Exploring the concept of fair and equitable distribution to minimise social unacceptability of airspace design options

Summary of Research

Contents

- FED2 – background, objectives & approach
- Community focus groups
- Supplementary assessment framework to support CAP1616
- Recommendations & next steps

FED2 Purpose and objective

Campaign groups around Gatwick Airport advocate for a "fair and equitable distribution (FED)" of aircraft noise, a policy sought since 2016. The CAA's CAP1616 framework prioritises reducing significant adverse effects of noise which can result in concentrated aircraft routes and has often been met with adverse local community response. Current UK policy lacks specific FED guidance, focusing instead on mitigating aviation noise impacts.

FED2

Purpose

To understand how airspace design options influence those features that impact perception of fairness and equity **to inform more socially acceptable airspace modernisation.**

Objective

To conduct an in-depth qualitative assessment, working directly with aviation and community stakeholders, **to define the performance features and their metrics that influence perception of concepts of fairness.**

Concepts of fairness

Social justice research distinguishes between different forms of fairness.

Distributional fairness

With aviation noise decisions, this relates to individual response or judgment on the **fairness of the (change in) distribution of overflight or noise burden across a geographical area or population – weighing up perceived benefits and dis-benefits** of a change.

In this context this is not monetary judgement (in the traditional cost-benefit analysis sense – although this may feature in compensation discussions).

Procedural fairness

People are not only concerned with the outcomes of a decision, but, more importantly, with the procedures that lead to the decision.

Research on the fair process effect suggests that **a fair process might have more influence on the overall fairness evaluation than the outcome itself**.

Informational (and interpersonal) fairness

Informational fairness describes the quality of the explanations given to the affected people that justify the reason for the application of a certain decision-making procedure or the distribution of the outcome in a certain way.

Interpersonal fairness focuses on the degree to which people are treated with politeness, dignity, and respect by the decision- making party.

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Key work stages

Q Methodology
An innovative approach helped to reveal the influence of attitudes, including understanding potential groupings of common attitudes, and preferences on the perception of fairness

Oct 22

Feb 24

Expert Review Group (ERG)

Four members with diverse experience reviewing tasks, progress, outcomes, additional considerations, and project report.

Stakeholder Focus Group (SFG)

CNG Fundamentals Workshop (CFW)

Community Fundamentals Workshop (CFW)

Workshops gathered feedback from key stakeholders on features, concepts, and barriers to mitigating aircraft noise. Used to develop test material for FG's.

Focus Groups (FG)

13 community focus groups, engaging over 130 members, and used a virtual airport to explore concepts.

Development and testing of supplementary approach

Final report published end of 2024

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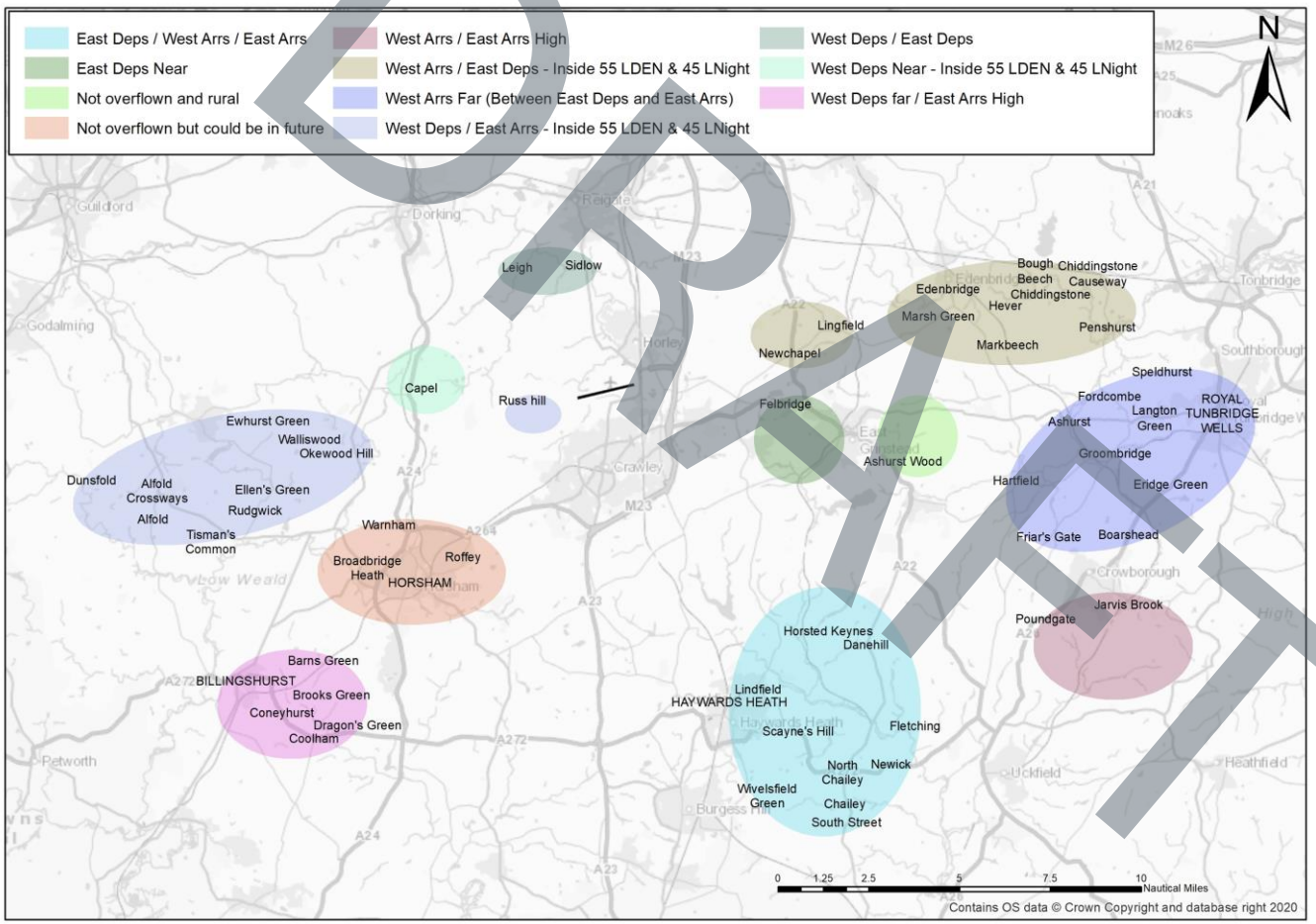
Focus Groups

Location of focus groups

13 community focus groups engaging 130 independently selected members

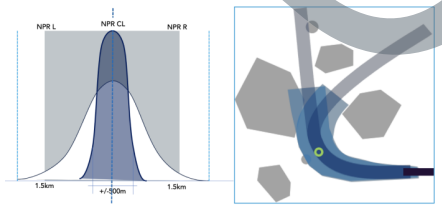


Although each focus group was composed of participants drawn from areas experiencing different levels of exposure to aircraft noise around a UK airport (including some with no overflights and relatively little/no aircraft noise exposure), there was **general consensus** as to the opinions expressed regarding the range of concepts presented for aircraft movement distribution.

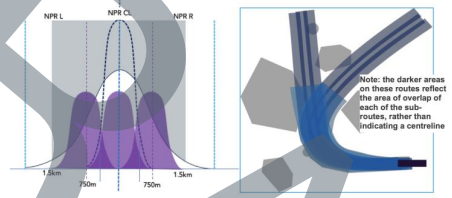
Use of virtual airport critical to success of FGs

Use of a virtual airport to illustrate different aircraft distributions and their consequences for noise changes on the ground enabled participants to reveal their underlying motivations and concerns.

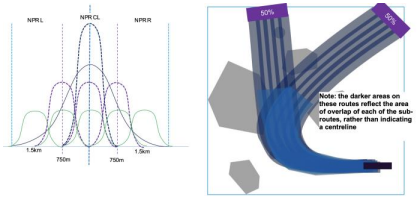
1. Replication of the conventional route



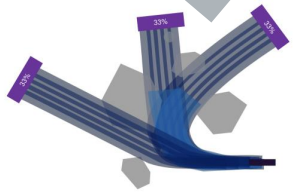
2. Limited dispersal of movements across the NPR



3. Wider dispersal within the NPR



4. Extensive sharing via a new route



Removing reference to specific locations reduced NIMBY bias and **enabled discussions to reflect on the overall fairness** for different patterns of increases and decreases in aircraft noise event outcomes.

Participants were willing and able to express preferences for different distributions of aircraft, and it **became possible to link these preferences to changes in an objective noise metric (N65s)**

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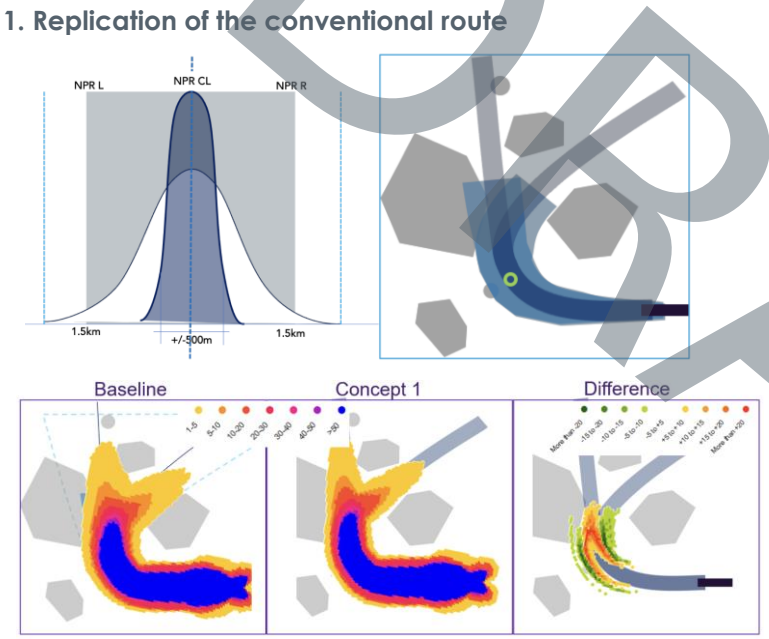
What did each concept reveal?

Concept 1: Replication of conventional route – concentration around centreline



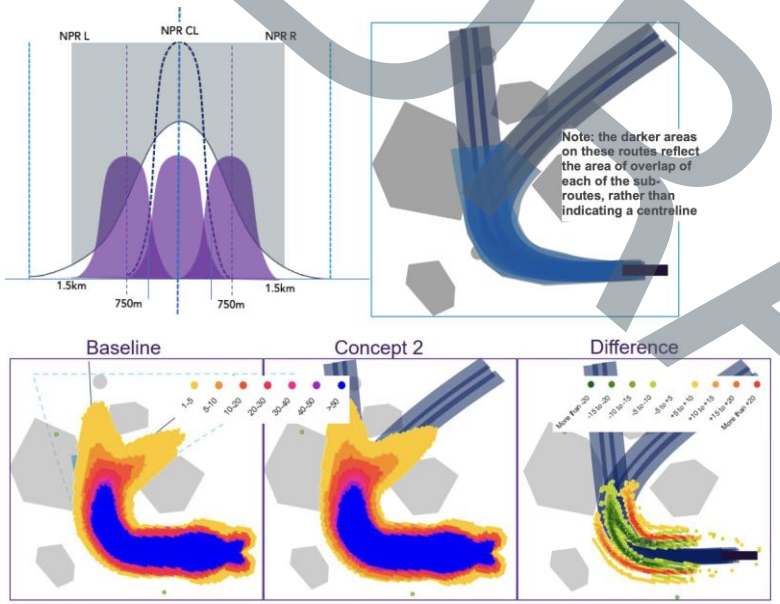
Exposing already most affected to more noise events was considered unfair/ unreasonable, exacerbating existing inequalities – even where concentration results in overall less people exposed.

Some form of spreading of the burden of aircraft movements was seen to be an improvement over replicating existing route centrelines if that leads to increasing concentration.

Increasing exposure to noise for those near the route centreline might mean critical health thresholds are exceeded and that the burden would become unbearable for those populations, despite any tolerance to relatively high levels of noise that may be present. This feature would be exacerbated by any increases in air traffic over time.

What did each concept reveal?

Concept 2: Limited dispersal of movements across the NPR with precision sub-routes



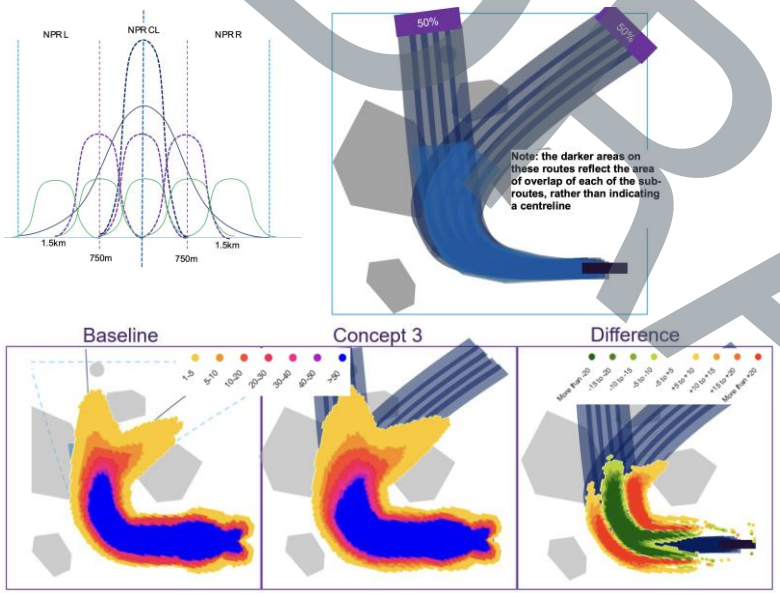
Generally positive response 2 Concept 2 indicating that some limited degree of sharing removed some of the burden on the most noise affected and avoided the negative consequences of the concentration associated with Concept 1.

Modifiers to this position include consideration of the number of people (as well as areas) affected and the nature of the areas being overflown (e.g. rural vs urban distinction).

When considering distributional changes resulting from specific ACPs, there needs to be transparency over consequences of future growth on geographical extent and severity of noise impacts

What did each concept reveal?

Concept 3: Wider dispersal within the NPR with additional precision sub-routes



Concept 3, introducing a greater degree of sharing than 2, met with more mixed reaction than that to 2. Benefits of wider spreading of noise burden acknowledged by some, others highlighted that the degree of change more noticeable and felt across wider areas, some of which may not have previously experienced much aircraft noise.

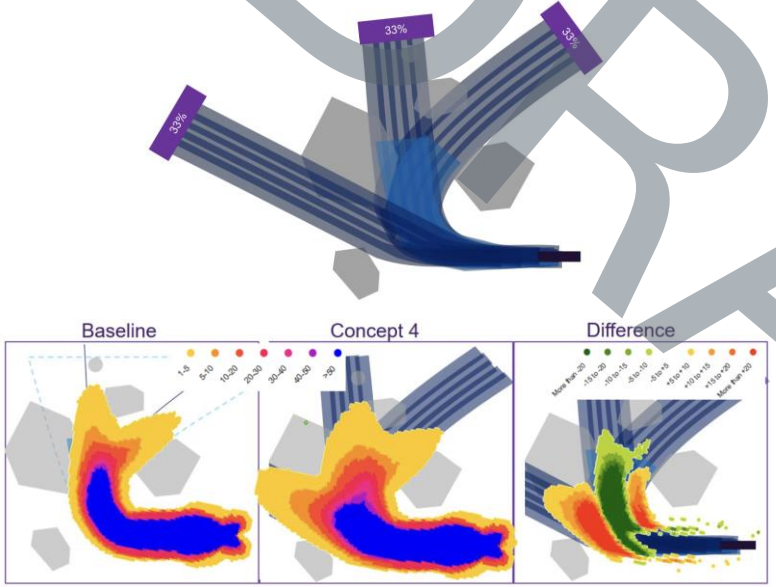
The risk of social unacceptability appears to increase with degree of noise change, number of people potentially affected, and nature of the areas affected (quieter areas with previously little noise exposure increases risk).

Effective public engagement over specific ACPs will need to provide information on these features if communities are to fully understand the outcomes of each proposal and make informed decisions at to their relative merits (degree of (un)acceptability).

What did each concept reveal?

Concept 4: Extensive sharing via a new route.

4. Extensive sharing via a new route



This Concept 4 divided opinion more than Concept 3. Whilst some participants felt that this more extensive sharing of air traffic was fairer, most highlighted the likely opposition to this scenario – new people, never been overflown, not fair.

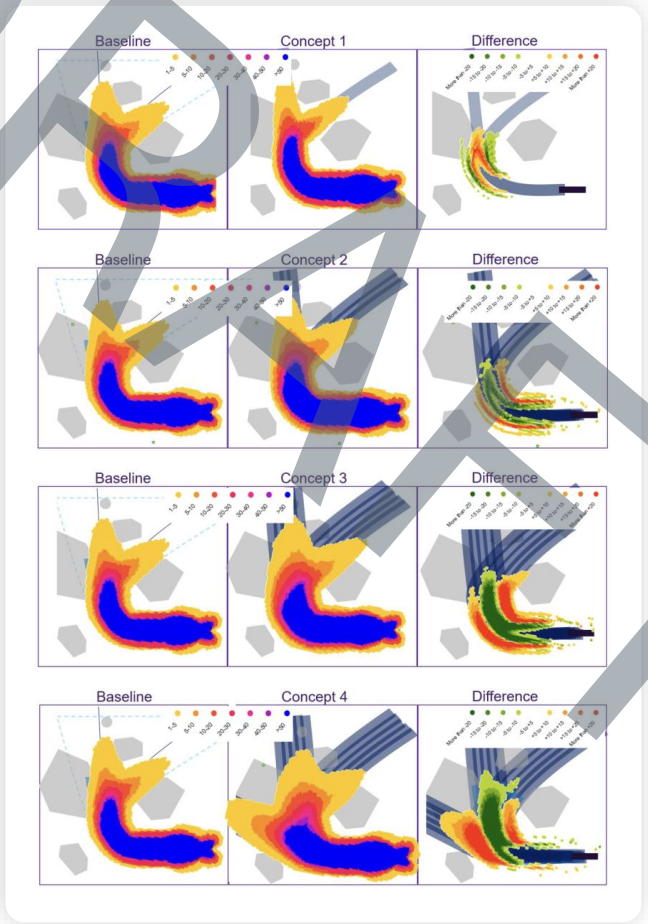
Overall, the responses to Concept 4 reinforced those from Concept 3, namely that the larger the perceived scale of change, and contrast with expectations, the greater the risk of socially unacceptable outcomes.

The point at which the benefits acknowledged to be associated with some limited spreading of the burden are outweighed by these concerns is unclear from these focus groups and perhaps may only become clear when specific ACPs are discussed.

A role for event-based metrics highlighted

Spatial presentation of N65 changes enabled understanding of important features of noise distribution that influenced perceptions of fairness – shedding light on relative merits of alternative options for distribution of aircraft.

- N65 metric easily understood - reflecting perception of community experience of aircraft noise.
- N65 sensitive to relatively small changes in aircraft lateral distribution within a route that are not picked up by Leq.
- Spatial change in N65 highlights areas experiencing increases or decreases in events resulting from a change in distribution of aircraft movements. These change patterns were understood and reflected community perceptions of distributional changes and impact.
- Power to illustrate the geographical extent and consequence of concentration and sharing regimes.



- Illustrate important features of noise distribution changes influencing perceptions of fairness - offers opportunity to enhance transparency around consequences of ACPs.
- Overlaid with pop data, could be extended to quantifying benefits/ disbenefits by calculating changes in number of person events thereby contributing to decision-making around compensation/mitigation based on a full understanding of the locations and populations adversely affected by distribution changes in the distribution
- Change illustrations support transparent engagement critical to informational and procedural fairness.

Understanding Distributional fairness

Key Findings.

Fair and/or equitable?

The **perception of distributional fairness was dominated by the extent of change from that currently experienced, NOT establishment of more even (equitable) distribution of noise events.**

Local people were consistent in indicating there is an **underlying assumption that all the Balanced Approach possibilities would be utilised to minimise the noise impact** of any lateral distribution options discussed (quieter aircraft, optimised departure and arrival vertical profiles, etc).

Change in spatial distribution of aircraft noise (events) lies at the heart of perceptions of fairness.

Airspace designs that result in **minimal change in the redistribution of the burden of aircraft noise** (presented as changes in event-based metrics) **and ideally reduce the burden for those that are already most affected** are at **lower risk of being perceived as distributionally unfair, and socially unacceptable**.

In airspace design terms this implies that some form of limited spreading of aircraft movements around areas already overflown is likely to be considered a less socially unacceptable outcome than:

- allowing aircraft to concentrate around existing route centrelines through more precise and consistent navigation, or
- for new areas to be overflown by similarly concentrated flows of aircraft

There is a spectrum of risk of social unacceptability associated with the perception of distributional fairness

Risk is lowered with some form of limited sharing that more closely reflects the existing distribution of the noise burden, whilst delivering noise reduction for those who are most exposed.

Risk is higher with more geographical extensive sharing and/or when new people are exposed to aircraft noise, or when those who are currently burdened the most, take an increase in noise exposure (increased concentration).

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Distributional fairness

Key Findings.

Unfair for health burden to increase

There was consensus that it would be considered **unfair for the burden on those currently most significantly at risk of adverse health outcomes to increase further**, even if this means larger numbers of people overall are exposed to lower noise levels.

The latter was regarded as a fairer outcome ONLY if the burden on the most exposed is reduced along with the associated risk of adverse health outcomes.

Secondary features influence acceptability and moderate risk.

Whilst the geography of redistribution was considered of primary importance, focus group discussions also identified several secondary factors that could moderate the perception of distributional unfairness and therefore moderate risk.

These included land-use/designation, the urban-rural divide, and the extent to which forecast changes conflicted with social expectations of living in an area.

The extent to which these secondary factors moderate the risk is unclear but the extent of the relative importance of these should be revealed when specific ACPs are discussed with communities.

Caution on wider sharing to provide relief/respite

The interaction between the perception of fairness from sharing over wider geographic areas and measures that could be introduced to provide noise relief/respite and compensation is unclear at this time and may only be revealed when specific ACPs are discussed with communities.

It is evident from respite studies (Porter et al, 2023) that there should be caution applied to the presentation of respite as a benefit to people who are currently not burdened by aircraft noise.

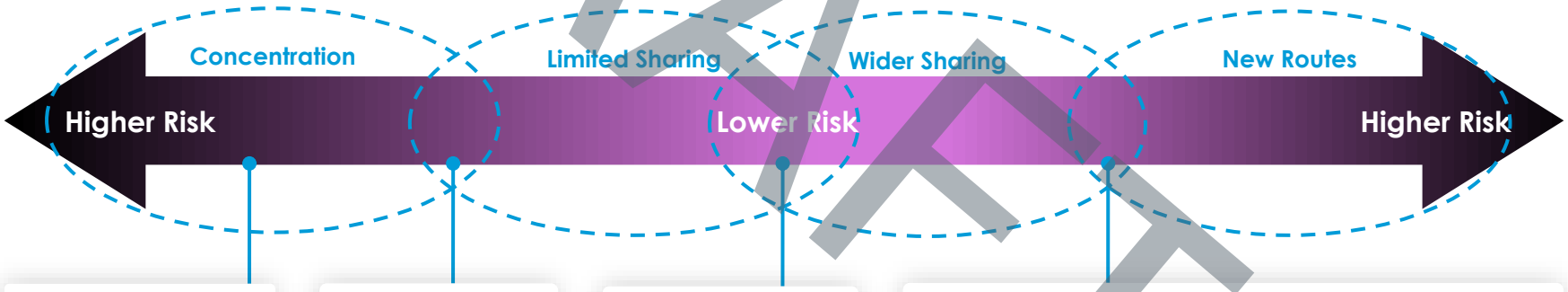
Spectrum of risk of of social unacceptability associated with the perception of distributional fairness

Airspace designs that result in **minimal change in the redistribution of the burden of aircraft noise** (presented as changes in event-based metrics) **and minimise increases for those that are already most affected** are at **lower risk of being perceived as distributionally unfair, and socially unacceptable**.

Higher risk
When those who are currently burdened the most, take an increase in noise exposure (increased concentration).

Lower Risk:
Some form of limited sharing that more closely reflects the existing distribution of the noise burden, whilst delivering noise reduction for those who are most exposed.

Higher Risk:
Wider geographically extensive sharing and/or when new people are exposed to aircraft noise,



Concentration of aircraft movements along existing route centrelines was considered unreasonable as those already most exposed to aircraft noise would experience an increase in their noise burden.

Some limited sharing of the burden of aircraft noise events could help overcome adverse perceptions of concentration.

Focusing the spreading among populations currently experiencing some noise exposure could allay concerns over the extent of change against expectation.

Some form of limited spreading of aircraft movements around areas already overflown is likely to be considered a less socially unacceptable outcome than allowing aircraft to concentrate around a route centreline as a result of more precise and consistent navigation.

As dispersal options extend over wider areas increasing concerns raised about:

- Change against expectations
- Conflict with existing land uses/ designations(e.g. AONB features)
- Likelihood of overflying people with no/limited experience of aircraft noise

As sharing becomes more geographically extensive (whether this be to distribute aircraft across existing NPRs or to share the noise burden over a wider area with the addition of new routes) the point(s) at which perceived benefits from sharing become outweighed by concerns over sharing is unclear and might only be revealed when specific ACPs are discussed with communities.

Informational and Procedural Fairness

Study highlighted the role of informational and procedural fairness during overall engagement processes in reducing risk of socially unacceptable airspace redesign.

An environment of mistrust

A number of comments were received in the FGs indicating a mistrust or cynicism over consultation associated with historic changes arising from airport developments and aviation growth more generally.

This demonstrates that the CAP1616 process will take place in an environment of resistance to change and thus must adopt as transparent a position as possible if trust is to be built up with communities over the process and outcomes of decision-making.

Event-based metrics – meaningful and relatable

Materials used in the focus groups revealed the greater utility of noise event metrics (compared with average noise level metrics that are primary metrics in the CAP1616 process) to transparently communicate noise distribution changes on the ground in a meaningful, understandable, and relatable manner (characteristics of information fairness) that is reflective of residents' lived experience.

Such transparency enhances informational fairness and can help build trust in the procedural fairness of airspace decision-making leading to more socially acceptable outcomes (or the least socially unacceptable outcomes).

Event-based metrics – greater depth to negotiation

Insights provided by event-based metrics could also add greater depth to negotiation over the appropriateness or otherwise all airspace change options, including 'concentrate and avoid' options for route changes being considered by some airports under AM.

Informational and Procedural Fairness

Realising contributions to informational and procedural fairness

Genuine options

For these beneficial outcomes to arise from future public engagement by airspace change sponsors over ACPs, the latter must allow for the presentation of a range of genuine options (i.e. ones that are operationally viable), where the consequences of each are presented transparently including explicit illustration of the spatial pattern of increases and decreases in noise events. This will enable full scrutiny of all options, including any preferred by the airspace change sponsor, and empower communities to express their preferences.

Influence over final decision

Providing opportunity for these preferences to influence the final decision over the selection of specific ACPs should enhance procedural and informational fairness, contributing to more socially acceptable outcomes and, over time, helping to rebuild trust in aviation authorities through demonstrably supporting social justice.

Growth could erode benefits

It is worth emphasising at this point that any discussions of the benefits, or otherwise, of noise sharing cannot ignore the influence of future traffic growth on the noise outcomes achieved from changes in aircraft distribution.

Repeatedly in our FGs participants highlighted their concerns that growth in absolute numbers of aircraft could erode the noise exposure reductions that sharing might achieve.

Thus it would appear essential to transparency and open negotiation that plans for traffic growth are incorporated into discussions and ultimate decision-making.

Informational and Procedural Fairness

The potential contributions to informational and procedural fairness from the incorporation of more transparent presentation of the consequences of airspace changes, highlights the need for a supplementary framework to support decision making. We proposed one below that:

- Is based on a number above metric (N65s are used but it is recognised that other thresholds may be relevant)
- Illustrates objective changes (to N65s and associated PEI) relevant to the assessment of distributional fairness
- Realises more comprehensive stakeholder engagement to support negotiated outcomes
- Contributes to robust decisions and thus reduces the risk of socially unacceptable outcomes

Development of a supplementary framework

CAP1616 provides a framework upon which to base consideration of FED

"The Government's noise policy is "to limit, and, where possible, reduce the number of people in the UK significantly affected by adverse impacts from aircraft noise. For the purpose of assessing airspace changes, the Government wishes the CAA to interpret this objective to mean that the total adverse effects on people as a result of aviation noise should be limited and, where possible, reduced, rather than the absolute number of people in any particular noise contour."

"To be consistent with this, ***priority should be given to reducing the total significant adverse impacts rather than the number of people who will experience aircraft noise****. Therefore, from a noise perspective, it* ***may on occasions be better to have multiple concentrated routes that share noise among more people, than a single concentrated route which affects fewer people but to a greater extent****."*

The implementation of an airspace system that fully harnesses the capability of PBN, whilst guided by the initial design principles consultation, will mean that routes are flown more accurately and consistently and, ultimately, result in concentrating noise in areas under route centrelines.

'Reducing the total significant adverse effects" could therefore be achieved by pursuing an approach that concentrates aircraft over least densely populated areas, and so avoiding more densely populated areas (a concentrate and avoid approach).

It is clearly a sensible intent to reduce the overall health consequences of aircraft operations for local people and so the "concentrate and avoid" approach is understandable. However, this approach lacks consideration of the changes in distribution of noise, the consequences of concentration for the smaller number of people (and possibly new people), the implications for change of expectation of land-use and the perception of the changes by the broader population.

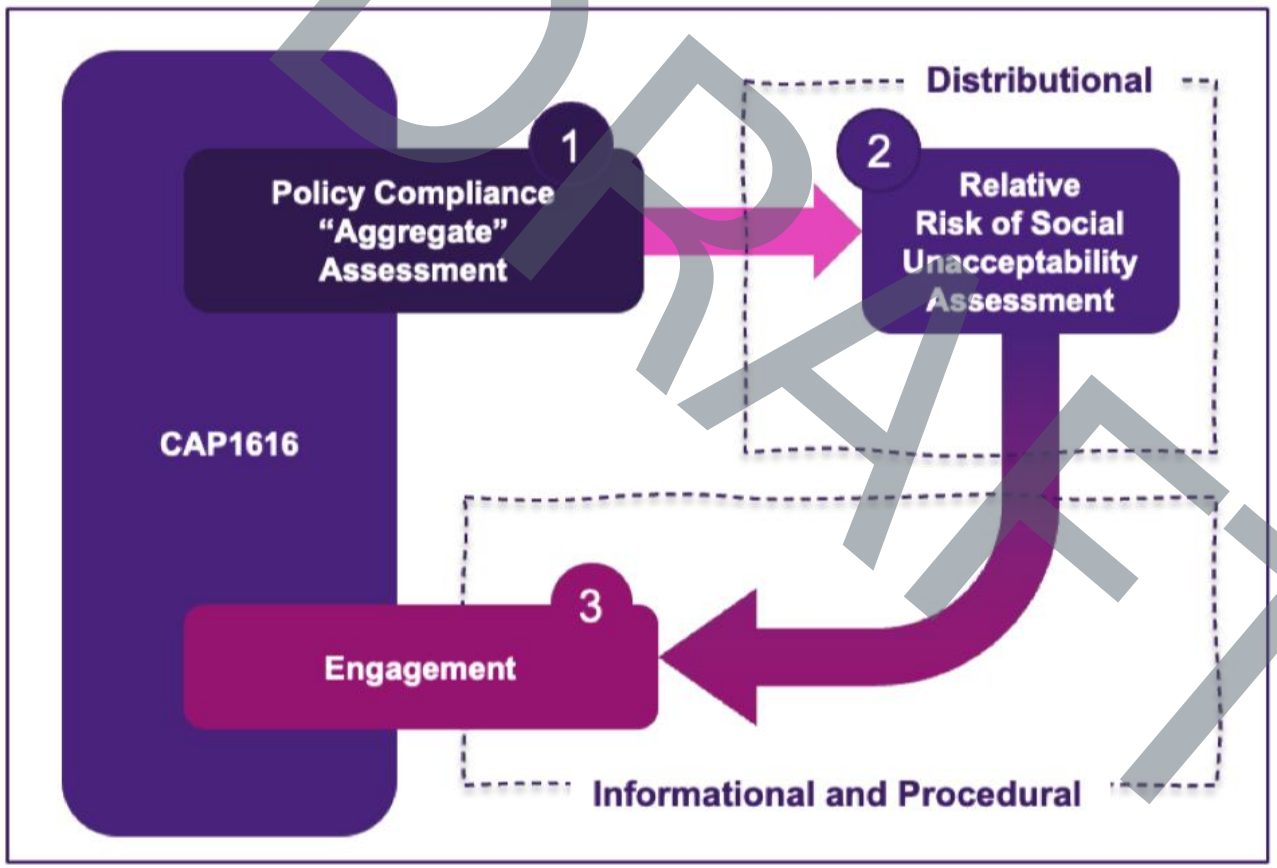
CAP1616 states:

"Rather than a 'one size fits all' approach to whether single or multiple routes are better, sponsors must consider the impacts of different options and **decide what will work better in a given situation**. These decisions should be **informed by considering the anticipated noise impacts, and through engagement with communities**."

CAP1616 therefore provides a framework upon which to base consideration of FED.

However, the concept of the fairness of redistribution of the noise burden is not considered within the process and as such, this process is likely to favour outcomes that concentrate aircraft over the smallest number of people regardless of their current exposure to noise.

Considering the dimensions of fairness alongside existing CAP1616 assessment



This includes enhancing community engagement through developing a better appreciation of the issues of greatest concern to residents.

Which is, in turn, used to propose an assessment and engagement framework using supplementary metrics to increase public understanding of the consequences of airspace options such that the processes leading to decisions on specific airspace change options are transparent and allow community input to the final outcomes.

Not a challenge to policy, nor any implications for existing policy.

Whilst there is a challenge to be recognised within the context of policy assessment, this study and its findings are not intended as a "challenge to policy" and nor do we consider there to be implications for existing policy.

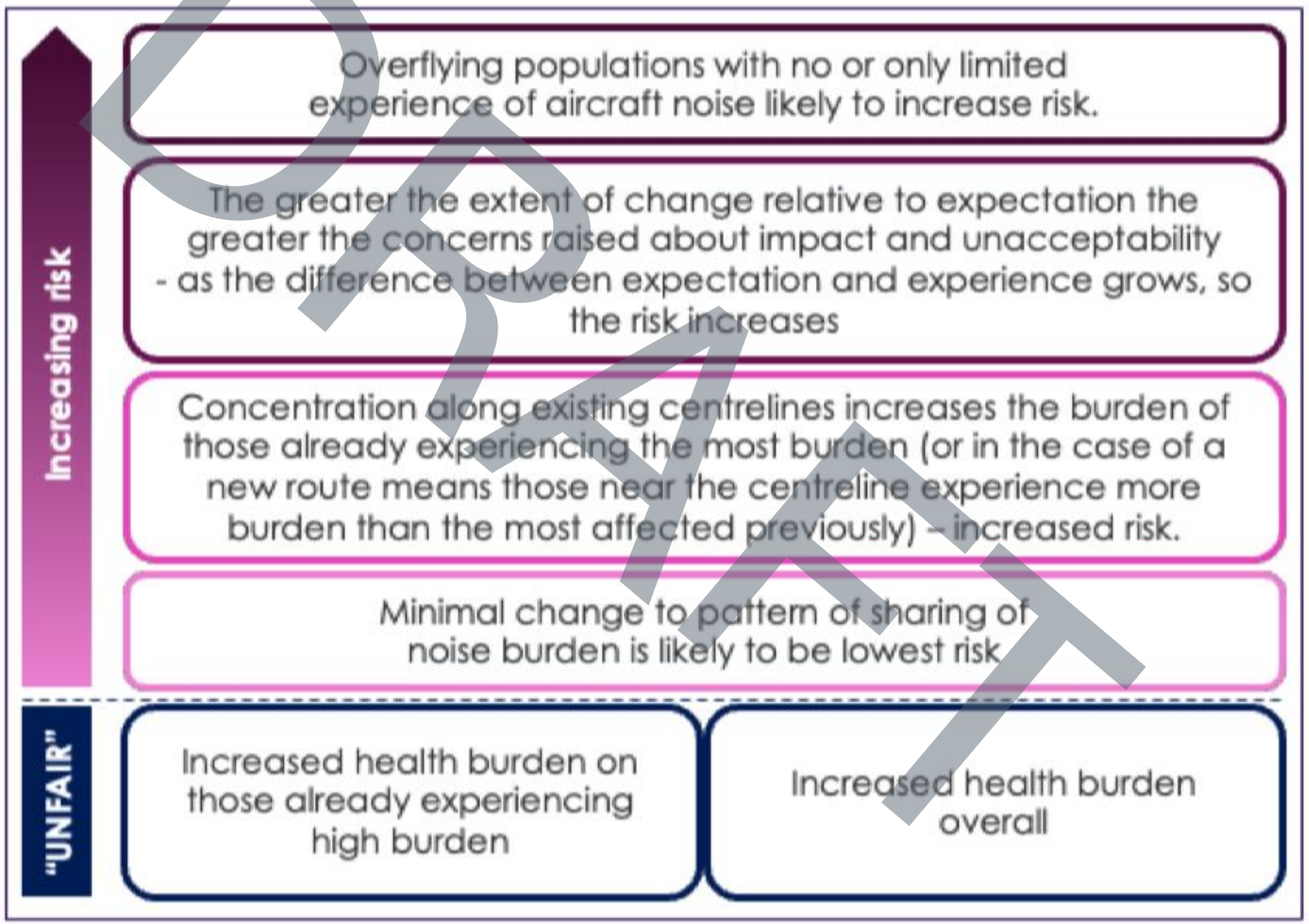
This study has found that minimal change in the distribution of aircraft noise reduces the risk of social unacceptability (at least in the context of populations local to Gatwick).

The findings and proposed framework are not intended to be a decision-making tool, more that it supports existing processes by providing greater understanding of the potential consequences on the social (un)acceptability of changes to distribution of aircraft arising from airspace modernisation and should improve transparency and openness in the engagement processes.

All of which ultimately should deliver less socially unacceptable outcomes.

It should also not be considered as a framework that will deliver a universally accepted solution.

Hierarchy of risk factors



Framework steps summary

Steps for assessing and communicating the distributional consequences of airspace change proposals.

Presenting and visualising changes to routes and noise geographically	Presenting and visualizing noise changes on populations geographically	Assessing noise burden and risks on people	Evaluating relative risk
Step 1. Spatial and narrative presentation of options	**Step 5.** Relating N65 changes to population distribution	**Step 7.** Determining noise burden with Person Event Index (PEI)	**Step 9.** Analyzing aggregate changes for proposals
Step 2. Spatial presentation of N65 and N65 change heat maps	**Step 6.** Quantifying populations exposed to N65 changes	**Step 8.** Aligning N65 and PEI with relative risk hierarchy	**Step 10.** Considering relative risk of social unacceptability
Step 3. Categorising N65 exposure into meaningful bands			
Step 4. Spatial presentation of N65 change categories			

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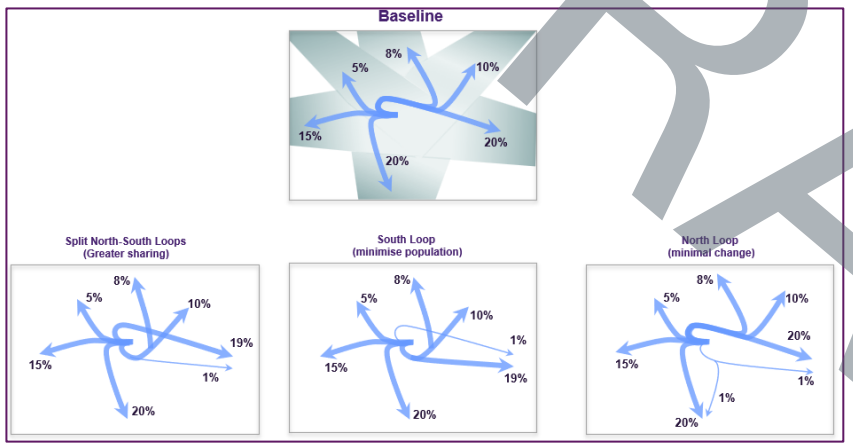
STEP 1 and 2

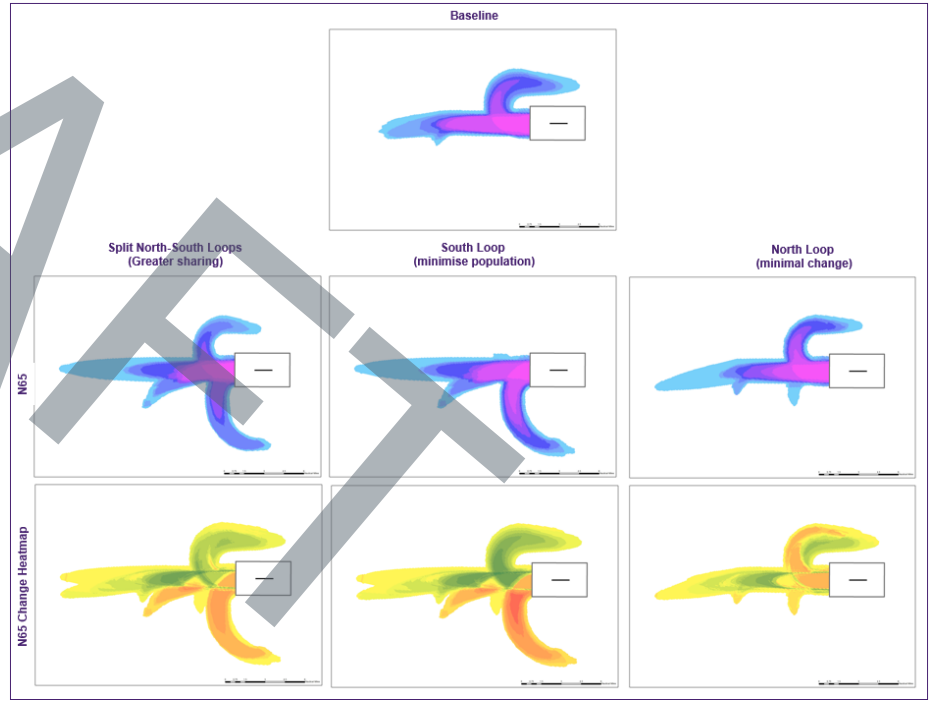
Spatial and narrative presentations

N65 and N65 change heat maps

Illustrate the options and provide an explanation of the basis for these options



Illustrate the N65 spatial distribution for each of the options (and the baseline) and N65 change heatmap (relative to the baseline case). This is to simply illustrate the spatial pattern of noise events and change



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STEP 3 and 4

Categorising N65

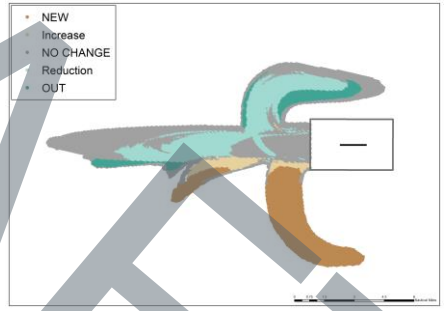
N65 change characterisation and spatial presentation

Categorising N65	N65 change categories	Spatial presentation of N65 change categories

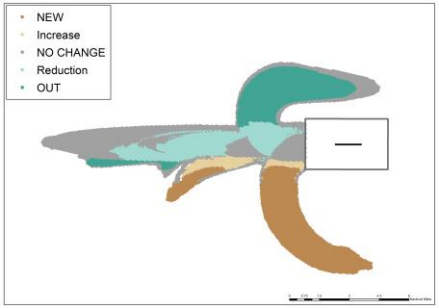
N65 BANDS (16h)
N65 >4 (1 x 4h)
N65 >8 (1 x 2h)
N65 >16 (1 x1h)
N65 >32 (1 x 30mins)
N65 >48 (1 x 20mins)
N65 >64 (1 x 15mins)
N65 >96 (1 x 10mins)
N65 >192 (1 x 5mins)

N65 Change Characterisation	
NEW (N65new)	**NEW (N65new)** Baseline N65 = 0 or N65 <4; increasing to N65>8, and an increase in average noise of at least +3dB LAeq.
INCREASE (N65+)	**INCREASE (N65+)** N65 band increases by at least 1, with an N65 increase of at least 8 or +45% (i.e. an increase of at least 1 aircraft every 2h)
NO CHANGE (N65nc)	**NO CHANGE (N65nc)** No change N65 band OR Band change +/- 1 with N65 change <+/- 8
REDUCTION (N65-)	**REDUCTION (N65-)** N65 band goes down by at least 1,N65 reduces by at least 8 or -33% (i.e. a reduction of at least 1 aircraft every 2h)
REMOVED – (N65rem)	**REMOVED – (N65rem)** N65 band goes down to Zero and N65 <=3, N65 >=4 in baseline,

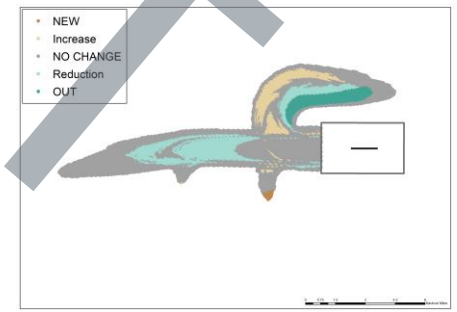
Split North-South Loops
(Greater sharing)



South Loop
(minimise population)



North Loop
(minimal change)



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STEP 5 and 6

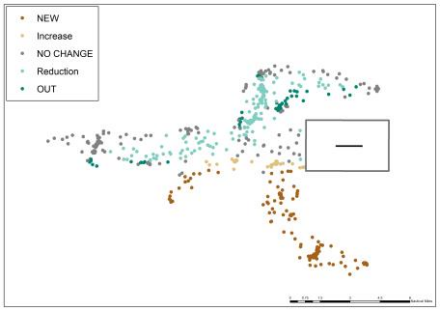
Relating N65 changes to population distribution

Quantifying population exposed to N65 changes

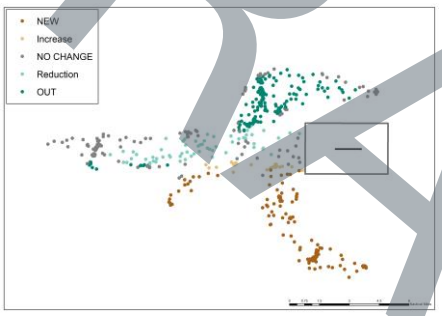
Relating N65 changes to population distribution

Quantifying Populations exposed to N65 changes

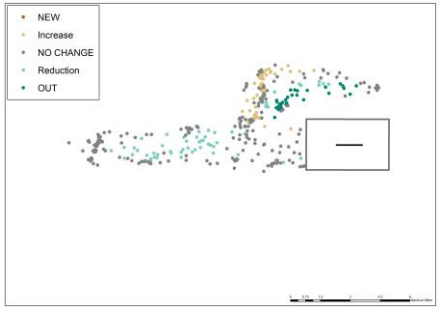
Split North-South Loops
(Greater sharing)



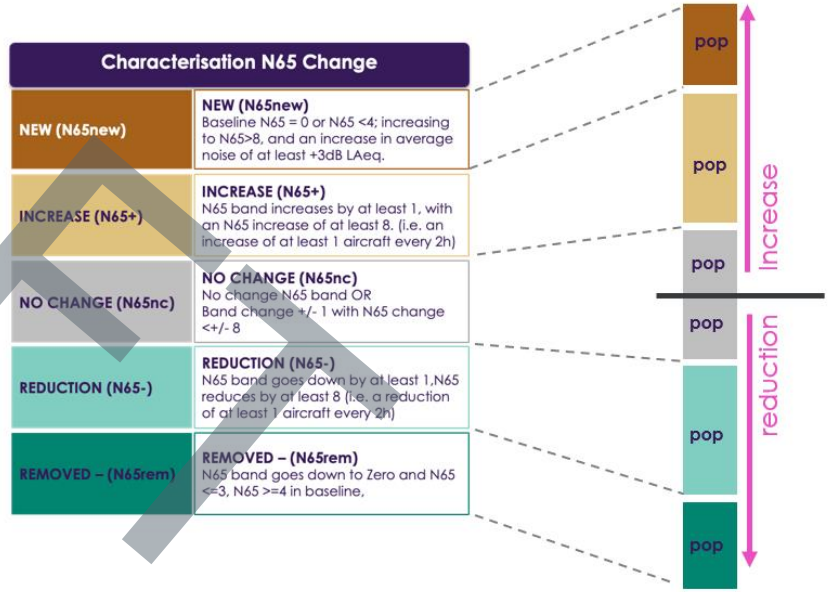
South Loop
(minimise population)



North Loop
(minimal change)



Characterisation N65 Change	
NEW (N65new)	**NEW (N65new)** Baseline N65 = 0 or N65 <4; increasing to N65>8, and an increase in average noise of at least +3dB LAeq.
INCREASE (N65+)	**INCREASE (N65+)** N65 band increases by at least 1, with an N65 increase of at least 8. (i.e. an increase of at least 1 aircraft every 2h)
NO CHANGE (N65nc)	**NO CHANGE (N65nc)** No change N65 band OR Band change +/- 1 with N65 change <+/- 8
REDUCTION (N65-)	**REDUCTION (N65-)** N65 band goes down by at least 1,N65 reduces by at least 8 (i.e. a reduction of at least 1 aircraft every 2h)
REMOVED – (N65rem)	**REMOVED – (N65rem)** N65 band goes down to Zero and N65 <=3, N65 >=4 in baseline.



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STEP 7

Determine the extent of the consequence of N65 changes on the population using Features of Person Events Index (PEI)

The present study highlighted the importance of the concept of "Person-Events" suggesting merit in the incorporation of the Person-Events Index (PEI) in the evaluation of relative risk. PEI brings together events and population to quantify noise load, change and distribution

Understanding PEI

"The PEI allows the total noise load generated by an airport to be computed by summing, over the exposed population, the total number of instances where an individual is exposed to an aircraft noise event above a specified noise level over a given time period……

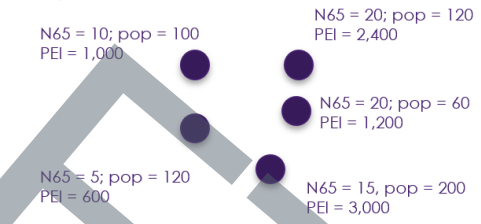
For example, if a departure off a specific runway at an airport by a particular aircraft type leads to 20,000 persons being exposed to a single event noise level greater than 65 dB(A) then the PEI(65) for that event would be 20,000. If there were a further similar event the PEI(65) would double to 40,000 since there would have been that number of instances where a person was exposed to a noise level louder than 65 dB(A). The PEI is therefore expressed by the following formula

$$PEI(x) = \Sigma P_N \; N$$

where x = the single event threshold noise level expressed in dB(A)

P_N = the number of persons exposed to N events > x dB(A)

Example PEI calc



TOTAL PEI
= 8,200 (person-events)

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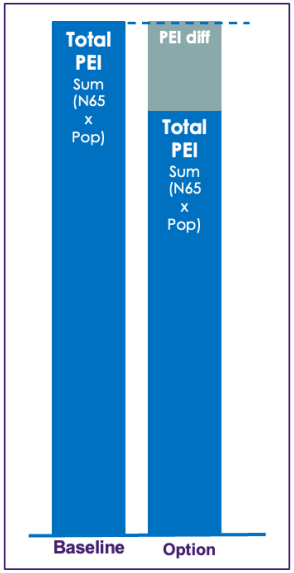
STEP 7

Determine the extent of the consequence of N65 changes on the population using Features of Person Events Index (PEI)

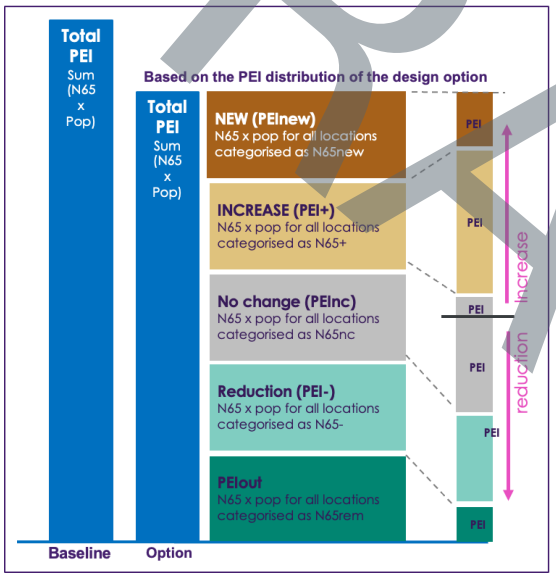
Analysis and presentation of the spatial population & distribution change features of N65 and PEI can provide enhanced understanding of the change in overall noise load with airspace proposals – the PEI features can provide objective assessment of risk factors associated with distributional fairness in terms of overall noise load.

Feature 1



Combining N65 with population enables greater understanding of differences in overall noise load (i.e. comparison of total PEIs - difference in PEI by comparing total PEI of baseline with the Option being considered.

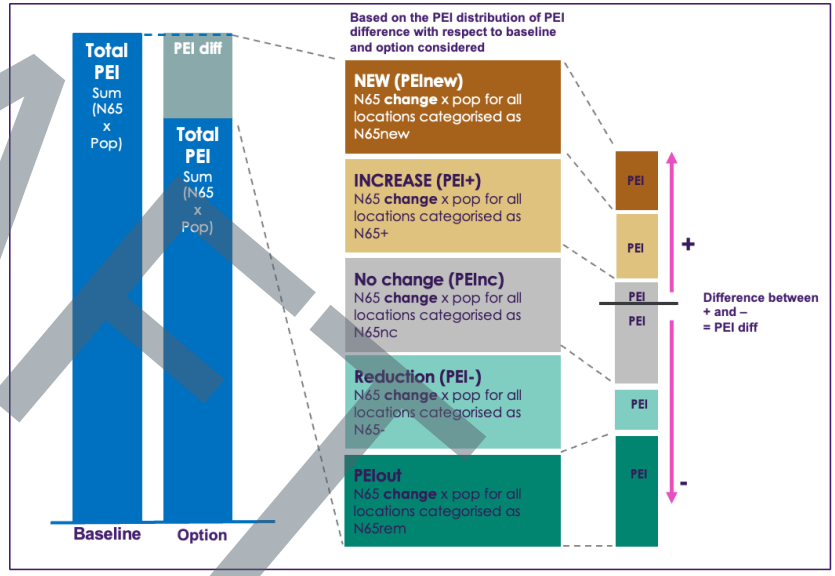
Feature 2



Combine N65 change categories with population at each postcode point, providing further understanding of the aggregate consequences of the change which can also then be included in the objective assessment of risk factors associated with distributional fairness.

Multiplying the N65 and the population for each point in each change category for the Option provides the PEI for each change category. Highlights how the distribution of PEI across the categories of change contributes to the total PEI for the Option being considered.

Feature 3



Quantification and distribution of the difference in total PEI (PEI diff) between categories of change. This is achieved by multiplying the change in N65 at each postcode point by the population therein.

The value of this assessment is that it sheds light on the PEI difference (both increases and decreases) experienced within each change category (rather than only the PEI outcome) as a result of the shift from baseline to the option being considered.

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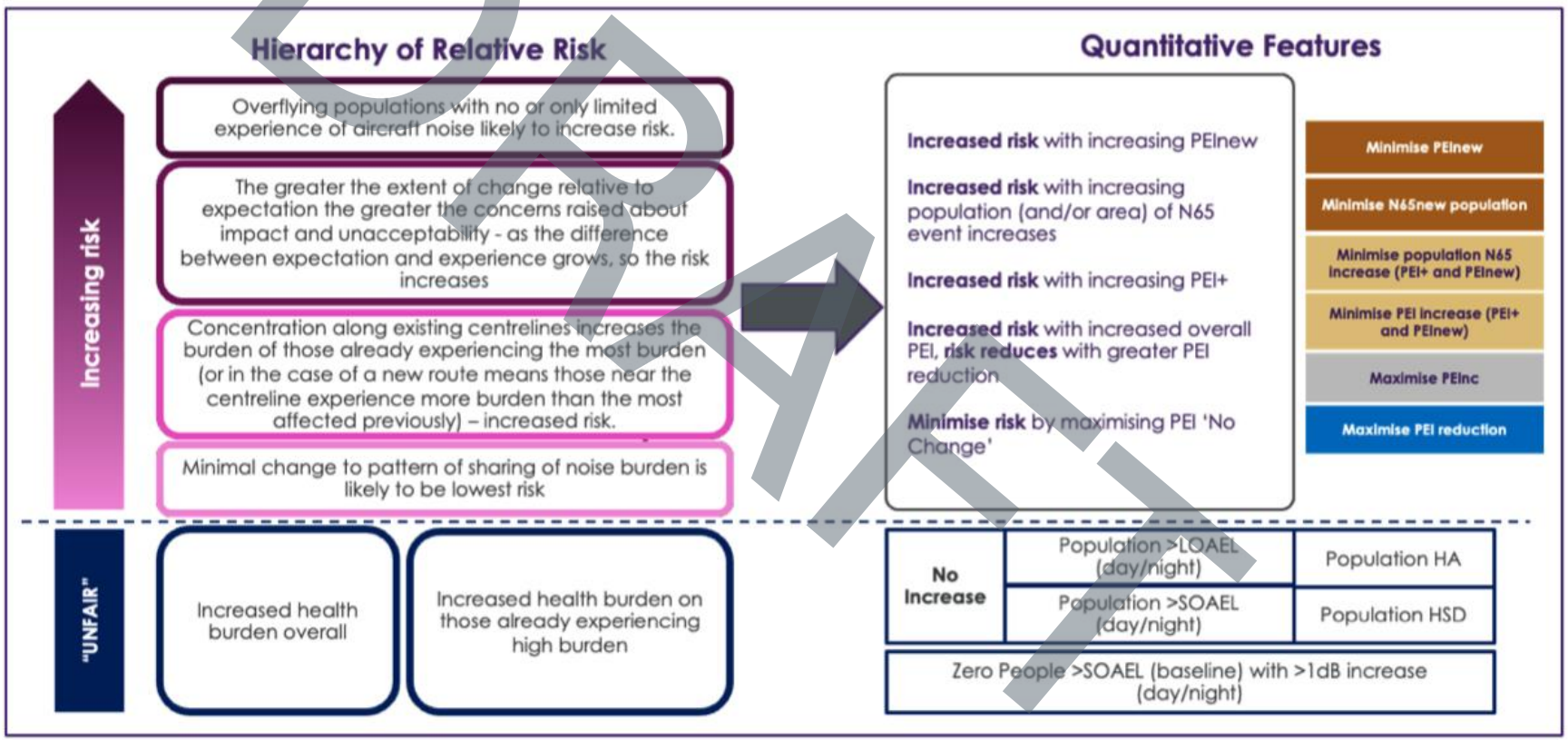
STEP 8

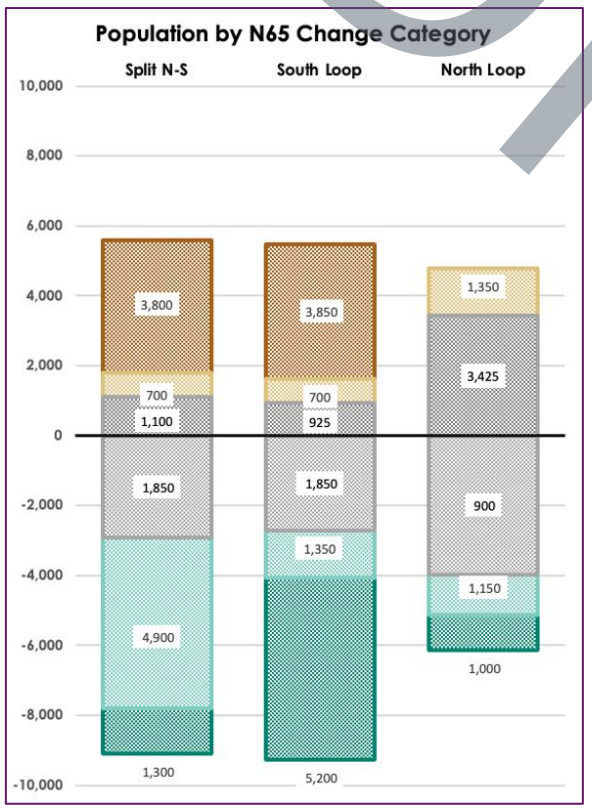
Align quantitative features N65 and PEI with the hierarchy of relative risk



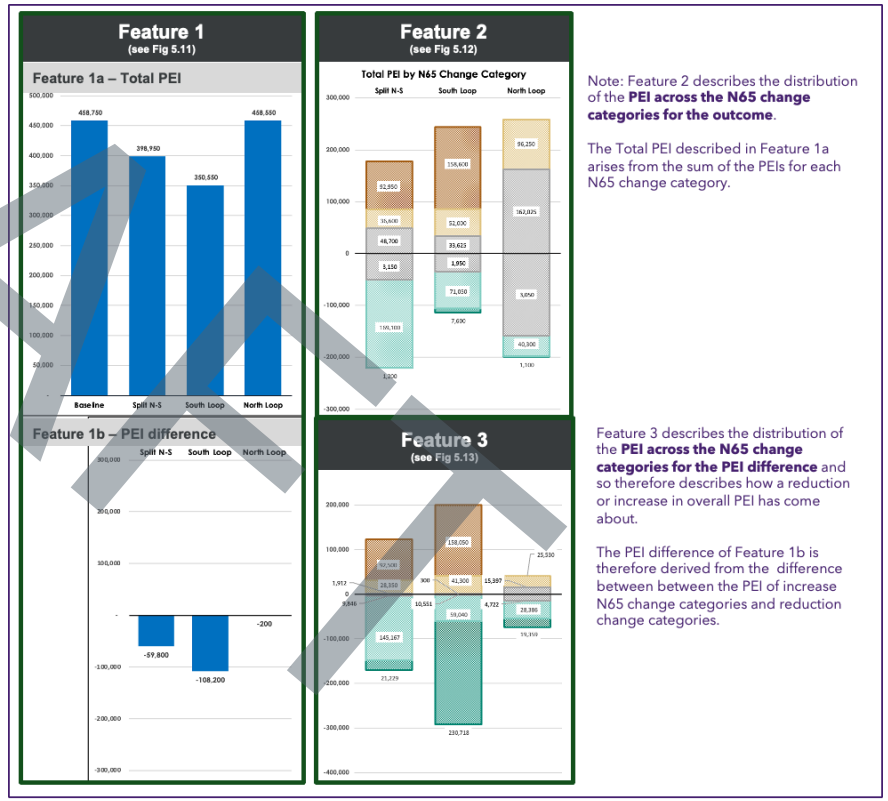
STEP 9

Analyse the aggregate changes for each proposal

Analysis of N65 change categories and PEI features provides insight into the consequences of the options



Distribution of the noise burden across the population by N65 category, which can be aggregated for the three options under consideration.



The implications for PEI can then be considered and linked to the Hierarchy of Relative Risk

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STEP 10

Assess relative risk of social unacceptability for each proposal to inform decision making using the hierarchy of risk.

Contextualise the relative risk of each proposal to inform decision making. Below illustrates a two-part assessment: The first part requires an evaluation of whether the outcomes of the option would be considered "unfair" (1); the second considers the relative risk with reference to the quantitative features of population and associated PEI derived from the Hierarchy of Risk (2) illustrated

Part 1 – Assessment of likelihood of being considered unfair.

Test	Split north-south	South Loop	North loop
Population >LOAEL	reduction (-)	Reduction (--)	No change
Population >SOAEL	No change	No change	No change
Population > SOAEL in BL with >1dB change	zero	zero	zero

Evaluation of social unacceptability.

1 Is the proposal likely to be considered "unfair"?

"UNFAIR?"			
	No Increase	Population >LOAEL (day/night)	Population HA
		Population >SOAEL (day/night)	Population HSD
	Zero People >SOAEL (baseline) with >1dB increase (day/night)		

2 Relative Performance of PEI metrics and associated relative risk of social unacceptability

Quantitative Features of Hierarchy of Risk

Increasing risk

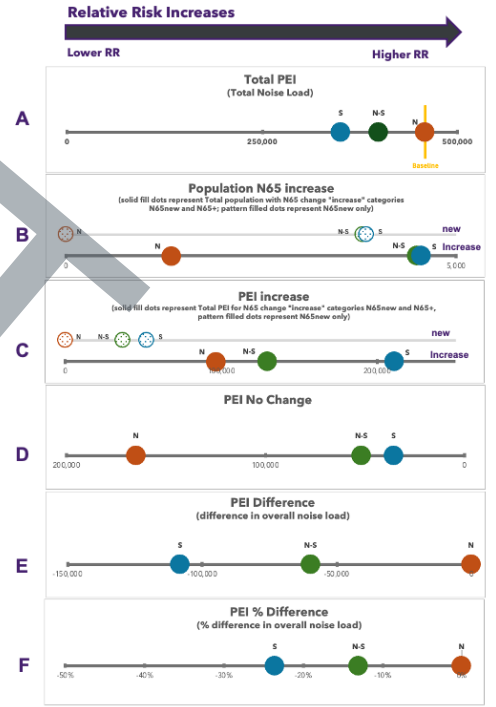
- **Increased risk** with increasing PEInew
- **Increased risk** with increasing population (and/or area) of N65 event increases
- **Increased risk** with increasing PEI+
- **Increased risk** with increased overall PEI, **risk reduces** with greater PEI reduction
- **Minimise risk** by maximising PEI 'No Change'

PEI metric associated with risk factors
4. Minimise PEI for newly experiencing (PEInew)
3. Minimise PEI increase (PEI+)
2. Maximise PEI no change (PEInc)
1. Maximise PEI reduction

Part 2 – Relative risk of social unacceptability

Visualising Relative Performance against PEI Categories

Each option has a coloured dot that is positioned relative to its performance in each PEI category, the relative position of dots can be associated with Relative Risk of social unacceptability.
Orange = N Loop, Green = N-S Loop, Blue = S Loop



Recommendations

Recommendations for airports

- **Implement this supplementary framework to complement the policy-based approach already undertaken** (it is recognised that the extent to which it is applied will need to consider existing and proposed airport size and impacts).
- **Undertake a two-step community engagement process.**

  Step A - to establish the preference for different patterns of change in the distribution of aircraft noise arising from a range of airspace change scenarios (using a virtual airport setting may assist this dialogue). This could also be used to test the event threshold metric (e.g. N60 or N65) and associated bandings.

  Step B - more generalised engagement that then seeks views on specific selected options following application of the learning from step A. This could form part of the main ACP consultation at Stage 3.

- **Use the outputs from this supplementary assessment of distributional fairness** to complement existing CAP1616 assessment of options and their refinement (to mitigate risks of socially unacceptable outcomes)
- **Design and develop transparent communication tools,** drawing on outputs from the supplementary assessment of changes in noise distribution, to enhance the quality of community engagement over selected airspace change options. Introduce a Q Methodology approach prior to Focus Groups to gain a greater understanding for the influence of attitudes on perceptions of fairness, and support development of materials for the focus groups.
- **In consultation, present communities with viable options** (even if one is presented as preferred) and with information that enables individuals to make informed decisions about their own preferences, which need to demonstrably influence final decisions/outcomes.
- **Input of community preferences to the final selection airspace change options,** thereby demonstrating meaningful engagement in airspace modernisation processes and helping to build trust in decision making

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Next stages

Implementing Fair and Equitable Airspace Design

- **Supporting airports in their CAP 1616 journey**
- **Dissemination and feedback of the findings to both the industry and communities**
- **Testing of approach across a number of airports** in their airspace modernisation programme

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What is the objective of the fairness assessment of airspace design?

OVERALL AIM

Reducing the risk of socially unacceptable outcomes,

Distributional and procedural fairness

by socially negotiated changes in the distribution of noise burden,

ICAO balanced approach

whilst optimising noise reduction through application of the ICAO balanced approach,

Procedural and informational fairness

through effective community and stakeholder engagement sharing transparent and meaningful information.

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Thank you

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