Technical Annex on the Fire & Rescue Relative Needs Formula (RNF)

Introduction

Fire and rescue services play a crucial role in making our communities safer, both in prevention and in responding to emergencies. Fire and Rescue services in England are provided by stand-alone fire authorities in some areas, and by upper tier authorities in other areas. These services include firefighting and rescue operations; community fire safety; and emergency planning and civil defence.

The Fire RNF is used to assess the demand and costs each Fire and Rescue Authority (FRA) faces in delivering this service. As the total funding for Fire is fixed based on Spending Review decisions and control total weightings, each FRAs needs score must then be compared to all other English FRAs[1] to give a measure of relative need.

Fire and Rescue has a bespoke formula as the Foundation Formula's need drivers are not suited to making this assessment; for example, that formula does not take account of how risk factors such as building density and building height may create service need. The formula calculates percentages which are used to allocate the total pot of fire funding to FRAs.

In terms of structure of the formula, firstly, a per capita need value is calculated for each FRA using a basic amount and top-ups based approach as follows:

$$\boldsymbol{FRA\ need\ per\ capita = basic\ amount + (top-up_x \times weighting_x)}$$

The resident population of the FRA is then applied to this per capita need figure to scale it up and give each FRA a RNF score:

$$\boldsymbol{FRA\ RNF\ score = FRA\ resident\ population \times FRA\ need\ per\ capita}$$

The Area Cost Adjustment (ACA) for the Fire RNF is then applied to give each FRA a final score:

$$\boldsymbol{FRA\ final\ score = FRA\ RNF\ score \times FRA\ Fire\ ACA}$$

The RNF share is then calculated for each FRA:

$$\boldsymbol{FRA\ RNF\ share = \frac{FRA\ final\ score}{sum\ of\ all\ FRA\ final\ scores}}$$

Methodology

The Fire RNF maintains the use of the 7 top-ups which have been included in the formula since 2013/14: coastline, density, sparsity, deprivation, high risk, property and societal risk, and community fire safety. Retaining the design of the 2013/14 Fire & Rescue relative needs formula reflects the acknowledgement of the unique demands of the sector and that it is important to provide stability, whilst also using the latest

[1] Excluding the Isles of Scilly who are funded separately.

available data, to ensure allocations are accurate and reflect local need. The full calculation, including weightings used to generate the shares of the Fire RNF for each FRA is as follows (with further definition of units of measurement, etc. below):

i. Basic amount of 2.7837, plus
ii. Fire Coastline top-up of 1.2861 multiplied by coastline length per head of population; plus
iii. Fire Density top-up of 0.1258 multiplied by population density; plus
iv. Fire Sparsity top-up of 0.1245 multiplied by population sparsity; plus
v. Fire Deprivation top-up of 14.1194 multiplied by proportion of households meeting 3 or more dimensions of deprivation; plus
vi. Fire High Risk top-up of 20,257.1126 multiplied by the number of COMAH sites per head of population in an FRA; plus
vii. Fire Property and Societal Risk top-up of 251.3872 multiplied by the Property and Societal Risk score; plus
viii. Fire Community Safety top-up of 0.5063 multiplied by the Community Safety score.

The above result is then multiplied by:

i. FRA residential population, and
ii. ACA for the Fire and Rescue formula.

In order to calculate the final RNF share of an FRA, its results from the above should be divided by the sum of these results for all FRAs.

The data sources and methodologies used to generate raw scores for each of the top-ups are detailed below.

Resident population

Resident population figures for each year of the Settlement will be calculated using 2022-based: Migration category variant on 2023 local authority geographies edition of the population projections for local authorities by single year of age and sex, England dataset published by the Office for National Statistics (ONS)[2]. FRA level estimates are calculated by aggregating from Local Authority District (LAD) level figures using the LAD to FRA lookup available from ONS's Open Geography Portal[3].

Coastline top-up

Coastline top-up values are calculated as the FRAs length of coastline per head of population. Data on length of coastline (to the nearest 1000 metres) is at low water using information on 1991 administrative areas from the Boundary Line Product

[2] Population projections for local authorities by single year of age and sex, England - Office for National Statistics
[3] LAD to Fire and Rescue Authority (December 2024) Lookup in EW | Open Geography Portal

provided by Ordnance Survey (OS)[4]. This is the exact same data as used in the 2013/14 Fire RNF. Where FRAs have merged since this data was used in the current Fire RNF (for example, Hampshire and the Isle of White), the coastline lengths for the two constituent FRAs have been summed to give a coastline length for the merged FRA. More up-to-date options for data sources were explored but issues arose due to the inclusion of tidal estuaries in more recent data. Estimated resident population is calculated as above.

Density top-up

Density top-up values are calculated as the sum of the estimated number of residents per hectare for each Census 2021 Output Area (OA)[5] within the FRA, projected forward to 2023 using all-England population change rates between 2021 and 2023 changes in mid-year estimates for those years), multiplied by that OA's share of the usually resident population in the area. This result is then divided by 10 as in the 2013/14 Fire RNF methodology.

Sparsity top-up

Sparsity top-up values are calculated using the same population data as density above, converting the figures from square kilometres to hectares and using the methodology and judgement-based weights that have been in place since the rollout of the 2013/14 Fire RNF. As such values are calculated as the sum of (i) and (ii):

i. Sparsity – The resident population of those OAs with more than 0.5 but less than or equal to 4 residents per hectare, divided by the total resident population of the FRA

ii. Super sparsity – 3 times the sparsity calculation for OAs with less than or equal to 0.5 residents per hectare

Deprivation top-up

The 2021 Census household deprivation measure[6] captures 4 dimensions of deprivation (employment, education, health and disability, and housing), scoring households on a binary (yes/no) for each they meet the criteria for to be considered deprived. The deprivation top-up values are calculated as the number of households within the FRA which meet any 3 or all 4 dimensions of deprivation, as a proportion of the total number of households within the FRA.

High risk top-up

High risk top-up values are calculated as the number of top tier Control of Major Accident Hazard (COMAH) sites[7] within the FRAs boundary per head of population. This

[4] Boundary-Line | Data Products | OS

[5] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/mid2022

[6] TS011 - Households by deprivation dimensions - Nomis - Official Census and Labour Market Statistics

[7] COMAH 2015: Search

will be as at April 2024 and derived from data supplied directly by the Health and Safety Executive. Estimated resident population is calculated as above.

Property and societal risk top-up

Property and societal risk top-up values are calculated as the sum of the number of buildings by building type within an FRA multiplied by (i) property risk frequency by building type and (ii) societal risk frequency by building type, per head of population. Total estimated resident population will be as calculated above. Building volumes (by type) are from the Ordinance Survey (OS) Points of Interest dataset[8] (supplied directly by OS). Risk frequencies are generated using Incident Recording System (IRS) data held by the Department as follows:

i. Property risk frequency is the likelihood a fire in each building type would result in damage to property. It is calculated as the average estimated extent of fire damage[9] by building type during 2021/22, 2022/23 and 2023/24. This specific breakdown of damage data is not published but more aggregated data on fire damage are available in published data tables: FIRE0204 and FIRE0305.[10]
ii. Societal risk frequency is the likelihood a fire in each building type would result in the need for the responding FRA to engage in a rescue. It is calculated as the average number of rescues by building type during the same period. This specific breakdown of rescues data is not published but more aggregated data on rescues are available in published data table FIRE0511.

Risk frequencies are adjusted to better align with the methodology used in the 2013/14 Fire RNF before being applied to building volumes. Weightings are generated and used to make this adjustment by: (i) calculating the new average societal risk frequency, (ii) multiplying this by 1.11 (as the average property risk frequency in the 2013/14 Fire RNF was 1.11 times the average societal risk frequency) and considering the result the 'target' average property risk frequency, (iii) calculating the reduction necessary to the real average property risk frequency to bring it to the 'target' one – this is the weighting applied.

Community fire safety top-up

Community fire safety top-up values are calculated using 2021 Census data on household composition (table TS003[11]) as the total number of households within an FRA that contain students, dependent children or people aged over 65, as a proportion of the total number of households within the FRA. These populations are selected as

[8] Points of Interest | Data Products | OS
[9] The IRS includes data on both total damage extent and fire damage. The fire damage variable specifically is used here.
[10] Fire statistics data tables - GOV.UK
[11] TS003 - Household composition - Nomis - Official Census and Labour Market Statistics

services use information relating to these population types to inform some of their protection activities (e.g. home fire safety visits).

Top-up weightings

All top-up values are weighted before they are summed with the basic amount and then multiplied by population. Their weightings are based on those in the 2013/14 formula which were derived using a combination of expenditure-based regression and Ministerial judgement. This approach means no adjustment has been made to account for potential overall change in relative top-up values. For example, if England wide deprivation was to have increased/decreased over the time period, this method would not reflect that by making it more or less strong within the overall formula.

Area Cost Adjustment

An ACA is applied in line with the approach taken across the other RNFs. However, due to the structure of the Fire RNF being based on the 2013/14 one, a key issue arises which is not found in other formulae. Some of the top-up weightings of the 2013/14 RNF were based on modelling which incorporated the ACA in use at the time. As the RNF maintains the 2013/14 RNF top-up weightings but has a new ACA applied, this means final shares for each FRA are determined partially by the ACA used in 2013/14, and partially by the updated ACA.

Changes from the Fair Funding Review 2.0 consultation

To align with the approach taken for other formulas within the Local Government Finance Settlement, the Fire RNF will include population projections within the formula. This will help target funding to areas with increasing demand across the multi-year Settlement, keeping the system up to date and reducing variations in funding at the point of reset.

Data and technical definitions

- **OS Boundary Line Product** – maps of every administrative boundary, more information at: Boundary-Line | Data Products | OS
- **Output Areas** – the lowest level of geographical area for census statistics, more information at: Census 2021 geographies - Office for National Statistics
- **OS Points of Interest Product** – A comprehensive, location-based directory of all public and privately-owned businesses, education and leisure services in Britain, more information at: Points of Interest | Data Products | OS
- **Control of Major Accident Hazard (COMAH) sites –** sites that store or handle large quantities of hazardous chemicals (e.g. liquefied petroleum gas).

- **Incident Recording System** – An online system used to collect data from Fire and Rescue services relating to all incidents they attend, more information at: Fire and rescue incident statistics - GOV.UK