe Risk Tabs

Non-life catastrophe risk relates to the risk of loss or of adverse change in the value of insurance liabilities, resulting from uncertainty from the occurrence of extreme or exceptional events. Please see Articles 119 to 135 of the DA text for details of the calculation.

4.10.1 NL Cat Risk Total

This sheet aggregates the non-life catastrophe risk results for all perils and categories. Both gross and net of reinsurance results are derived, the gross being used to estimate the simplified risk mitigating effect of outwards reinsurance for Counterparty Default Risk. As described in section 3.8, users may use the inputs on this sheet to provide mitigation amounts at a higher level than the peril level calculation such that credit can be taken for contracts which cover multiple perils and losses. Article 119 includes details of the aggregation.

4.10.2 Natural Catastrophe Risk – Geographical Diversification

Natural catastrophe risk is derived separately across European and non-European regions as displayed in the 'Region Information' sheet. Geographical diversification benefit is calculated separately; across CRESTA zones where appropriate and then by country for European exposures and between the remaining 14 regions for non-European exposures.

Articles 120 to 126 cover Natural Catastrophe Risk (European and non-European).

4.10.3 Eur NatCats – Sum Insureds

2020YE update: Following latest revisions to the delegated acts, the sum insured for European natural catastrophe risk should be completed considering sum insured at CRESTA zone level. The diversification benefit by CRESTA zone, calculated based on the delegated acts, should be completed using the Eur NatCats – SI CRESTA zones sheet (see section 3.10.4). Alternatively, an option to use a simplified calculation has been added. As per the latest

revisions to the delegated acts, this applies the highest CRESTA zone risk weight for each country/risk – these weights have been included in the calculation.

All syndicates with exposures of more than £10bn aggregate Sum Insured in European (across all perils excluding UK) NatCats are now required to complete the CRESTA zone level calculation for all perils. This is because information from the global standard formula (aggregation of syndicate's Lloyd's Standard Formula submissions) is used in the derivation of the SCR for Lloyd's Brussels. Therefore, syndicates following the simplified approach should not have an aggregate European (excl. UK) Nat Cat Sum Insured across all perils that exceeds £10bn. Nevertheless, syndicates with exposures that do not exceed £10bn may also complete the CRESTA zone level calculation.

This tab collects the inputs for European natural catastrophe risk by each country and natural catastrophe risk peril. This information is pulled from the Eur NatCats – SI CRESTA zones tab and aggregated to country level, allowing for diversification between CRESTA zones. A simplified calculation option can be selected so that country-level sum insured information can be inputted directly into the tab. This simplification applies the highest CRESTA zone risk weight for each country/risk to the sum insured inputs, as per the Delegated Acts.

Exposure captured here relates to regions 1 to 4 of the 18 geographical regions shown on the 'Region Information' tab, where the perils are applicable. For example, there is deemed to be no Earthquake risk in Spain or UK, so inputs are not required. As noted in 3.6, the definition of the countries to include within 'France' varies. Further detail can be found in the European natural catastrophe risk sum insured input tab. Additionally for natural catastrophe risk, please use geographical region 5 (Central & Western Asia) for Russia and the Ukraine. There are no factors for these countries under European natural catastrophe risk; as such Lloyd's has included these within the non-European calculation.

The classes of business covered by this sub-module are direct and proportional only, non-proportional business is captured within other sections of the non-life catastrophe risk sub-module. The property classes covered (Fire, MAT and Motor) by each peril (Windstorm, Earthquake, Flood, Hail and Subsidence) are detailed below the input table.

The table collects the total sum insured for each class of business in each country which has exposure to each peril. Note that sum insureds will be counted across all perils to which they apply but may be different as certain policies may not be applicable to certain perils. The sum insured should be the syndicate's share of the exposure only and be in line with the standard formula regulation. It can be any reasonable measure of sum insured, for example the amount at the valuation date or an expected average over proposed calendar year.

In the Delegated Acts, in deriving a total volume measure for flood and hail perils, the motor class is given a greater weighting of 1.5 and 5 times the sum insureds respectively.

4.10.4 Eur NatCats - SI CRESTA zones

This tab collects the inputs for European natural catastrophe risk by each country, CRESTA zone and natural catastrophe risk peril. The guidance in section 3.10.3 above should be referred to when completing this tab. Zone mappings for each region can be found in Annex IX of the Delegated Acts.

This tab is not required to be completed when the simplification in the Eur NatCats - Sum Insureds tab is selected.

4.10.5 Eur NatCats – Mitigation

This sheet derives the Gross and Net Loss for each European natural catastrophe peril. The inputs here relate solely to the mitigation arising from each of the perils and scenarios.

Gross losses are based on the volume measures derived on the previous sheet as well as risk factors prescribed by country/peril and allowance for geographical diversification. To determine the gross losses:

- For windstorm, flood and hail perils, two scenarios are prescribed; each with two losses of a defined percentage of the diversified 'specified loss'. The mitigation is to be estimated based on each of the scenario losses. The losses within each scenario are assumed to be consecutive and independent and no further risk mitigation is entered between these events. The SCR charge is then taken as the largest scenario after summing the two losses.
- For earthquake and subsidence scenarios, 100% of the diversified 'specified loss' is taken. Mitigation can then be estimated based on the level of this gross loss.

Please see the principles noted in 3.8 for estimating recoveries from gross losses.

4.10.6 Non Eur NatCats – GEPs

This sheet collects the inputs for the non-European natural catastrophe risk. Exposure captured here relates to regions 5 to 18 shown on the 'Region Information' tab. Note that although Russia and the Ukraine are included in the Eastern Europe region (as per the 'Regional Information' sheet) no factors are prescribed for these countries for European Natural Catastrophe Risk; as such syndicates should include any exposures in these countries to the Central & Western Asia region (Region 5).

The classes of business covered by this sub-module are direct and proportional only, non-proportional business is captured within other sections of the non-life catastrophe risk sub-module. The property classes covered (Fire, MAT and Motor) by each peril (Windstorm, Earthquake, Flood and Hail) are detailed below the input table. There is no subsidence risk for non-European exposures.

The inputs should be gross earned premium amounts to be earned in the next 12 months (i.e. 2023 calendar year for 2022YE SF) by region for each class of business which has exposure to that peril. Note that premiums will be counted across all perils to which they apply but may be different as certain policies may not be applicable to certain perils.

4.10.7 Non Eur NatCats – Mitigation

This sheet uses the estimated 2023 gross earned premium from the previous sheet to estimate a gross and net capital requirement following allowance for geographical diversification benefit. The gross loss is based on a factor which varies by peril. The inputs here relate solely to the mitigation arising from each of the perils and are applied to derive a net loss. Please see the principles noted in 3.8 for estimating recoveries from gross losses.

4.10.8 Non-Proportional Property

Similar to non-European natural catastrophe perils, this section collects Gross Earned Premium to be earned in the next 12 months (i.e. 2023 calendar year) by the 18 worldwide geographical regions. Article 127 of the DA text includes the details of the calculation.

This section relates purely to the non-proportional coverage of property risks. A further split of the inputs is required by the sub-classes falling under this non-proportional reinsurance class. These classes are Other Motor, Fire and Other Damage, Legal Expenses, Assistance and Miscellaneous Financial Loss. Note that non-proportional policies relating to the Credit & Suretyship direct and proportional class (which are usually counted under non-proportional property) are not included in this module, the catastrophe risk for this sub-class being captured elsewhere.

There should be no double counting of premium across classes or regions within this section. Where premium relates to more than one class or region, these should be apportioned by the managing agent, using any reasonable basis. Where premium relates to multiple classes of business, including classes not covered under non-proportional property, only the portion of the premium relevant to these classes should be included in this section.

In accordance with Article 127, Annex III paragraph 5 and Annex II of Commission Delegated Regulation (EU) 2015/35, no credit is applied for geographical diversification for all underlying non-proportional property classes in estimating the gross capital requirement.

4.10.9 Man Made Catastrophe Risk – General Comment

The calculation of the capital charge for man-made catastrophes is based on global exposure (not split into regions) and the charge is derived under a series of scenarios for each peril. Lloyd's has provided a detailed description of the data requirements for each peril within the calculation template and below.

Articles 128 to 134 of the DA text cover Man-Made Catastrophe Risk.

4.10.10 Man Made – Motor

This scenario covers direct and proportional motor vehicle liability risks only. The data required here is the number of vehicles insured with a 'deemed policy limit' below and above €24m separately. This can be classed as £21m for the purposes of this calculation (i.e. £1 = €1.16). The 'deemed policy limit' should be determined as the overall limit of the motor vehicle liability insurance policy or, where no such limit is specified in the terms and conditions of the policy, the sum of the limits for damage to property and for personal injury should be used. Where the policy limit is specified as a maximum per victim, the deemed policy limit should be based on the assumption of ten victims.

The number of motor vehicles covered by the proportional reinsurance obligations of the insurance or reinsurance undertaking should be weighted by the relative share of the undertaking's obligations in respect of the sum insured of the motor vehicles.

Article 129 of the DA text covers the calculation in more detail.

4.10.11 Man Made – Marine

The scenario for marine risk combines the results from a vessel collision and a platform explosion. The inputs are the results of each of these scenarios. The classes covered in these scenarios are the marine elements of the direct, proportional and non-proportional MAT classes. Article 130 of the DA text covers the calculation in more detail.

The capital requirement for the vessel collision is based on the maximum sum insured for a single vessel across hull, liability and pollution exposures.

The capital requirement for the platform explosion is the maximum sum insured for a single (oil or gas) platform. This should cover the sum insured for compensation for property damage, removal of wreckage, loss of production, capping/securing the well and liability losses arising from the explosion.

4.10.12 Man Made – Aviation

The aviation scenario requires the single largest aircraft sum insured across both hull and liability perils. The classes covered in this scenario are the aviation elements of direct, proportional and non-proportional MAT classes. Article 131 of the DA text covers the calculation in more detail.

4.10.13 Man Made – Fire

The fire scenario requires the sum insured for the largest single building concentration covering property and content damage due to fire or explosion, including as a result of terrorist attacks. The measure of concentration of exposure is defined as buildings fully or partially covered within a radius of 200 metres. This concentration may occur over one or multiple insurance or reinsurance contracts. The classes covered within this scenario are direct and proportional fire and property only (i.e. does not include non-proportional fire and property risks). Article 132 of the DA text covers the calculation in more detail. Note that there is a simplified calculation that can be applied under Article 90c of the Delegated Acts, with the SCR based on the largest exposures relating to one of the following: Industrial fire (SCR_{firei}); Commercial fire (SCR_{firec}) and Residential fire (SCR_{firer}).

4.10.14 Man Made – Liability

The liability scenario requires gross earned premium in the next 12 months (i.e. 2023 calendar year) and the largest limit of indemnity for each risk group under liability risk. These groups are Professional Malpractice, Employers' Liability, Directors' and Officers', General Liability (Direct and Proportional) and General Liability (Non-Proportional) as defined in the DA text and template. These classes would largely fall under direct, proportional and non-proportional liability classes, however, please note that there are other segments of the general liability Solvency II classes covered elsewhere in the non-life catastrophe risk sub-module (notably 'Other Non-Life Catastrophe Risk').

To estimate the total gross loss for each risk group, the gross earned premium is multiplied by a risk factor. To estimate the reinsurance recoveries and the resulting net loss, the total gross loss is split into a number of equally sized individual losses based on a function of the largest limit of indemnity. Please use the 'Assumed number of claims' and 'Gross amount of each claim' column as the basis to determine the resulting outwards reinsurance recoveries. The losses arising from each risk group can be assumed to be stand-alone and independent.

Article 133 of the DA text covers the calculation in more detail.

4.10.15 Man Made - Credit and Surety

The scenario for credit and surety risk combines the results from a Default Risk scenario and a Recession Risk scenario. The inputs are the results of each of these scenarios. Article 134 of the DA text covers the calculation in more detail.

The classes covered by these scenarios relate to direct and proportional credit and surety classes. Catastrophe Risk arising from the non-proportional credit and surety class is covered within the 'Other Non-Life Catastrophe Risk' section.

The capital requirement for the default risk scenario is based on the loss in own funds which would arise from an immediate default of the two largest credit insurance exposures of an insurance or reinsurance undertaking. The calculation of the capital requirement is based on the assumption that the loss-given-default, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles, of each credit insurance exposure is 10% of the sum insured in relation to the exposure. The determination of the two largest credit insurance exposures of the insurance or reinsurance undertaking should be based on a comparison of the net loss-given-default of the credit insurance exposures, where the loss-given default is after deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles.

The capital requirement for recession risk is equal to the loss in basic own funds of insurance and reinsurance undertakings that would result from an instantaneous loss of an amount that, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles, is equal to 100% of the premiums earned by the insurance or reinsurance undertaking during the next 12 months in lines of business 9 and 21 (direct and proportional credit and suretyship insurance).

4.10.16 Other Non-Life Catastrophe Risk

Other non-life catastrophe risk is intended to capture other risks not covered by the natural, non-proportional or man-made catastrophe risk sections above. The input required is gross earned premium in the next 12 months (i.e. 2023 calendar year) split by the following classes of business:

- Insurance and reinsurance obligations included in lines of business 6 and 18 (direct and proportional Marine, aviation and transport insurance) other than marine insurance and reinsurance, and aviation insurance and reinsurance.
- Reinsurance obligations included in line of business 27 (Non-proportional marine, aviation and transport reinsurance) other than marine reinsurance and aviation reinsurance.
- Insurance and reinsurance obligations included in lines of business 12 and 24 (direct and proportional Miscellaneous financial loss) other than extended warranty insurance and reinsurance obligations provided that the portfolio of these obligations is highly diversified and these obligations do not cover the costs of product recalls.
- Reinsurance obligations included in line of business 26 (Non-proportional casualty reinsurance) other than general liability reinsurance.
- Non-proportional reinsurance obligations relating to insurance obligations included in lines of business 9 (Credit and Suretyship Insurance).

The factors for determining the gross losses are set out in the DA text. Note that the Lloyd's template allows the calculation of mitigation to be done at the risk-group level, thereby assuming each of these losses is stand-alone and independent. Please note: a strict reading of the DA text would require mitigation to be calculated once losses are aggregated across risk groups. The approach is considered to be appropriate given the disparate risk groups used in this calculation.

Article 135 of the DA text covers the calculation in more detail.

4.10.17 Region Information

No inputs are required on this tab. This sheet shows the allocation of countries or territories to the 18 regions defined in the DA text as well as the short-codes used for European countries. This information is also contained in Annex III of the DA text.

4.10.18 Lines of Business

No inputs are required on this tab. This sheet shows the detailed description of each of the Solvency II classes of business. This information is also contained in Annex I of the DA text.

4.10.19 Correlations

No inputs are required on this tab. This sheet contains correlation matrix parameters for non-life catastrophe risk as prescribed by the DA text.

4.10.20 Correlations CRESTA zones

No inputs are required on this tab. This sheet contains correlation matrix parameters for CRESTA zones for European NatCat perils as prescribed by the DA text.

4.10.21 Risk zone mapping

No inputs are required on this tab. This sheet contains mappings of regions to CRESTA zones, for information purposes, for European NatCat perils as prescribed by the DA text.

4.11 Health Catastrophe Risk Tabs

Health catastrophe risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty related to outbreaks of major pandemics, as well as the unusual accumulation of risks under such extreme circumstances. The standard formula SCR for health catastrophe is derived from the aggregation of 3 different scenarios as discussed (along with the required data inputs) below. In general, these

scenarios are based on the number of lives covered and events which may affect those lives under each scenario. Note that detailed data requirements are given within each of the sections of the calculation template, Articles 160 to 163 of the DA text also provide further information.

As noted in section 3.9, the DAs don't explicitly allow for catastrophe risk on Non-proportional health business and imply that this is to be included in the three scenarios. However, the inputs required for the scenarios are detailed and reinsurers of this business may not have the required granularity. To account for this, and similar to the approach in the past, Lloyd's has allowed catastrophe risk on non-proportional health to be included as a 250% of gross (of reinsurance) premium (earned in the next 12 months, i.e. for 2022YE SF, 2023 calendar year) shock; this is the default allowance. If agents are able to include this business in the three individual scenarios, then they should do so and can set the selection on the 'Health Cat Risk Total' sheet to '*Scenario*' which will set the Non-Proportional Premium Shock to zero.

4.11.1 Health Cat Risk Total

This sheet aggregates the results from the subsequent health catastrophe risk perils as per Article 160 of the DA text with the addition of non-proportional health catastrophe risk as noted below. A gross and net SCR is calculated. The gross output is used as an input to the risk mitigating effect simplification used for Counterparty Default Risk.

At the top of this sheet, select the drop down to indicate the method which has been adopted to allow for Non-proportional health catastrophe risk as described in 4.11 above. Within this tab, further risk mitigation may be included on the Net SCR from each peril as discussed in 3.8.

4.11.2 Non-Proportional

As noted above, this sheet has been added to incorporate risks relating to non-proportional health catastrophe risk, which may not be allowed for within the other scenarios. The estimate of gross earned premium in next 12 months (i.e. 2023 YoA for 2022YE SF) is taken from the premium risk inputs on the 'Non-Life & NSLT Health P&R' tab. If this is not felt to be appropriate, for example if this amount includes policies which do not cover catastrophic events, then the figure in this tab can be overwritten. Additionally, as noted above, if non-proportional health business is to be included within the individual health catastrophe scenarios, this charge can be set to zero on the 'Health Cat Risk Total' tab to avoid double counting. Please see the principles noted in 3.8 for estimating recoveries from the gross loss.

4.11.3 Mass Accident

This scenario covers health insurance and reinsurance contracts (non-proportional may be included within the 'Non-Proportional' charge as described above), other than workers' compensation insurance and reinsurance classes, across 31 European countries (this peril is not applicable to non-European regions). The calculation is described in Article 161 of the DA text. The DA text states that health catastrophe risk applies to worldwide exposures, however no r_s factors are provided for non-European exposures. As a result, Lloyd's is not including risk arising for non-European exposures to this peril.

The data required ($E_{(e,s)}$) is the total sum insured for each inhabitant of each country for the event type covered, where this is covered by the policy. Note this will give rise to figures counting across events where insureds are covered across multiple perils, but there should be no counting of sum insureds across different countries. More detail on how sum insured can be determined is included within the template.

A gross loss is produced for each country using the total sum insured, parameters for the proportion of insureds affected and provided risk factors. Reinsurance recoveries may then be estimated for each country separately assuming each country's event is stand-alone and independent. The net SCR for each country is then estimated from this and aggregated to produce a total SCR estimate for mass accident risk.

4.11.4 Accident Concentration

This scenario covers insurance and reinsurance obligations (non-proportional may be included within the 'Non-Proportional' charge as described above) arising from workers' compensation and group income protection contracts classes. This section includes risks arising from global exposures; it includes the 31 European regions as per mass accident risk. To allow for non-European exposures and give credit for geographical diversification, Lloyd's has included non-European regions in which to collect the exposures. The calculation is described in Article 162 of the DA text.

The data required is as follows:

- C_c - The largest accident risk concentration of the insurance and reinsurance undertaking in each country, this should be based on individuals working within the same building within each country c , provided they are covered for at least one of the risk events under workers' compensation or group income protection cover.
- $CE_{(e,c)}$ - The average value of benefits payable by the insurance and reinsurance undertaking for each event type e for the largest accident risk concentration in each country c .

Note this will give rise to counting the sum insured several times across events where insureds are covered across multiple perils but there should be no counting of the same sum insured across countries.

A gross loss is produced for each country using the average sum insured, number of concentrated lives and provided risk factors. Reinsurance recoveries may then be estimated for each country separately assuming each country's event is stand-alone and independent. The net SCR for each country is then estimated from this and aggregated across European and Non-European exposures to produce a total SCR estimate for accident concentration risk.

4.11.5 Pandemic

This scenario covers health insurance and reinsurance contracts (non-proportional may be included within the 'Non-Proportional' charge as described above), other than the workers' compensation insurance and reinsurance classes. This section includes risks arising from global exposures; this includes the 31 European regions as per mass accident risk. To allow for non-European exposures Lloyd's has included non-European regions in which to collect the exposures. The calculation is described in Article 163 of the DA text.

The data required is as follows:

- N_c – The number of insured persons of the insurance and reinsurance undertaking which are inhabitants of each country c and are covered by insurance contracts covering medical expenses.
- $CH_{(h,c)}$ - The best estimate of the amounts payable by insurance and reinsurance undertakings for an insured person in each country c in relation to medical expense insurance or reinsurance obligations for healthcare utilisation h in the event of a pandemic.
- E - The income protection pandemic exposure of the insurance or reinsurance undertaking calculated as the sum over all insured lives covered by income protection insurance or reinsurance of the benefits payable in case of a permanent work disability caused by an infectious disease. The value of the benefits should be the sum insured or, where the contract provides for recurring benefit payments, the best estimate of the benefit payments assuming that the insured person is permanently disabled and will not recover.

The gross loss is based on the above inputs and prescribed factors as set out in the template and the DA text. The gross loss is a single result combining all countries and after allowance for medical expense and income protection risks. Note that no geographical diversification benefit is given for pandemic risk. Reinsurance recoveries may then be estimated for this.

4.12 Life Underwriting Risk Tabs

4.12.1 Life Risk Total

This sheet requires no inputs; it aggregates the inputs from the 'Life Underwriting Risk' tab to produce an overall Life Underwriting Risk SCR based on the correlation matrix in Article 136 of the DA text.

4.12.2 Life Underwriting Risk

Both life syndicates and syndicates with exposure to non-life or health annuities are required to complete this return and value underwriting risk in relation to these operations. The tab collects the following details.

- Technical Provisions & Capital at Risk – Similar to non-life and health NSLT the top of this tab collects technical provisions summarised by life Solvency II class of business split by gross and reinsurance best estimate and risk margin. This section also collects provisions relating to annuities stemming from non-life contracts valued similarly to life techniques, although if a value has already been provided on the 'Non-Life & NSLT Health P&R' tab, this will automatically be linked through.
The Capital at Risk for all life insurance contracts should also be included in this section. This feeds into the MCR calculation.
- Life Insurance Underwriting Risk – Life insurance underwriting risk includes the risk arising from mortality, longevity, disability/morbidity, lapse, expense, revision and catastrophe risk. Please refer to Articles 137 to 143 of the Delegated Acts for more information. There are a number of simplifications that can be applied – refer to Articles 91 to 96 of the Delegated Acts.

4.12.3 SLT Health

No inputs are required on the tab since Lloyd's calculations do not include a capital charge for SLT Health, as it is assumed to be immaterial.

4.13 Market Risk Tabs

Market risk relates to uncertainty in the level or volatility of market prices of financial instruments. This is assessed by the impact of movements in the level of financial variables such as stock prices, interest rates, real estate prices and exchange rates. The full calculation is set out in Articles 164 to 188 of the Delegated Acts.

As described in section 3.3 the financial investments supporting syndicates and feeding into the market risk module will be considered on two different bases.

Each of the sub-modules is addressed in turn below.

4.13.1 Market Risk Total

This sheet aggregates the individual market risk sub-module results from the sheets below on both of the relevant bases. Note that certain factors in the correlation matrix depend on the shock which determines the interest rate risk SCR charge. The full aggregation is described in Article 164 of the DA text.

As noted in section 3.3, this section also collects values used to produce a scale factor to derive the inputs for Basis 1 from the Basis 2 inputs. These inputs are:

- The syndicate assets (excluding Funds in Syndicate) projected to 31 December 2022 valued on a Solvency II basis with a zero-opening net asset value, as per those used to calculate market risk in the LCR. **This is the basis that should be used for all of the inputs for the calculation of market risk.**
- The total syndicate assets projected to 31 December 2022 valued on a Solvency II basis including any Funds in Syndicate (FIS).

The derived proportion is then applied throughout the market risk sub-modules to determine the adjusted Basis 1 capital charge.

4.13.2 Interest Rate Risk

Interest rate risk exists for all assets and liabilities for which the net asset value is sensitive to changes in the term structure of interest rates or interest rate volatility. This primarily relates to fixed interest securities for assets and technical provisions for liabilities. The full calculation is described in Articles 165 to 167 of the DA text.

The inputs required on this tab are as follows:

- Assets – the market value of the Basis 2 assets (i.e. discounted) within each currency split for all assets exposed to interest rate risk. The average modified duration of all assets within each currency is also required. The Basis 1 amounts by currency are then determined from the above inputs.
- Liabilities - the undiscounted cashflows in relation to each currency at each specified maturity. Note that a maturity of '1' refers to all cashflows deemed to occur between time 0 (i.e. the valuation date) and time 1.

Interest rate risk is derived based on prescribed upwards and downwards shocks to the risk-free 2022 mid-year (30 June 2022 yield curves. The risk-free yield curves are those supplied by EIOPA, which can be found in the 'Risk Free Yield Curves' tab, these are the same curves that should be used for the Solvency II basis technical provision calculations.

4.13.3 Equity Risk

Equity risk arises from uncertainty in the level or volatility of market prices for equities. Agents are required to provide details of their held equity investments split as follows:

- Type 1 exposures: listed in regulated markets which are members of the OECD or EEA and qualifying unlisted equities that meet the requirements set out in Article 168a of the latest delegated regulations;
- Type 2 exposures: not listed in EEA or OECD countries, non-qualifying unlisted equities, private equities, hedge funds, commodities and other alternative investments. They should also comprise of all other assets not covered elsewhere in equity risk module and not included within property risk, spread risk and interest rate risk.
- Infrastructure equities separated by public section and private sector undertakings. These comprise of undertakings that operate within either Economic Infrastructure (Transport, Utilities, Communications and Renewable Energy) or Social Infrastructure (Schools, Healthcare, Government buildings and sports structures).

These exposures are further split as follows:

- Investments of a strategic nature – please see Article 171 of the DA text for the criteria for classification of strategic equity investments. These relate to participations in third parties which are deemed to be material (from the perspective of the third party) and further, there are clear intentions to maintain this investment for the foreseeable future.
- Long term investments – please see article 171a of the revised DA text for criteria for classification of long-term equity investments
- All other equity investments

Agents are required to enter the expected market value of the above investments at 31 December 2022 in each of the four cells on this tab.

The equity risk charge is determined from factors for each of the four equity classifications. Lloyd's has also incorporated the 'symmetric adjustment' to the factor for other investments as specified by Article 172 of the Delegated Acts. Lloyd's has estimated this based on the FTSE Global All Cap Index. The adjustment for this exercise is -6.02%.

The equity risk charge is based on the market values and the above factors. A value for Basis 1 is also derived based on the proportion produced in the 'Market Risk Total' sheet. The full calculation is described in Articles 168 to 173 of the DA text.

4.13.4 Property Risk

This tab uses the value of all property investments within the syndicate to estimate the risk arising from the sensitivity of the market value of these assets. In line with the DA text, property investments can be classified as the following:

- land, buildings and immovable-property rights; and
- property investment for the own use of the insurance undertaking.

Otherwise, the following investments should be treated as equity risk and considered accordingly in the equity risk sub-module:

- an investment in a company engaged in real estate management, or
- direct or indirect participations in real estate companies that generate periodic income, or which are otherwise intended for investment purposes;
- an investment in a company engaged in real estate project development or similar activities, or
- an investment in a company which took out loans from institutions outside the scope of the insurance group in order to leverage its investments in properties.

The shock applied to these assets is a 25% fall in their value to estimate the property risk charge. A value for Basis 1 is also derived based on the proportion produced in the 'Market Risk Total' sheet. The full calculation is described in Article 174 of the DA text.

4.13.5 Spread Risk

Spread risk covers the sensitivity in the values of assets, liabilities and financial instruments to changes in the level or volatility of credit spreads over the risk-free interest rate term structure. This will apply particularly to corporate bonds, subordinated debt, hybrid debt, asset-backed securities and credit derivatives.

This was updated in the 2021YE template in line with latest regulations. Please see Articles 175 to 181 and the revised regulations set out in Delegated Regulation (EU) 2018/1221 of 1 June 2018 for further detail on the calculation.

No spread risk applies to EEA government bonds issued in their domestic currency or instruments issued by the below entities. Amounts relating to these assets should not be included in the spread risk sheet.

- The European Central Bank; or
- Central government or central banks, including those that are fully, unconditionally and irrevocably guaranteed by regional governments and local authorities which are part of member states of the EEA issued in their domestic currency; or
- Multilateral development banks; or
- The European Community; or
- The International Monetary Fund; or
- The Bank for International Settlements.

To derive the spread risk charge different shocks are applied with reference to different rating categories for bonds, structured products and credit derivatives. Each of these is addressed in turn below:

- Bonds and Loans – These relate to all bonds and loans split by covered bonds, bonds issued by governments outside of the EEA in their domestic currency, bonds issued by (re)insurance undertakings not meeting their MCR and all other bonds and loans (including all government bonds not issued in their domestic currency). Agents are requested to provide the classification of the bond as per the above as well as the market value, modified duration and credit rating of each bond. If the bond is unrated and collateral exists, this may also be supplied. The SCR charge is determined as the product of the market value and a risk factor set out in the DA text which varies by classification, duration and credit rating, with an adjustment for collateral (where applicable). Where the bond relates to exposures to Member States' regional government or local authority please refer to the revised sections of Article 180 for more information in assigning credit ratings to these investments. Where a bond is unrated, and collateral does not exist please consider the new Articles 176a-c for requirements to be met when assigning credit ratings to these investments.

Non-tranched Mortgage Backed Securities (MBS) exposures (such as Freddie Mac and Fannie Mae) should be treated as bonds.

For bonds or loans issued by unrated insurance or reinsurance undertakings there is a table within the template which shows how the credit quality of each undertaking should be derived based on the solvency ratio.

- Financial Instruments Based on Repackaged Loans and Other Tradeable Securities – These relate to investments in instruments based on securitisation or re-securitisation (this includes all tranched MBS). These are classified as Senior and Non-Senior Simple Transparent Standardised (STS) securitisations, re-securitisations and other securitisations. For each of the above categories, agents are requested to provide the classification, market value, credit rating and modified duration. For Senior and Non-Senior STS securities, risk factors associated with the contracts are now differentiated by duration which was not the case under the previous regulations.
- Credit Derivatives – The calculation for spread risk arising from credit derivatives should be as per the DA technical specifications which can be found in a link at the end of this guidance. This is based on a scenario approach applied to credit default swaps (CDS), total return swaps (TRS), and credit linked notes (CLN) based on the loss in basic own funds arising from a change to the credit spreads of the above instruments. The shocks, as set out in the DA text, are an increase varying by credit quality step and decrease of 75%.

An SCR charge is then derived for spread risk as the sum of the SCRs for each sub-component. A value for Basis 1 is also derived based on the scaling factor derived in the 'Market Risk Total' sheet.

4.13.6 Concentration Risk

This risk sub-module relates to the concentration risk arising from assets considered in the equity, spread and property risk sub-modules, and excludes assets covered by the Counterparty Default Risk module (e.g. cash at bank) in order to avoid any overlap between both elements. The risk arising from concentration risk only includes the accumulation of exposures in financial investments in the same counterparty. It does not include any other types of concentration. Please see Articles 182 to 187 of the DA text for the full details of the calculation including the assets to be captured in this module and the required level of grouping of counterparties.

Inputs for this sub-module are:

- Total amount of financial investment assets included in the concentration risk sub-module. Lloyd's has taken this as the sum of the total exposure to each counterparty in the large table of inputs. If this is not correct, for example if some immaterial exposures have not been included in the table then this value can be overwritten.
- Counterparty name or grouping.
- Type of exposure to counterparty should be split as follows:
 - 1 - Member States' government and central bond, including those which are fully, unconditionally and irrevocably guaranteed by the Member States' regional governments and local authorities, multilateral development banks and international organisations (these do not incur a charge, but should be included as part of total exposures to be considered for concentration risk)
 - 2 - standard – this is all exposures that do not belong in any other category
 - 3 - mortgage and public sector covered bonds,
 - 4 - property
 - 5 - non-EEA government and central bank bonds.
- Credit rating. This input is not required for property exposures. For unrated counterparties, refer to the revised Article 182 to assign a rating based on the solvency ratio of the counterparty.
- Total exposure in GBP 000s.

Where a number of exposures exist within a single counterparty, a weighted average rating should be calculated for these. Where part (or all) of the exposure is unrated, a rating should be assigned based on the requirements set out in additions to Article 182 which consider solvency ratios where available.

The calculation determines a maximum threshold of total exposure based on the type of exposure and rating/solvency ratio. Any exposure in excess of this threshold is then subject to a charge 'g_i' according to a factor which also varies by the type of exposure and rating/solvency ratio. This is then aggregated with credit given for diversification across different types of exposure. A value for Basis 1 is also derived based on the scaling factor derived in the 'Market Risk Total' sheet.

4.13.7 Currency Risk

Currency risk arises from changes in net asset values from uncertainties in the level or volatility of currency exchange rates. Inputs here are the total asset and liability exposure by currency. For each relevant foreign currency, the position should include any investment in foreign instruments where the currency risk is not hedged.

The charge for currency risk for each currency is the loss in basic own funds which arise following either a 25% rise or fall in the exchange rate against GBP (i.e. effectively 25% of the net asset value for all currencies except GBP). The currency risk charge is then the total across all non-GBP currencies. A value for Basis 1 is also derived based on the scaling factor derived in the 'Market Risk Total' sheet.

4.13.8 Risk Free Yield Curves

This sheet requires no inputs. It contains the risk-free yield curves as supplied by EIOPA at mid-year 2022 (30 June 2022), as well as the prescribed shocked curves for the interest rate risk calculation.

4.14 Counterparty Default Risk Tabs

4.14.1 Counterparty Default

This module estimates the risk of losses arising from unexpected default or deterioration in credit standing of counterparties and debtors of the undertakings within the SCR period. This includes risks arising from:

- Type 1 exposures such as risk-mitigating contracts, including reinsurance, derivatives not included within the spread risk module and cash at bank; and
- Type 2 exposures such as future receivables from intermediaries, policyholder debtors and mortgage loans.

Cash at bank and mortgage loans are not considered financial investments on the Solvency II balance sheet and as such no scaling of results is required in this module to adjust for basis 1.

Column by column guidance on the inputs required are found at the top of this sheet. Please see Articles 189 to 202 of the DA text for further details on the calculation.

For Type 1 exposures a simplification for reinsurance risk mitigation has been calculated in the 'CPD Risk Mitigating Effect' sheet. The risk mitigating effect is calculated as the difference between a hypothetical 'gross' of reinsurance SCR and the net SCR for underwriting risk. This is designed to capture the additional counterparty default risk which arises under the stressed underwriting risk as the reinsurance recoverables increase. Note that in order to simplify the inputs; some approximations have been used to arrive at the gross of reinsurance SCR in respect of underwriting risk. The risk mitigating effect is apportioned across all non-life reinsurance contracts in line with the existing recoverables. Note that for Reinsurance and Insurance Securitisation, only 50% of the risk mitigating effect is taken in to account.

If the risk mitigating effect simplification is not deemed to be appropriate, then it may be switched off in cell C23 of the 'Counterparty Default' sheet and the risk mitigating effect derived explicitly for each counterparty.

Counterparty exposure to Lloyd's syndicates should be classed as 'A' rated entities for the purpose of this calculation.

The loss given default for each counterparty within Type 1 exposures is based on a loss rate (defined by the nature of the contract type with the counterparty) and the total recoverables plus risk mitigation less a proportion of any collateral currently being held. As a standard, Lloyd's assumes that only 90% of the collateral is available based on the assumption that the third-party requirement is not met. Please see Article 197(2) of the DA text for further details.

The Type 1 amounts are then aggregated by consideration of probability of default and the variance of each credit rating/solvency ratio loss distributions.

To estimate the Loss Given Default charge for Type 2 exposures enter amounts separately for those which over-due by more than 3 months and all other exposures. The charge for these is 15% of all amounts over-due by less than 3 months and 90% for those that are over-due by more than 3 months.

4.14.2 CPD Risk Parameters

This sheet requires no inputs. It is used in the aggregation of results for Type 1 counterparty default risk exposures.

4.14.3 CPD Risk Mitigating Effect

This sheet requires no inputs. As noted above it derives the total amount of risk mitigating effect based on the simplification set out in the DA text for underwriting risk exposures.

4.15 Operational Risk

This tab is used to estimate operational risk arising from inadequate or failed internal processes, systems, personnel, procedures or external events. This tab collects high level Gross Earned Premium data for 2021 (12 months prior to previous 12 months) and projected for 2022 (previous 12 months) calendar years split by life obligations, non-life obligations, unit-linked obligations. Unit linked expenses in respect of life insurance contracts where investment risk is borne by policyholders are also collected.

The calculation uses inputs from the underwriting risk sheets in respect of gross best estimate technical provisions. The operational risk charge is then derived based on a series of factors applied to these volumes.

Note that as the operational risk charge is subject to a maximum of 30% of the Basic Solvency Capital Requirement (BSCR), the charge is derived on both of the bases described in section 3.3.

Please see Article 204 for further details on the calculation of this module.

4.16 Minimum Capital Requirement

The minimum capital requirement is derived separately for life (including non-life and health annuities) and non-life exposures. The pre-corridor MCR also feeds the Early Warning Indicator amount as proposed by the PRA in May 2013. This is also calculated in this sheet.

The non-life MCR is based on factors applied to projected net written premium amounts in the previous 12 months (i.e. 2022 calendar year for 2022YE SF) and the net best estimate technical provisions, both split by Solvency II class of business. The charge for premium and technical provision elements are then summed to create a total charge. While the net best estimate amounts are fed directly from the non-life and health underwriting risk sheets, net written premium is not collected elsewhere on the workbook.

Note that premium written should be based on the Solvency II definition of written which is not necessarily the same as the UK GAAP definition. The DA text defines written premium as follows:

“written premiums’ means, the premiums due to an insurance or reinsurance undertaking during a specified time period regardless of whether such premiums relate in whole or in part to insurance or reinsurance cover provided in a different time period.”

The life MCR is based on factors applied to the net best estimate technical provisions split by Life classes of business as well as a factor applied to the capital at risk for all life exposures. Note Lloyd’s has also included exposures where these have been split out in the technical provision valuation to non-life annuities. These amounts are all fed from the life underwriting risk modules where completed but may be overwritten if necessary.

- The ‘linear’ pre-corridor MCR is the sum of the MCR elements for non-life and life exposures. This is the value on which the Early Warning Indicator is based, the factors being 175% and 300% of the linear MCR for non-life and life segments respectively.
- The MCR ‘combined’ applies a floor and cap of 25% and 45% of the SCR respectively to the MCR. As this uses the SCR result which is being derived on two different bases in the sheet, two sets of result will be produced.
- The final MCR then takes the minimum of the ‘combined’ MCR above and €3.7m – the Absolute Minimum Capital Requirement (AMCR).

Articles 248 to 253 of the DA text contain further details on the calculation of the MCR.

5 Sources of Information and Advice

The calculation template has been produced in line with the Solvency II Delegated Acts (Level 2 texts). The basis for the majority of the data requirements is unchanged from previous Lloyd's exercises. The Delegated Acts provides the most comprehensive guidance on the requirements and valuation approach, in the first instance Agents should review this text should they have any questions.

Lloyd's will also maintain a set of FAQs throughout the 2022 year end exercise on the Capital Guidance → Standard Formula SCR section of the Capital and Reserving area of lloyds.com, previous exercises' FAQs may also be useful, these can be found in the same location.

If agents still have questions after referring to these sources, then please email these to SFReturns@lloyds.com.

5.1 European Commission

http://ec.europa.eu/finance/insurance/solvency/solvency2/index_en.htm

The European Commission has published the text approved by the European Parliament and Council on their website as linked above, this also includes the relevant annexes as a separate link. This should be the first point of reference for any Agent requiring additional information on the requirements or calculation approach.

Solvency II Delegated Acts: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R0035>

Amending Delegated Regulation (8 March 2019): <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R0981>

Delegated Regulation (EU) 2018/1221 of 1 June 2018: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R1221>

5.2 PRA

<http://www.bankofengland.co.uk/prs/Pages/solvency2/default.aspx>

The PRA has established Solvency II pages on its website to ensure all firms are kept up to date and informed.

5.3 Lloyd's

Standard Formula template and Guidance:

<https://www.lloyds.com/resources-and-services/capital-and-reserving/capital-guidance/standard-formula-scr>

This is where the latest template (version 9.2), guidance and related FAQs for use in the Standard Formula exercise can be found.

Risk code mapping:

<https://www.lloyds.com/market-resources/underwriting/risk-codes>

This sets out the mapping from Risk Code/ Currency to Solvency II lines of business which is the basis for completing the premium and reserve risk sections of the template.

5.4 Yield curves

<https://eiopa.europa.eu/regulation-supervision/insurance/solvency-ii-technical-information/risk-free-interest-rate-term-structures>

In line with the Solvency II Delegated Acts, EIOPA has published technical information relating to the risk-free interest rate term structures, on a monthly basis. For the purpose of this exercise, yield curves as at mid-year 2022 (30 June 2022) are used in the template.

Appendix A

Simple Examples of Application and Complexity of Risk Mitigation Techniques to Catastrophe Risk

The examples below are purposefully simplistic and designed to represent how risk mitigation may be applied in practice and the potential complexity of this application.

Further information on the application of reinsurance to catastrophe risk losses has been provided in [EIOPA guidelines](#).

EXAMPLE A

Consider a single outwards risk excess contract of £100m XS £100m covering worldwide exposure to windstorms, no other reinsurance exists; the contract does not include reinstatements. The standard formula has derived the following results for the gross losses:

1. European Natural Catastrophe Windstorm 'Specified Loss' of £200m such that:

Scenario	A	A	B	B
Loss	1	2	1	2
Loss Factor	100%	20%	80%	40%
Gross Loss	£200m	£40m	£160m	£80m
Mitigation	£100m	£0	£60m	£0m
Net Loss	£100m	£40m	£100m	£80m

Scenario B is the selected 'Net' loss for the European Natural Catastrophe risk component (as it has a higher net loss). Total Net Loss of £180m, £60m of cover utilised.

2. Non-European Natural Catastrophe Windstorm Gross Loss of £200m. Applying the outwards programme to this amount would result in a net loss of £100m.

Possible approaches in allowing for the programme:

3. Aggregating the gross losses of £240m and £200m in the above across European and non-European exposures respectively results in a £312m gross charge. Applying the programme at this level would provide a net result of £212m.
4. Aggregating the stand-alone net results of £160m and £100m respectively for European and non-European exposures would result in a net SCR charge of £206m. Although this approach is in line with the requirements, it effectively overstates the recoveries by £6m as the outwards policy is exhausted.

An alternative approach could be to assume the losses occur in a specific order and determine the recoveries from these based on the remaining cover:

5. Were the gross European loss of £240m to occur first, this would trigger £60m of recoveries (scenario B remains applicable) such that the net loss is £180m. There is £40m of cover remaining for the non-European loss giving a net charge of £160m. These amounts would then aggregate to a £241m net charge.
6. Were the £200m non-European loss to occur first, the full £100m of cover could be taken against this giving a net loss of £100m. The full £240m gross European loss would also then be the net loss. Combining these two net losses gives a charge of £260m.

The above example highlights the possible complexity and various options which exist in the application of the programme. A strict interpretation of the requirements would give rise to a net SCR charge of £206m (as per 4, above), while this approach is acceptable, being in line with the latest requirements, Lloyd's is encouraging agents to carefully consider the application of their programme and the derived net results in determining appropriate SCR charges.

EXAMPLE B

Consider an aggregate stop loss cover which provides protection for claims experience (post application of other reinsurance) between £100m and £200m.

At a non-life catastrophe sub-module level, the net losses (after applying any mitigation which applies to these losses prior to this programme and adjusting where applicable as per Example A) are:

- Natural Catastrophe: £80m
- Non-Proportional Property: £100m
- Man-Made Catastrophe: £100m
- Other Non-Life Catastrophe: £40m

The above gives a pre-diversified result of £320m and a diversified loss of £210m.

A strict interpretation of the requirements would not permit the utilisation of this cover in mitigating the losses arising from the four sub-modules and the charge would be £210m. However, as the firm could recover the full £100m from the above programme on the aggregated losses it could potentially be appropriate to allow for these such that the final net SCR charge is £110m.

The above examples demonstrate that even in these simplistic scenarios there are several options to allow for mitigation. Again, Lloyd's is comfortable with Agents applying their programmes strictly in line with the requirements (i.e. at a peril/sub-module level) but where steps are taken to derive a more representative overall result by applying programmes further up the aggregation steps, agents should be careful to avoid over- or double-counting of their programmes.