New information on noise impacts of a third runway at Heathrow

CAA spreadsheet

1 Following a Freedom of Information request by TAG (Teddington Action Group) the CAA (Civil Aviation Authority) provided a spreadsheet called 'LHR R3 Central Monetisation Noise Workbook updatedOBEforecasts.xlsx'. The template for this spreadsheet is part of the DfT (Department for Transport) 'WebTAG' computer aid, designed to evaluate transport projects (https://www.gov.uk/guidance/transport-analysis-guidance-webtag). This spreadsheet has been used to assign a monetary value (economic cost) to aircraft noise to a third runway (R3) at Heathrow.

2 The primary purpose of the spreadsheet was to calculate a 'Net Present Value' (NPV) for aircraft noise as part of the overall economic evaluation of R3 which looks at a 60 year period. However, there is a good deal of other relevant information. There are 5 distinct components of aircraft noise cost and cost are evaluated for each year up to 2084. In the build-up to these costs information on the number of households exposed to various levels of noise and a valuation of the impact of each of those levels were collated and entered into the spreadsheet.

3 The primary output from the spreadsheet is a cost of £625 million. This is the estimated cost of a three runway Heathrow runway compared with the 'Baseline' or 'Do minimum' scenario in which Heathrow remains with two runways. However, there is good deal more if information that can be gleaned from this spreadsheet. Instead of showing just the additional impact, it is possible to see or derive the actual impact of a 2-runway and a 3-runway airports. This is crucially important because it provides a 'sanity check' on the results. Additional result shown directly or readily derivable from the spreadsheet are summarised below, giving necessary references and calculations.

4. The notes below give results from the spreadsheet and general issues which are referenced from the relevant web pages.

Notes about spreadsheet and other matters

A single NPV figure for economic cost - that looks as far ahead as 60 years - gives limited information. More useful are figures for the individual years. In particular we have examined the results for 2030. This is an especially convenient and relevant date because it is not too far ahead, because it is one of the 'spot dates' used for the demand forecasts (the others are 2040 and 2050) and because the third runway would be fairly full by then. Likewise, figures at 2030 are particularly pertinent for the number of people affected by noise.

5. Acknowledgments to Teddington Action Group for the chart which is based on the Airports Commission (AC) data. The chart shows the relative number of people 'affected' by aircraft at all the major European airports. Lden [link https://www.eea.europa.eu/help/glossary/eea-glossary/lden] is a measure of noise over 24 hours. 55 decibels (dB) is the level at which people are often seriously affected by noise.

6. The government claims in the NPS that " .. *around 92,700 more people will be affected by noise with a third runway than compared to a two runway Heathrow Airport in 2030.*" (Page 22 of 'Appraisal of Sustainability: Revised Draft Airports National Policy Statement Non-Technical Summary, at

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/654320/aos-revised-draft-airports-nps-non-technical-summary.pdf)

7. The noise exposure figures show the numbers of households or people which fall within a 3dB band, eg 54-57dB. Where a figure for people exposed to increased noise is quoted, this is actually the number of people who would fall into a higher 3dB noise band. Likewise, where a figure for people exposed to reduced noise is quoted, this is actually the number of people who would fall into a lower 3dB noise band.

These are the numbers of people in thousands exposed to more noise or less noise as a result of R3.

	Day	Night	Derivation
Exposed to more noise	2795	570	Summing all relevant entries in the matrix of households lines 60 to 75 of "input" sheet for day and lines 77-92 for night. Then multiplying by the average number of people per household of 2.3.
Exposed to less noise	1638	253	As above. (This is consistent with the numbers in rows 61 and 109 when summed and multiplied by 2.3).
Net increase	1157	317	By subtraction

8. The figures in the table above and the 92,700 claimed in the NPS are not calculated on exactly the same basis. The 92,770 refers to people exposed to daytime noise over 54dB. But the fact is that many people are affected by noise below 54dB - the government officially recognises that people can be affected by noise down to 45dB. It is certainly the case that some people exposed to these may not be affected, but sufficiently many are for there to be a significant societal impact. This is reflected in the large values for economic cost shown in the spreadsheet.

9. Although the spreadsheet does produce the figures, it is straightforward to derive the actual numbers of people exposed to noise for each 3db noise band with 2 runways and with 3 runways. The totals are

	Day	Night	Derivation
Total exposed to >45dB with two runways	3368	467	Day: subtract the total of <45dB row (cells D46 to Q46 = 4,018,565) from grand total of matrix (cells D46 to Q59 = 5,482,880). Night: subtract the total of <45dB row (cells D65 to Q65 = 5,279,852) from grand total of matrix (cells D65 to Q78 = 5,482,880). Multiply each by 2.3 to convert from households to people.
Total exposed to >45dB with three runways	4440	709	Day: Subtract the total of <45dB col (cells D46 to D59 = 3,552,382) from grand total of matrix (cells D46 to Q59 = 5,482,880) for day. Night: Subtract the total of <45dB col (cells D65 to D78 = 5,174,414) from grand total of matrix (cells D65 to Q78 = 5,482,880) for night. Multiply each by 2.3 to convert from households to people.
Effect of R3	1072 +31%	242 +52%	By subtraction % increase

10. Sincere thanks are due to TAG [link] who use a Freedom of Information request to obtain the government spreadsheet and who first publicised [link https://www.theguardian.com/environment/2018/apr/09/heathrow-third-runway-noise-affect-people-government-documents] the issue.

11. The government's goes further than shown the number of people who would be exposed to increased noise. It calculates monitory or economic values on the noise impacts, in accordance with

government guidance. It looks at sociological, medical and economic evidence and ascribes a notional cost for each dB of noise per household or person for each of the following:

Sleep disturbance (night noise)

Amenity ie annoyance/disturbance

Health impacts: heart attacks, strokes, dementia

12. The spreadsheet shows the following values for the cost of noise at 2030:

Sleep disturbance	£22.3 million (cell X1170 of 'calculation' in spreadsheet)
Amenity (daytime disturbance/annoyance)	£46.2m (cell X1171)
AMI (acute myocardial infarction - heart attacks)	£0.6m (cell X1172)
Stroke	£2.0m (cell X1173)
Dementia	£3.1m (cell X1174)
Total	£74.3m (sum of above)

13a. To derive total figures for a 2-runway and a 3-runway airport (as opposed to the difference between the two), one needs to go back to the figures for the numbers of households in each noise band and the economic cost of noise. These can be found in the 'calculations' spreadsheet.

13b. Households exposed to each noise band at 2030 are shown in rows 44-59 and 63-78 (day and night respectively). Figures for the economic unit cost assigned to each noise band and calculations of the economic cost totalled over all households/people at 2030 are spread though rows 229 to 962.

13c. These costs are then adjusted for economic growth which is shown at row 1154. (As people become richer, their valuation of noise and other impacts is higher). The figures do not allow for 'discounting' (application of an interest rate to allow progressively less weighting to costs further into the future).

13d. Having carried out these calculations, the results are:

2-runway airport - £276.5 million

3-runway airport - £350.8 million

The difference between them is £74.3 million. This agrees with the difference obtained in para 12, thereby validating our calculations.

14a. It is instructive to compare the extra noise cost of a third runway with the total cost of a 2-runway and 3-runway airport. The extra cost is only 26.9% (74.3/265.5) of the "baseline" or "do minimum" scenario of two runways. This is surprising because a third runway would add nearly 50% to the number of flights and passengers. One night therefore expect an increase noise impacts of nearly 50%. The increase in passenger exposed to day-time noise, (see para 9) is similarly low at 31%.

14b. The main explanation seems to be that assumed flight paths have been optimised to minimise people "affected" by noise in the 3-runway scenario. Crucially, flight path have not been optimised for two runways. This means that the comparison is not like-for-like. If the 2-runway case had been optimised the cost of noise would be less and the difference would be much greater. (If, for instance, the cost of optimised 2 runway were just 10% lower than un-optimised 2 runways, the difference – ie the 3rd runway impact - would be 37% greater.

14c. This would of course have shown that R3 has a much greater impact - something the DfT and government are desperate to avoid. It would have made the economic case even weaker.

14d. Teddington Action Group have also identified another mis-comparison. 3.5 degree angle of approach was assumed to be in operation with 3 runways but not with 2 runways, again reducing the claimed cost of a third runway.