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Institute of Environmental Management and
Assessment (IEMA) Guide to:

Determining Significance For Human Health In Environmental Impact Assessment



November 2022

Contents

Acknowledgements	4
Working Group.....	4
About IEMA.....	4
1. Executive Summary	5
2. Introduction	6
3. The Need For This Guidance	7
The legislative requirement	7
4. Defining EIA Health Significance	8
EU definition	8
General approach to EIA significance	8
5. Health Of Populations, Sub-Populations And Individuals	9
6. Elements Of An Effective Assessment	11
7. EIA Health Significance Framework	15
8. Annex 1 – Glossary	21
9. Annex 2 – Worked Examples	26
Example A – Generic project	26
Example B – Highways improvements and bypass	28
10. Annex 3 – Links To Other Guidance	34
11. References	35

Tables

Table 4.1: Generic indicative EIA significance matrix.....	9
Table 7.1: Health sensitivity methodology criteria.....	17
Table 7.2: Health magnitude methodology criteria	18
Table 7.3: Generic indicative EIA significance matrix	18
Table 7.4: Significance conclusion and reasoning related to public health	19

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Working Group

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About IEMA

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1. Executive Summary

- 1.1. This guidance covers the consideration of health as a topic in environmental impact assessment (EIA). It presents a framework that supports a proportionate approach that can apply to all scales of EIA.
- 1.2. The guidance should be used by EIA practitioners working on projects in England, Wales, Scotland, Northern Ireland and the Republic of Ireland. It may also support or inform the approach taken by other stakeholders engaged in EIA and for EIA practice further afield.
- 1.3. This guidance is applicable to the various EIA legislative processes within England, Wales, Scotland, Northern Ireland and the Republic of Ireland. Knowledge of the EIA process is assumed.
- 1.4. Practitioners of health in EIA are part of the public health endeavour, and practice must reflect this role. Legal challenge to health in EIA work is a risk and it can be reduced by following guidance. IEMA supports quality and proportionality.
- 1.5. An EIA must identify, describe and assess the direct and indirect significant effects in an appropriate manner of a proposed development on human health. It must include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects, taking into account current knowledge and methods of assessment. It must include a description of the forecasting methods or evidence used to identify and assess these significant effects, including details of difficulties encountered in compiling the required information.
- 1.6. EIA significance is defined as informed expert judgement of the importance, desirability or acceptability of a change². For human health, this relates to whether the change is important, desirable or acceptable for public health^{3, 4, 5, 6}. The judgement must explain the context and be evidence based.
- 1.7. EIA commonly uses a significance framework that seeks to assign sensitivity to receptors, to assign a magnitude of change to derive the level of effect, and then to state if the effect is significant. For health, this requires the identification of relevant populations and their sensitivity, the level of change in determinants of health (magnitude), and a description of the likely significant effects to population health outcomes. This partly, but not fully, explains whether the change is important, desirable or acceptable for public health.
- 1.8. The guidance provides health sensitivity and health magnitude tables. It also sets out how to provide an evidence-based narrative to explain why the change is or is not significant for public health.
- 1.9. The guidance confirms that a population health approach should be taken when determining significance.
- 1.10. The guidance also notes that the potential for health inequalities need articulating in 'significance conclusions' to determine if any specific mitigation should be put in place or monitoring is required.
- 1.11. Worked examples are provided to illustrate the application of the significance framework presented. The qualitative framework can be informed by quantitative and/or qualitative health analysis and inputs.
- 1.12. The guidance highlights key learning from existing national and international good practice publications, extends the guidance where necessary and signposts out to further detail.

2. Introduction

- 2.1. This guidance has been produced, both to inform current practice and in anticipation of potential changes to the way that environmental impact assessment (EIA) is undertaken in the UK and Republic of Ireland, and addresses inequalities and population health as environmental outcomes of a project. Knowledge of the EIA process is assumed.
- 2.2. This guidance discusses what 'significance' means for 'human health' as an EIA topic.
- 2.3. This document forms one of a series of focussed health guidance documents aimed at EIA practitioners and reviewers, planning application decision-makers, health policymakers and other stakeholders. At the time of publication, the following IEMA Guide has also been produced: Effective Scoping of Human Health in EIA (November 2022).
- 2.4. The EIA process uses the term 'significance' to describe the weight that should be placed on an issue during a decision, i.e., the extent to which it is 'material' to the planning decision. What this 'weight' means and how it is determined differs between EIA topic areas, such as air quality, biodiversity and health.
- 2.5. It is, however, important that 'significance' remains a common basis for conveying conclusions both within and between EIA topic areas. If this was not the case, the planning decision-maker would be unable to equate and find the balance between EIA issues and topic areas. This would undermine the value of EIA as a decision support tool.
- 2.6. Whilst there are multiple EIA legislative frameworks nationally and internationally¹, this paper takes an overarching position setting out an approach that can be adopted across England, Wales, Scotland, Northern Ireland and the Republic of Ireland. Although there is some variation in terminology highlighted in this document. For avoidance of doubt, this guidance refers to the 'EIA Report' as opposed to the 'Environmental Statement'.
- 2.7. This guidance uses the World Health Organization (WHO) definition of health and explains that this means a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.
- 2.8. Health is influenced by a range of factors, termed the 'wider determinants of health'. Determinants of health span the bio-physical¹, social, behavioural, economic and institutional² factors. This guidance provides a framework for concluding on the significance of population health effects that can be applied across the wider determinants of health.
- 2.9. This document should be read in conjunction with the glossary of common health in EIA terminology in **Annex 1**, as well as the list of health determinants and glossary provided in **Effective Scoping of Human Health in EIA (November 2022)**.

1. Bio-physical factors include for example air quality, water quality and noise.
2. Institutional factors include for example health and social care services.



3. The Need For This Guidance

- 3.1. This publication responds to gaps and inconsistencies across existing guidance documents as to how health is assessed in EIA, particularly with regard to significance. This guidance supports practitioners, planning authorities and developers to undertake assessment in a way that demonstrates if there are significant implications for public health. This includes where there are opportunities to improve the development in favour of better population health outcomes and respond to potential inequalities.
- 3.2. This guidance promotes greater consistency in the assessment process, including how EIA health conclusions are reached, interpreted and used by all parties. This will promote consensus and streamline discussions between practitioners producing the EIA Report and the statutory agencies reviewing those reports. This is consistent with the ambitions of governments across England, Wales, Scotland, Northern Ireland and the Republic of Ireland for the EIA regime to become more efficient.
- 3.3. The absence of clear and transparent guidance contributes to divergent practices and disagreement between experts and between stakeholders. This situation increases costs, report length, uncertainty and planning risks. It also increases the need for health expert evidence at public inquiries and planning appeals.

The legislative requirement

- 3.4. The legislative basis of EIA requirements across England, Wales, Scotland, Northern Ireland and the Republic of Ireland derives from the EU EIA Directive 2011/92/EU, as amended by 2014/52/EU. This is variously transposed into a range of national EIA legislation. Given the diversity of national legislation, the common origin of the EU Directive wording remains informative and adequately summarises the current requirements.
- 3.5. Directive 2014/52/EU states:
 - The objective of EIA is 'to ensure a high level of protection of the environment and of human health' (Recital 41).
 - The EIA shall 'identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect **significant** effects of a project on ... population and **human health**...' (Article 3).
 - The EIA Report shall include: 'a description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, **human health**...' (Annex IV), [emphasis added].
 - The EIA Report shall include: 'the information that may reasonably be required for reaching a **reasoned conclusion** on the **significant** effects of the project on the environment, **taking into account current knowledge and methods of assessment**' (Article 5)].
- 3.6. Any variation in how these broad requirements is phrased in national legislation does not affect the approach to health in EIA significance described in this guidance.
- 3.7. The term 'significance' in EIA should not be confused with either a statistical or a non-technical meaning of the word.

4. Defining EIA Health Significance

EU definition

- 4.1. The EU Directive (and thus the foundation for diverging national legislation) definition of significance is provided in the European Commission Guidance²:
- 4.2. 'The assessment of significance relies on informed **experts' judgements** about what is **important, desirable or acceptable** with regards to changes triggered by the project in question. These judgements are relative and must always be understood in their **context**:
 - They are **value-dependent**: while judgements are, in most cases, informed by **scientific data** (e.g., regarding the type of impact being examined), they are subjective to some degree as they are the opinion of one practitioner or a team of practitioners. Even when presented with similar data, experts' judgements may vary depending on their individual background and any context specific issues that may inform their perspective (for example, legal, institutional, political or public position).
 - They are **context-dependent**: judgements are made within the socio-cultural, economic and political contexts of a project. **A thorough understanding of contextual factors** (e.g., local ecological, social, and cultural conditions, judgements in related decision-making areas), likely to influence judgements' significance, is essential when identifying a project's impact on the environment.'
- 4.3. The European Commission's definition of significance is widely applied in the context of health significance^{3,4,5}.
- 4.4. EIA health significance therefore needs to reflect what it means for a change triggered by the project to be 'important', 'desirable' or 'acceptable' for public health. The professional judgement must reflect the context and cite relevant evidence to support the position reached.
- 4.5. The challenge of needing to clarify what this means for health was articulated in the 2017 joint publication by IEMA and the UK's Faculty of Public Health⁶. The publication states:
 - 'in impact assessment, the significance of an effect is usually a matter of expert professional judgements informed by reference to an evidence base and to practitioner guidance.
 - human health significance in EIA should include a **professional judgement supported by evidence**, for example on an issue's "importance" and "acceptability". Available evidence to cite in the EIA may include: scientific literature; consultation responses; baseline conditions; local health priorities; and regulatory standards.'
- 4.6. This guidance takes that early IEMA position further and provides detail on a clear process and approach.

General approach to EIA significance

- 4.7. EIA methods typically use a matrix of sensitivity and magnitude. For health this identifies if there is a relevant population (the sensitive receptor) and if there is a relevant project change to a health determinant (magnitude of impact). This alone does not fully explain whether the change is important, desirable or acceptable for public health.
- 4.8. This guidance explains how the generic EIA matrix is applied to human health. The generic EIA matrix shown in Table 4.1 forms part of the method explained later in this guidance.

Table 4.1: Generic indicative EIA significance matrix

		Sensitivity			
		High	Medium	Low	Very Low
Magnitude	High	Major	Major/moderate	Moderate/minor	Minor/negligible
	Medium	Major/moderate	Moderate	Minor	Minor/negligible
	Low	Moderate/minor	Minor	Minor	Negligible
	Negligible	Minor/negligible	Minor/negligible	Negligible	Negligible

- 4.9. It should be noted that:
- EIA Reports can use a variety of terminologies equivalent to high, medium and low and also variation in the number of subdivisions within sensitivity and magnitude.
 - The matrix is only a tool to assist with judgement, there are not clear cut-off points between categories and terminologies, for example the point at which an impact changes magnitude category is a professional judgement and should be supported by evidence and justification.
 - Typically, on this four-category approach, major or moderate effects are considered to be significant and minor or negligible are considered to be not significant. It is noted that if a different categorisation is used, e.g., the seven-category approach of EPA (2022) moderate may be not significant⁷.
 - The magnitude of project change may lead to positive or negative health effects. Populations may have varying levels of sensitivity that result in greater positive or negative health effects.

5. Health Of Populations, Sub-Populations And Individuals

- 5.1. Development has the potential to affect a range of individuals in profoundly different ways. To understand this, it is important to be familiar with the concept of 'wider determinants of health' (Dahlgren-Whitehead, 1991)³, particularly how health can be affected by:
- age, sex and constitutional factors (these cannot be influenced by development);
 - individual lifestyle factors;
 - social and community networks;
 - living and working conditions;
 - general socio-economic, cultural and bio-physical conditions.
- 5.2. EIA analysis at the level of individuals would likely mean that all determinants of health conclusions, positive or negative, would be significant on all projects because of the effects to some particularly sensitive individuals. This would be contrary to supporting decision-makers in identifying the material issues. Assessment of EIA significance at the level of individuals is not proportionate.
- 5.3. Literature and public health practitioner and impact assessor consensus is that EIA should take a population health approach^{3,4,8}. 'Population health' refers to the health outcomes of a group of individuals, including the distribution of such outcomes within the group⁹.
- 5.4. Within a defined population, individuals will range in level of sensitivity due to a series of factors such as age, socio-economic deprivation and pre-existing health conditions. Some groups of individuals may be particularly vulnerable to changes in bio-physical and socio-economic factors (adversely or beneficially) whereby they could experience differential or disproportionate effects when compared to the general population.
- 5.5. As an example, the older people, young children and individuals with chronic pre-existing respiratory conditions would be more sensitive to adverse changes to air quality, with the potential for emergency admission to hospital more likely than for someone of working age who has good respiratory health. On the other hand, an individual who has been unemployed for a long period of time would benefit more from employment opportunities generated by a project in comparison to an individual who is already employed.
- 5.6. While the average local health circumstance across a defined population may be considered good, there may be groups of individuals within that defined population who are particularly sensitive and could experience disproportionate or differential effects. On this basis it may be appropriate to consider relevant sub-populations, i.e., groups of more sensitive individuals.
- 5.7. Following a public health perspective in relation to the distribution of an effect, health in EIA should consider both populations and differential or disproportionate effects to relevant sub-populations.
- 5.8. The role of determining EIA levels of effect on health (including identifying significant effects) is therefore not to set a threshold of 'no harm' from development, but to show where, at a population or sub-population level, the harm should weigh strongly in the balance alongside the development's benefits for health and other outcomes.
- 5.9. To provide actionable information to decision-makers, significance conclusions should be on the basis of whether or not there are likely to be population-level effects, both positive and negative.
- 5.10. The population health significance conclusions should reflect the potential for widening or narrowing health inequalities between defined populations and relevant sub-population(s).

³. How the wider determinants of health as a concept is specifically applied in EIA is set out in Effective Scoping of Human Health in EIA (November 2022).

6. Elements Of An Effective Assessment

Define appropriate populations and sub-populations

- 6.1. As introduced in IEMA's **Effective Scoping of Human Health in EIA (November 2022)**, for each determinant of health scoped into the analysis, define a study area appropriate to the scale of the project's impacts and identify the most relevant geographic population. This should focus on smaller areas where feasible.
- 6.2. Define the characteristics of the relevant population and identify particular attributes relating to vulnerability or sensitivity to define sub-populations as required. Advice on this is provided in IEMA's **Effective Scoping of Human Health in EIA (November 2022)** (Table 4).
- 6.3. As relevant, discuss infrastructure and assets that support population health. The identification of relevant populations may be informed by the receptors defined in other EIA chapters, such as dwellings, disease vectors or routes.

Map health pathways

- 6.4. The scoping stage will have considered relevant source-pathway-receptor linkages (see IEMA's **Effective Scoping of Human Health in EIA (November 2022)**). During analysis, briefly explain the relevant source, pathway and receptor for each scoped-in determinant of health.
- 6.5. The analysis should also state the relationship between the most relevant determinants of health and health outcomes. A change in a determinant of health for a population does not necessarily mean there will be a significant effect. Health outcomes are usually linked to a wide range of risk factors, one or more of which may be determinants of health affected by the project. The context should be explained. The change in a risk factor may need to be large, sustained and widespread within a population for there to be a significant influence on public health outcomes.

- 6.6. Consult with community stakeholders and health stakeholders, as to their views and the availability of local data to inform the judgements, e.g., on population sensitivity. See points of contact for engagement in **Effective Scoping of Human Health in EIA (November 2022)**.

Assess sensitivity and magnitude

- 6.7. Sensitivity can be informed by baseline data, including demographic statistics, public health statistics and deprivation mapping. It can also be informed by professional judgements about the characterisation of the relevant population, e.g., in relation to their capacity to adapt and the likely presence of vulnerable groups (see Table 7.1).
- 6.8. Magnitude can be informed by a full understanding of the project and the findings of other EIA Report chapters, including their zones of influence and expected degrees of change. It can also be informed by professional judgements based on the project description and other evidence sources or supporting assessments (see Table 7.2).

Judge significance and public health implications

- 6.9. For each determinant of health, identify levels of sensitivity and magnitude for the population and for relevant sub-population(s). Also reach a single level of significance that reflects the overall public health conclusion, including whether there are likely to be significant changes in health inequalities due to the project.
- 6.10. The approach determines EIA health significance with reference to sensitivity and magnitude (see Table 7.3). On the approach set out in this guidance, major and moderate will, by default, normally be considered significant, supported with appropriate evidence and justification. Levels of effect (including significant effects) can be amended to residual effects where accompanied by suitable secured additional mitigation or enhancement.

- 6.11. Ensure conclusions provide a suitable concise narrative to evidence a reasoned conclusion of the public health implications for the relevant context, see Table 7.4. Reporting should summarise key considerations and supporting evidence.
- 6.12. The assessment should explain how the population's health is likely to vary over time by considering relevant assessment years and project phases and if health outcomes may increase or reduce over time, e.g., with prolonged exposure or adaptive responses.
- 6.13. Determining significance is based on expert judgement regarding the effect-receptor interaction that occurs and on the data that is available. The assessment narrative should explain the extent to which the expected change is:
- central to the public health agenda of the relevant jurisdiction (positive or negative effects), evidence may include scientific literature, local baseline conditions and local health priorities; or
 - is contentious (negative effects) or strongly desired and in need of securing (positive effects), evidence may include consultation responses, regulatory standards and the health policy context.
- 6.14. The conclusions on significance reached for public health may differ from the conclusions reached for outcomes discussed in other EIA technical chapters.
- 6.15. For example, that there are a small number of significant effects on receptors in the noise assessment does not mean there would be a significant population level health effect. Or, a negligible air quality assessment conclusion based on concentrations being below statutory air quality standards, does not exclude the possibility that there would be a minor adverse effect to population health to acknowledge, relating to the absolute change in an air pollutant's concentration and non-threshold nature of some air pollutants, even within regulatory limits. **See Annex 2 – Worked examples.**
- 6.16. Within the EIA Report health chapter, ensure the same method for reaching significance conclusions is taken across all the determinants of health assessed (e.g., the tables set out herein). Such a basis may be informed by both qualitative and quantitative inputs.
- 6.17. Each significance conclusion should:
- be comparable, so that those tasked with determining the project application, can decide the overall weight to give to the health effects of the project and determine the relative influence different health determinants have;
 - give parity to physical health and mental health across the analysis of bio-physical, social, behavioural, economic and institutional influences on population health outcomes;
 - take a proportional approach to the depth of evidence gathering, analysis and reporting in the EIA health chapter;
 - reach conclusions on whether an effect is significant in terms of relevant population health outcomes, based on the proportionate reporting of the best available evidence and certainty.

Secure mitigation and enhancement measures

- 6.18. It is important to use an EIA as a tool to understand how people and communities can benefit from a project, rather than just avoid being adversely affected.
- 6.19. As explained in other IEMA Guidance⁴, there is an EIA requirement to demonstrate mitigation of the significant adverse effects of a project following the mitigation hierarchy.
- 6.20. It is equally important to demonstrate enhancement measures. Significant beneficial effects should be sought, and secured within the scheme through appropriately worded planning conditions.
- 6.21. The assessment of significance should take into account all committed or secured mitigation and/or enhancement measures. These can be 'primary' (i.e., forming part of the project being consented), 'secondary' (i.e., requiring further activity in order to achieve the anticipated outcome), or 'tertiary' (meeting legislation or standard practice). Where these measures are known, their effectiveness should be taken into account in the determination of significance.
- 6.22. Significance conclusions should not take into account unsecured mitigation, but may include a qualitative statement indicating their expected effect. If there is no certainty on mitigation, then the residual effects reported would not change. Where there is the potential for a likely significant adverse population health effect and there is a high degree of uncertainty, which may include uncertainty on the effectiveness of proposed mitigation, monitoring should be secured, including clarity of governance and further action.
- 6.23. Health-related mitigation measures may include those that act on determinants of health as well as those that target health outcomes. This may mean that many health-related measures are covered in other EIA chapters, e.g., to avoid or reduce bio-physical environmental emissions, thereby preventing health effects from arising.
- 6.24. Be iterative in the process of analysis of health significance and securing of mitigation or enhancements.

Undertake combined or cumulative effects

- 6.25. The significance of in-combination effects (also known as intra-project effects) should be determined. This further analysis requires collating the effects identified (excluding negligible effects) for each determinant of health by population or sub-population(s). The IEMA **Effective Scoping of Human Health in EIA Guidance (July 2022)** provides advice on consistent population classification to support this process. The exercise produces, for each population or sub-population, a list of the relevant determinants of health and their level of effect. The EIA Report should then provide a narrative of likely interactions, and if appropriate a professional judgement as to a combined significance conclusion for that population or sub-population. This may include multiple significance conclusions, e.g., one combining positive effects and one combining negative effects. The need for any further mitigation should be described.

⁴ IEMA (2016): EIA Guide to: Delivering Quality Development.

6.26. Considerations for in-combination assessments:

- whether the same population, or sub-population(s), could be affected by multiple effects simultaneously or consecutively;
- interactions between determinants of health are complex as the changes may affect either the same or different risk factors; and independently, the same or different health outcomes;
- whilst overlaps in health determinants occur, positive and negative health effects usually don't cancel each other out. Similarly, positives (or negatives) do not necessarily reinforce each other in combination;
- clearly stating whether a population experiences an overlap in effects from a range of determinants of health is usually more appropriate than calculating a net effect on public health. A professional judgement of the significance of the combined effect for the population may be made if considered appropriate.

6.27. The level of cumulative effects (also known as inter-project effects) should be determined. This further assessment requires extending analysis of levels of effect for each determinant of health. This means for each determinant of health listing the relevant reasonably foreseeable cumulative projects and using professional judgement (further sensitivity analysis is not required as the receptor remains the same, however magnitude should be appraised in light of the combined effect), providing a combined level of effect to reflect the likely implications for public health. The priority being the identification of likely significant effects and the identification and description of any further mitigation necessary.

6.28. Considerations for cumulative assessments:

- A combined public health effect is most likely where a population is affected by multiple determinants of health and a large proportion of the same individuals within that population experience the combination of effects.
- Some impacts are relatively localised, e.g., dust from a construction site, whilst others may be more far-reaching, e.g., job creation or noise along shared transport corridors.

6.29. In addition, an element of the cumulative assessment should articulate where a project contributes to a trend of incremental additional pressures on public health that whilst individually is not significant, collectively gives rise to significant public health effects. Broad spatial and temporal bounding may be appropriate for such trends where they account for the wider development context in an area. Further guidance is available^{5, 6}.

State limitations and assumptions

6.30. The report should include details of where assumptions or limitations in the assessment could have a material impact on the validity and accuracy of the assessment findings or mitigation.

5. IEMA (July 2020): Impact Assessment Outlook Journal, Volume 7: Demystifying Cumulative Effects

6. National Infrastructure Planning (2019): Advice Note 17, Cumulative Effects Assessment

7. EIA Health Significance Framework

- 7.1. Table 7.1, Table 7.2, Table 7.3 and Table 7.4 together summarise the EIA health assessment methodology and explain levels of effect. This good practice approach is based on existing national and international guidance^{3,4} and can be applied consistently to all determinants of health. Table 7.1, Table 7.2, Table 7.3 and Table 7.4 are indicative of generic four-category EIA matrices, other matrices are also commonly used. The approach may be adapted depending on the generic EIA sensitivity and magnitude matrix used by the project.
- 7.2. It should be noted that not all criteria in Table 7.1, Table 7.2 and Table 7.4 will be relevant to all assessments. The most relevant should be selected. If appropriate, explain why certain criteria are excluded. The decision will depend on the project, location, population and availability of evidence.
- 7.3. It will often be the case that relevant criteria span categories of level, e.g., a high scale of change, but over a short-term duration. In these instances, the narrative should reflect elements of multiple categories and a judgement made on the most appropriate level, taking into account all relevant criteria. Being transparent supports reaching consensus with public health stakeholders.
- 7.4. The approach uses professional judgement, drawing on consistent criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain what significance means for public health.
- 7.5. The analysis draws on qualitative and quantitative inputs and evidence, including from other EIA topic chapters. This methodology assesses wider determinants of health proportionately, consistently and transparently.
- 7.6. The EIA Report health chapter conclusions on significance should identify whether the effect is major, moderate, minor or negligible; along with a narrative explaining this with reference to project evidence and local context, see Table 7.4.
- 7.7. The assessment of significance can be highly contextual and requires the assimilation and consideration of a range of information, such as:
- scientific literature;
 - baseline conditions for the population;
 - health priorities in the jurisdiction;
 - consultation for the project;
 - regulatory standards in the jurisdiction; and
 - health policy context in the jurisdiction.
- 7.8. The criteria in Table 7.1, Table 7.2 and Table 7.4 are intentionally broadly phrased to provide flexibility in covering a wide range of determinants of health, population groups, project activity types and contexts. In applying the tables as the basis for a narrative, efforts should be made to be as specific as is reasonably practicable. For example long-, medium-, short- and very short-term should be defined for a given project. Not all criteria will readily relate to available evidence sources, so professional judgement must be used. However, where relevant public or project data is available, it should be proportionally referenced.

- 7.9. Whilst data varies, in terms of evidencing sensitivity, the deprivation criteria could reference national deprivation mapping quintiles; resource sharing could reference the baseline of community assets described in the socio-economics chapter; existing inequalities could reference statistics for health inequalities in life expectancy and compare these to national averages; outlook could reference pre-application consultation with the community or a professional judgement about levels of community concern; life stage, health status and daily activities could reference national self-reported census statistics; and capacity to adapt could be based on professional judgement based on all the above. The aim is to triangulate evidence to provide a clear and concise summary statement, not exhaustively list evidence on all criteria. In most cases a couple of sentences covering three of four criteria is likely to be sufficient.
- 7.10. To avoid repetition, where common criteria for establishing differences in sensitivity between the general population and vulnerable sub-population(s) are used across determinants of health, cross-referencing can be used to a single statement.
- 7.11. For magnitude, information on exposure, scale, frequency, duration and population extent are likely to come from other EIA topic chapters or the project descriptions. A professional judgement on severity, health outcome permanence and service quality implications can be made, which may be informed by the scientific literature. It's important to be clear on whether the impact would have positive or negative health outcomes.
- 7.12. Terms in *italic* in Table 7.1, Table 7.2 and Table 7.4 indicate terms that qualitatively describe levels within criteria that are discussed across the category options. For example, *high*, *moderate*, *low* or *very low* levels of deprivation.



Table 7.1 Health sensitivity methodology criteria

Category/Level	Indicative criteria (judgement based on most relevant criteria, it is likely in any given analysis that some criteria will span categories) The narrative explains that the population or sub-population's sensitivity is driven by (select as appropriate):
High	<i>high</i> levels of deprivation (including pockets of deprivation); <i>reliance</i> on resources shared (between the population and the project); existing <i>wide</i> inequalities between the most and least healthy; a community whose outlook is predominantly <i>anxiety or concern</i> ; people who are <i>prevented</i> from undertaking daily activities; <i>dependants</i> ; people with <i>very poor</i> health status; and/or people with a <i>very low</i> capacity to adapt
Medium	<i>moderate</i> levels of deprivation; <i>few</i> alternatives to shared resources; existing <i>widening</i> inequalities between the most and least healthy; a community whose outlook is predominantly <i>uncertainty</i> with some concern; people who are <i>highly limited</i> from undertaking daily activities; people providing or requiring <i>a lot of care</i> ; people with <i>poor</i> health status; and/or people with a <i>limited</i> capacity to adapt
Low	<i>low</i> levels of deprivation; <i>many</i> alternatives to shared resources; existing <i>narrowing</i> inequalities between the most and least healthy; a community whose outlook is predominantly <i>ambivalence</i> with some concern; people who are <i>slightly limited</i> from undertaking daily activities; people providing or requiring <i>some care</i> ; people with <i>fair</i> health status; and/or people with a <i>high</i> capacity to adapt
Very Low	<i>very low</i> levels of deprivation; <i>no</i> shared resources; existing <i>narrow</i> inequalities between the most and least healthy; a community whose outlook is predominantly <i>support</i> with some concern; people who are <i>not limited</i> from undertaking daily activities; people who are <i>independent</i> (not a carer or dependant); people with <i>good</i> health status; and/or people with a <i>very high</i> capacity to adapt.

Table 7.2 Health magnitude methodology criteria

Category/Level	Indicative criteria (judgement based on most relevant criteria, it is likely in any given analysis that some criteria will span categories) The narrative explains that the population or sub-population's magnitude narrative explains that the magnitude of change due to the project is driven by (select as appropriate):
High	<i>high exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/injury outcomes; majority of population affected; permanent change; substantial service quality implications</i>
Medium	<i>low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications</i>
Low	<i>very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications</i>
Negligible	<i>negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life; very few people affected; immediate reversal once activity complete; no service quality implication.</i>

Table 7.3: Generic indicative EIA significance matrix

		Sensitivity			
		High	Medium	Low	Very Low
Magnitude	High	Major	Major/moderate	Moderate/minor	Minor/negligible
	Medium	Major/moderate	Moderate	Minor	Minor/negligible
	Low	Moderate/minor	Minor	Minor	Negligible
	Negligible	Minor/negligible	Minor/negligible	Negligible	Negligible

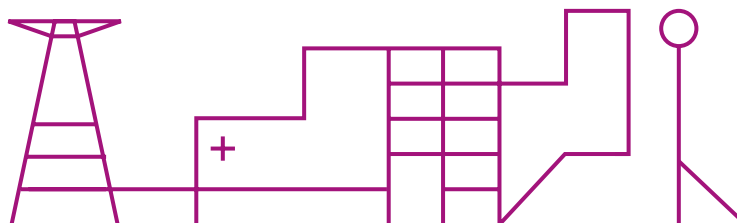
Table 7.4: Significance conclusion and reasoning related to public health

Category/Level	Indicative criteria (judgement based on most relevant criteria, it is likely in any given analysis that some criteria will span categories)
Major (significant)	The narrative explains that this is significant for public health because (select as appropriate): • Changes, due to the project, have a <i>substantial</i> effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity levels), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show <i>consensus</i> on the importance of the effect. • Change, due to the project, could result in a regulatory threshold or statutory standard being <i>crossed</i> (if applicable). • There is likely to be a <i>substantial</i> change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a <i>causal relationship</i> between changes that would result from the project and changes to health outcomes. • In addition, health priorities for the relevant study area are of <i>specific relevance</i> to the determinant of health or population group affected by the project.
Moderate (significant)	The narrative explains that this is significant for public health because (select as appropriate): • Changes, due to the project, have an <i>influential</i> effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show <i>mixed views</i>. • Change, due to the project, could result in a regulatory threshold or statutory standard being <i>approached</i> (if applicable). • There is likely to be a <i>small</i> change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a <i>clear relationship</i> between changes that would result from the project and changes to health outcomes. • In addition, health priorities for the relevant study area are of <i>general relevance</i> to the determinant of health or population group affected by the project.
Minor (not significant)	The narrative explains that this is not significant for public health because (select as appropriate): • Changes, due to the project, have a <i>marginal</i> effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and/or that <i>no relevant consultation themes</i> emerge among stakeholders. • Change, due to the project, would be <i>well within</i> a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable). • There is likely to be a <i>slight</i> change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a <i>suggestive relationship</i> between changes that would result from the project and changes to health outcomes. • In addition, health priorities for the relevant study area are of <i>low relevance</i> to the determinant of health or population group affected by the project.

Negligible (not significant)

The narrative explains that this is not significant for public health because (select as appropriate):

- Changes, due to the project, are *not related* to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and as informed by the project having *no responses* on this issue among stakeholders.
- Change, due to the project, would *not affect* a regulatory threshold, statutory standard or guideline (if applicable).
- There is likely to be a *very limited* change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is an *unsupported relationship* between changes that would result from the project and changes to health outcomes.
- In addition, health priorities for the relevant study area are *not relevant* to the determinant of health or population group affected by the project.



8. Annex 1 – Glossary

- 8.1. The following glossary provides definitions and considerations for key terms used in the significance framework. A further glossary of health-related EIA terms is provided in the IEMA publication **Effective Scoping of Human Health in EIA (November 2022)**. That glossary is not duplicated here and should be referenced as appropriate.

Baseline conditions

- 8.2. Baseline conditions can establish if relevant sensitivities or inequalities identified in the scientific literature are present. It may be relevant to note if conditions differ from local, regional or national comparators, or if geographic or population features may amplify effects. Public health profiles and indicator sets can be used. The change in the health baseline will be informed by not only the magnitude of project change and the sensitivity of the population, but also by external factors affecting the future baseline (including cumulative effects of other projects) and project-specific committed mitigation and enhancement. Explain what the magnitude and sensitivity issues mean in terms of change to the baseline for public health. Link to data on specific indicators or health outcomes. Consider, could the proposal result in an important change in the health baseline? This could be a substantial change or it could be a small change in a large or highly vulnerable population. Take account of mitigation that has been secured.

Health priorities

- 8.3. Health priorities can identify if relevant determinants of health or health outcomes have been identified as particularly important locally, regionally or nationally. Health and well-being strategies, health needs assessments or similar can be reviewed. Consider, have health priorities been set for the relevant study area that are of specific or general relevance to the determinant of health or population group affected by the proposal?

Scientific literature

- 8.4. Scientific literature can indicate if there is evidence to support an association between changes arising from the project, a relevant determinant of health and a relevant health outcome. It may be relevant to note well-evidenced thresholds, prerequisite conditions or population groups identified as being particularly susceptible. If appropriate, the type of relationship can be described, e.g., linear, exponential etc. Databases such as PubMed can be searched for systematic reviews and meta-analyses. Scientific literature can indicate the aetiology and potentially the degree of change, but careful consideration should be given to the internal validity (quality of the study), the external validity (the generalisability of those findings to the particular context) and to the strength of evidence (including emerging evidence since the last systematic reviews or meta-analyses). Recognised hierarchies of study quality should be followed (i.e., searches for and use of systematic reviews, meta-analyses in the first instance and only resorting to grey literature where no better-quality studies are available). Consider, is there a causal relationship, or a clear association, between changes that would result from the proposal and changes to health outcomes? Focus on relationships or associations with sufficient effect size to meaningfully influence population health.

Capacity to adapt

- 8.5. Also known as resilience, the ability of the population or service to absorb the change or voluntarily (consciously or unconsciously) make small changes to their behaviour that lessen its effects. For example, a minor increase in use of health services where a small non-home-based project workforce is present may be within the usual capacity of the services. If this is the case it will have no adverse effect on service quality for the resident population (or service providers). It should be noted that in line with the mitigation hierarchy, expecting behavioural change as a formal way to avoid or reduce an adverse effect is not recommended.

Consultation responses

- 8.6. Consultation response themes can indicate the extent to which stakeholders and the public support, or have concerns, uncertainty or ambivalence on relevant determinants of health or health outcomes. Where there is consensus on a health issue (particularly between the affected community and the health authority) this may be influential to the reasoned conclusion as to whether that effect is significant for the context. Consider, have themes emerged, in consultation for the proposal, on relevant determinants of health or health outcomes? Is there consensus, or a mix of views, among stakeholders?

Daily activities

- 8.7. Similar to health status, the ability of people to perform day-to-day activities is relevant to their sensitivity, particularly where there are changes in access to services or community amenities. If not part of routine statistics this can be a professional judgement. Consider the extent to which people affected are particularly reliant on access to health service facilities, staff or resources.

Deprivation

- 8.8. Deprivation is a term with different indicators in different jurisdictions. Common distinctions are between material and social deprivation or between absolute and relative deprivation. Regardless of the appropriate measure for the context, deprivation reflects an increased sensitivity due to lack of ownership of or access to assets, including those that support good health. Deprivation differences between areas are indicative of social gradients, which are central to the consideration of health inequalities. The potential for localised high deprivation within wider areas showing average or low deprivation should always be considered. Consider if the population is already stressed by limited resources or high burdens as well as if groups are affected that have reduced access to financial, social and political resources.

Duration

- 8.9. The length of time an effect occurs for is a key consideration for health. Typically, effects that continue for a long duration are of greater magnitude (including inter-generational effects). Where effects are best characterised as short term, other factors such as scale or exposure may still indicate that the change is of high magnitude (i.e., short-term effects are not automatically low magnitude). Appropriate reference periods for duration should be selected as some projects' activities can span weeks whilst others span decades.

Exposure

- 8.10. Exposure tends to vary with proximity of the population to the source, but also has an important time dimension relevant to health, e.g., low concentrations over a long period, or high concentrations over a short period.

Frequency

- 8.11. How often the population or service would be affected should be characterised. Effects that are frequent or continuous are likely to indicate greater magnitude. However, even where the effect would be occasional, other factors such as scale or exposure may still indicate that the change is of high magnitude (i.e., occasional effects are not automatically low magnitude).

Health policy

- 8.12. Health policy context can identify published local, regional or national government position statements that raise particular expectations for the relevant project change, determinant of health or health outcome. The project may affect existing health policy delivery to varying degrees (e.g., a substantial, influential or marginal effect on health policy delivery). The health policy context may include adopted local area development plans or references (implicit or explicit) to health in published planning policies. Wider international health policies or treaties may also be relevant. Where government policy has specific reference to delivering local health benefit in the project's study area (in contrast to a policy agenda of geographically unspecified or wider societal benefits) this can be partially relevant at the project level (i.e., the acceptability of certain effects may depend on whether the project supports delivery of those policy expectations or not). Consider, could changes, due to the proposal, have a substantial or influential effect on the ability to deliver current health policy?

Health status

- 8.13. An overall measure of population health, either self-reported within routine statistical surveys/censuses or using an empirical public health measure such as life expectancy at birth. Areas with a poor health status are typically of higher sensitivity. Consider the degree to which the population includes those with pre-existing conditions and/or disability that would make them more susceptible to the change (particularly multiple or complex long-term health conditions).

Inequalities/ disparities

- 8.14. Refers to descriptive measures of difference in exposure to health risk factors, and to differences in health status between groups of people. Where inequalities between areas or populations are wide (or at risk of widening), this indicates greater sensitivity. Principles of equity may also be relevant. Consider if the population experiences a high degree of inequalities (disproportionate effects between groups, not only those defined in relation to discrimination such as age and gender, but also in relation to other factors that may affect health outcomes, such as socio-economic status). Consideration should also be given to the protected characteristics under the equalities legislation. These population groups can be more vulnerable or experience greater inequalities/disparities compared to the general population.

Life stage

- 8.15. Life-course analysis is often used in public health and reflects differing health sensitivities and needs at different ages. Typically, children and older people are particularly sensitive to change, including due to being dependants. Those providing care may also be more affected by project changes or less able to take advantage of project opportunities. Consider if particular age groups are likely to experience effects more strongly, e.g., pregnant women and their unborn children; the very young; the very old; or working age people (benefiting from jobs). Also consider if some groups are more likely to be at home during the day (e.g., due to low economic activity or shift work); or whether people with higher levels of dependence on carers or public transport can access alternatives to, or respite from, project effects.

Outcome reversibility

- 8.16. Some changes in health outcomes rapidly reverse once the source is removed (e.g., many short-term nuisance-related effects on well-being). In other cases, health effects may reverse at a slower rate (e.g., gradual returns to physical activity levels once access is restored to amenities). However, in some cases health effects should be considered permanent, indicating a higher magnitude.

Outlook

- 8.17. People's understanding or views of the project can be highly influential to their psychological and even physiological response to project changes. Such views may change through the project and depend on trust in the developer and regulators. Where there are strong and persistent concerns, sensitivity, particularly to mental health effects, is higher. Consider if there are people with strong views (or high degrees of uncertainty) about the project who may anticipate risks to their health and well-being and thus be affected by not only actual changes but also by the possibility of change.

Population extent

- 8.18. How much of the population (defined by the assessment) is affected, is influential to the magnitude decision. Where most of the study area's population is affected this would indicate a higher magnitude. This is not to downplay cases where only a few people are affected to a high degree. However, given that a population health conclusion is being reached, it is helpful to understand how widespread the change may be, e.g., where only a few people are affected, this may indicate greater potential for targeted mitigation. Where feasible, the size of the affected population should be estimated quantitatively. It is noted that this measure is influenced by how the 'population' is defined. Also consider if there is likely to be substantial population displacement or influx. Where the effect is best characterised as only affecting a few individuals, this may indicate that a population health effect would not occur. Such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change.

Regulatory threshold, or statutory standards

8.19. Regulatory thresholds, or statutory standards (if applicable) can identify where there would be formal monitoring by regulators. The phrasing is intended to cover the formal standards adopted by national jurisdictions. This may include statutory air quality standards, as well as standards set by, or commonly adopted in relation to, government noise policy. Discussion may include EIA modelling results on the extent to which regulatory or statutory limit values would be met. It may also be relevant to discuss advisory guidelines, e.g., WHO global air quality guidelines. Limit values for occupational exposure tend to differ from non-occupational exposure. Where thresholds have been set, these do not mean that there would be no health effect below these levels. For example, in the case of fine particulate matter and nitrogen dioxide there are non-threshold health effects (i.e., no known limit below which health effects may not occur). In such cases an informed discussion about what is acceptable for the jurisdiction is appropriate. For example, giving the public confidence in thresholds and standards set by government for the purpose of health protection having taken into account other social, economic and environmental considerations. Consider, could a change, due to the proposal, result in a regulatory threshold or standard or guideline being crossed or nearly crossed?

Resource sharing with the project

8.20. Where a project affects a resource (service, power supply, water supply, highway capacity, school places etc.), the effects may extend a great distance from the development boundary, e.g., regional hospital capacity being affected by a workforce who move to an area for a project. Where there is high resource sharing and a lack of easily accessible alternatives, the population sharing the resource may be more sensitive.

Scale

8.21. The scale of change is a useful characterisation, particularly when 'exposure' is not a relevant descriptive for the type of effect, for example, the scale of change in open space available for physical activity.

Service quality implication

8.22. As well as direct changes to population health, there may be an associated or independent change in the quality of services that support or facilitate good health (including health services, schools, social care etc...). For example, where direct population health reductions (or population influx) increase demand on services that consequently reduce in quality, the magnitude of the effect on health is amplified. Appropriately supporting services to avoid this can be an important aspect of mitigation.

Severity

8.23. Health severity relates to the type of health outcome affected (for example, if the change is predominantly related to mortality, disease, nuisance or well-being). It may also relate to the type of change relative to the baseline conditions (for example, onset of new conditions, affecting existing conditions or change to day-to-day functioning). Whilst there is not a rigid hierarchy of health severity, changes in mortality (i.e., death) indicate a higher magnitude than changes in only well-being or quality-of-life (less severe). However, this should not exclude a change in quality-of-life from being a high magnitude effect. This underlines the importance of using this analysis of multiple criteria as a guide for writing a narrative that contextualises each decision and the interrelationship between factors.

9. Annex 2 – Worked Examples

9.1. The following section provides worked examples of a narrative conclusion on significance. These are generic examples and actual assessment reports would in addition cite the relevant evidence sources.

9.2. These hypothetical examples demonstrate some of the public health implications for EIA and how they can be discussed with a narrative on significance of health effects in EIA. The particular conclusions and professional judgements are exemplar and illustrative only and would depend on the particular project features and context.

EXAMPLE A – GENERIC PROJECT

9.3. The following generic example demonstrates how a structured narrative can be constructed based on Table 7.1, Table 7.2 and Table 7.3 of this document. The narrative uses the most relevant criteria from each table and makes a professional judgement about the levels, showing transparency and a reasoned conclusion. This example reflects the realistic scenario that there is likely to be some overlap between the considerations for each indicative magnitude and sensitivity level (i.e., not every criteria will align with a single category).

9.4. This example is literal in its application of the framework and uses clunky phrasing. This may be a good starting point, but a more eloquent and fluid presentation style may also be used that refines the generic formulation. Further statements about the context, project and population should be added as relevant. This example refers to adverse effects, although the approach can be equally applied to beneficial effects if an impact magnitude would lead to positive health outcomes.

9.5. To aid cross-reference to the framework, relevant criteria are underlined and terms that qualitatively describe levels within criteria are in *italics*. The conclusions for sensitivity, magnitude and

significance are in **bold**. Such formatting is intended as an aid to interpretation and need not be used when reporting.

Sensitivity

9.6. This example discusses the sensitivity of the local population of the study area and, to consider potential health inequalities, the sub-population of relevant vulnerable groups. As such:

- Sensitivity of the local population is **low**. This reflects that deprivation data for the study area indicates the area is in the 20% least deprived nationally (i.e., low deprivation). Routine self-reported census statistics indicate that (X%) rate their health status as fair or good and (X%) report their daily activities to be *limited a little* or *not limited*. Local public health data on life expectancy suggests that inequalities between the most and least healthy are narrowing [X reference]. Based on professional judgement, the population is considered to have a high capacity to adapt, particularly in relation to accessing the *many alternatives* to community assets affected by the project (resource sharing). Consultation themes from the community reflect an outlook of general *ambivalence* with some concern about the project.
- Sensitivity of the vulnerable sub-population is **high**. This reflects that in terms of life stage, the sub-population includes a high representation of dependants, both children, older people and those receiving care due to poor health. Whilst the overall deprivation in the area is relatively low, it is likely that this masks pockets of moderate or *high* levels of deprivation. Routine self-reported census statistics indicate that (X%) rate their health status as *poor* or *very poor* and (X%) report their daily activities to be *limited a lot*. Based on professional judgement, this sub-population may have limited capacity to adapt to it changes. This reflects reliance on community assets affected

by the project (resource sharing), including due to fewer resources or access limitations. This sub-population includes the proportion of the community that during consultation expressed an outlook of *anxiety* or *concern* about the project.

Magnitude

- 9.7. This example considers [X determinant of health], which is one of the risk factors for [X health outcome(s)].
- 9.8. For both the local population and the vulnerable group sub-population, the magnitude of change due to the project is **medium** (negative). As reported in [X] EIA Report chapter, the level of exposure would be *low* in comparison to baseline levels [a X change]. In terms of duration and frequency, this change would be experienced over the *medium-term* [X months], though with frequent events due to the regularity of the source project activity [X operating hours]. For this determinant of health and level of exposure, the severity of the health outcome relates predominantly to a *minor change in morbidity* for [X health outcome(s)]. This would be experienced by a *large minority* of the [X number] population of the study area (population extent). A gradual reversal of this change in population health would be expected once the source of exposure is removed at the conclusion of the [X project phase]. The health service implications of this change are likely to be *small*, reflecting existing capacity and that the change in the [X determinant of health] contributes only a small increase in risk for [X health outcome].

Significance

- 9.9. The significance of the health effect on the population for this determinant of health is **moderate adverse (significant)**. The professional judgement is that there would be a *small adverse* change to

the health baseline for the local population. This conclusion reflects the medium magnitude of change and the scientific literature [X references], which establishes a clear theoretical relationship between the project change [X impact] and changes to [X health outcome(s)]. It also reflects that health priorities within the local published health and well-being strategy [X reference] are of *general* relevance to [X determinant of health]. The small adverse change in the baseline may have an *influential effect* on the ability to deliver current health policy [X references], including to address health inequalities [X references]. This is due to the potential for significant disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). This conclusion is supported by consultation for the project, which indicates *consensus* among public health stakeholders and the public that unmitigated changes in [X determinant of health] for vulnerable groups are a widespread concern.

- 9.10. The following further mitigation is therefore proposed [X list]. This would be secured by [X mechanism]. The further mitigation is targeted to the vulnerable sub-population by [X process]. This further mitigation is expected to greatly reduce the level of exposure to vulnerable groups, reducing the magnitude of effect for this sub-population to low.
- 9.11. The residual effect on [X determinant of health] would be **minor adverse (not significant)**. The project is considered to appropriately mitigate effects on population health.
- 9.12. Monitoring is proposed on the efficacy of the further mitigation given its role in avoiding a significant effect. The monitoring would be funded and undertaken by [X organisation] for [X duration], with the following further action [X action] in the event that [X trigger]. Monitoring data would be shared with [X organisation].

EXAMPLE B – HIGHWAYS IMPROVEMENTS AND BYPASS

- 9.13. As a theoretical example, the following sub-sections consider distinct determinants of health, and how these could be impacted by a proposed bypass, with improvements to highways, footpaths and cycle paths.

Physical activity and active travel

- 9.14. The sensitivity of the general population is **low**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population for all determinants of health have been taken into account and are listed in Section X of the methodology. The general population comprises members of the community in *good* physical and mental health, including due to established active travel and physical activity behaviours, and/or those who already have *many alternative* active travel routes and therefore less reliance on the routes affected by the project.
- 9.15. The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high proportion of *dependants* (e.g., children, older people and those receiving care). People on low incomes, including in *moderately* deprived areas of X, may experience *wider* baseline inequalities and are more likely to be *reliant* on active travel routes as a primary mode of transport. Older adults and people in poor health may be *limited* a lot in their day-to-day activities and mobility constraints may make them more sensitive to the quality of active travel infrastructure, including uneven surfaces, separation from traffic, priority crossing points and dropped kerbs.
- 9.16. The magnitude of change due to the project is medium (positive). This reflects the *long-term* availability of improved active travel infrastructure that is expected to be used *frequently*. The new

routes and public realm enhancements represent a *medium* scale of change compared to the baseline situation. These benefits are expected to be realised by a *large minority* of the people of X, with potential for a *moderate* risk reduction in cardiovascular and mental well-being *morbidity* where regular active travel behavioural change is sustained. In this regard, the links to X school/social infrastructure are considered particularly beneficial.

- 9.17. The significance of the population health effect is moderate beneficial (significant). The professional judgement is that there would be a *small* improvement in the health baseline for the population. The change may be *influential* within this population in delivering health policy that aims to increase physical activity, promote mental health, reduce obesity and narrow inequalities. This also relates to the *specific* local health priority on 'Healthy Lifestyle'. The likelihood of change is supported by a strong evidence base in the scientific literature for a *causal* relationship between physical activity and good physical and mental health.

Transport modes, access and connections, including to healthcare

- 9.18. The sensitivity of the general population is low. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in Section X. This reflects that most people in the local area (X) would only make occasional use of the affected section of the road network. It also includes those for whom the road network affords many alternative routes. The general population comprise those members of the community with a high capacity to adapt to changes in access, including changes in healthcare access, for example due to greater resources and good physical and mental health.

9.19. The sensitivity of the vulnerable group population is high. Vulnerability in this case is linked to mode of travel, including pedestrians and cyclists being more sensitive to road safety changes; age (young people and older people) being more vulnerable to accident severity; those reliant on services accessed on affected sections of the road network (e.g., travelling to schools); and those in areas of moderate deprivation. Deprived populations may already face more access barriers compared to the general population and therefore be more sensitive to access changes. Low incomes may compound access barriers by limiting adaptive response. Vulnerability also includes those accessing health services (emergency or non-emergency) at times and locations affected by congestion. Ambulance services (and the recipients of their care) are particularly sensitive to delays in response times (time taken to arrive and stabilise the patient), but journey times may benefit from the road improvements. People in poor or very poor health may be more frequent users of healthcare service and therefore be more sensitive to access changes.

9.20. The magnitude of change due to the project is **small (positive)**. This reflects that:

- in relation to road safety the scale of reduction in accident risk would be small, with such events remaining occasional. However, the benefit would be expected to accrue over the long-term with fewer incidents, e.g., at X. Severity relates to a minor change in risk of injury or mortality (though with outcome reversal gradual or permanent). Very few people would be affected, with no or slight implications for healthcare services; and
- in relation to journey time, the change for those undertaking long-distance travel on the X route is relatively *small* scale. However, within X, the effect on shorter, more frequent journeys is greater and considered of *medium* scale. Such a reduction in journey time is expected to continue over the long term. Where the change relates to healthcare

access, the change is likely to result in a *minor* change in risk for morbidity or mortality associated with time-critical treatment. The frequency with which health-related journeys may be affected is likely to be occasional, with *very few* people affected and only *slight* implications for healthcare services.

9.21. The population health effect for this determinant of health is **minor beneficial (not significant)**. The conclusion reflects what whilst the benefits to road safety and health-related journey times are noteworthy, they are on a scale that is likely to only have a marginal influence on the delivery of local health policy to improve local road safety and healthcare access. The change may contribute to a slight improvement in the population health baseline.

Air Quality determinants

9.22. The sensitivity of the general population is considered to be **low**. This reflects that most people in area (X) live, work or study at a distance from the project (or parts of the local road network that are expected to experience additional vehicle movements) where emissions would have high levels of dispersion, reducing exposure. Furthermore, most of the population enjoys good respiratory health (e.g., are not asthmatic) and are not at a life stage (e.g., infant or frail older people) for which lower levels of emissions could be of concern.

9.23. The sensitivity of vulnerable groups is considered **high**. This reflects the presence of populations (e.g., residents or workers) who (while at work or at home) are likely to spend extended periods near to the project or parts of the local road network that are expected to experience additional vehicle movements. It also reflects the generally higher sensitivity of children and older people to air pollution. Within these groups people with existing respiratory conditions, such as asthma or COPD, may be particularly sensitive.

9.24. Based on the air quality assessment findings, which are informed by guidance issued by the Institute of Air Quality Management, the changes in concentrations of all modelled air pollutants are *well within* statutory standards. The change in concentrations relative to these standards, as well as to WHO 2021 global air quality advisory guidelines, has been considered in the context of the air quality and health baseline, local health priorities, health policy and the scientific literature.

9.25. It is concluded that the health magnitude of the change due to the project is **low** (negative). The potential for non-threshold effects of NO₂ and PM_{2.5} to population health is noted and has been taken into account in determining the significance of potential air quality effects. Any health effect would relate to a *very low* level of exposure to air pollutants, which may occur on a *continuous* basis over the *long-term*. Additional exposure due to the project would represent an incremental addition to the existing baseline conditions resulting in a *very minor* change in morbidity- and mortality-related population health risk, e.g., of respiratory and cardiovascular health outcomes. Any effect is likely limited to a *small minority* of the local population and the effect on routine health service planning is likely negligible.

9.26. The significance of the effect would be up to **minor adverse** (not significant). The conclusion reflects the view that compliance with statutory standards demonstrates an acceptable level of health protection and that these air quality protection measures are produced in the knowledge that particular groups within a population will have particular health vulnerabilities. The minor adverse (rather than negligible) level represents a conservative assessment finding on the basis of scientific uncertainty (and emerging evidence) about non-threshold health effects of NO₂ and PM_{2.5}. This is

a public health acknowledgement of the incremental contribution to air pollution that the project would make, but also recognition that at the project level this should not be considered a significant effect on population health or health inequalities. Whilst community concerns may be raised about increases in air pollution, the assessment conclusion is consistent with health planning policy and with consultation responses from public health stakeholders. Any change to the health baseline would be *slight* with a *marginal effect* on delivery of health policy.

Noise determinants

9.27. The sensitivity of the general population is considered to be **medium**. This reflects that existing noise stressors affect a wide area and the population is likely to have heightened sensitivity to commercial transport noise as an issue. Existing proximity to the baseline noise conditions of the development site and local transport network suggests the site-specific population may already have a degree of exposure to transport noise that may affect cardio-metabolic and annoyance outcomes, as well as being at times that may disturb sleep or reduce amenity.

9.28. The sensitivity of the vulnerable sub-population is considered **high**. This reflects the presence of populations who (while at work or at home) are likely to spend extended periods near to the development site or parts of the local transport network that are expected to experience additional movements. Vulnerability in this case is particularly linked to: living close to sources of noise; age (both young people and older people); existing poor health (e.g., long-term illness); spending more time in affected dwellings (e.g., due to low economic activity, shift work or ill health); vulnerability due to deprivation or health inequalities (including potential for more deprived communities to live in areas of high noise disturbance); or having strong views or high degrees

of uncertainty about the project (which may be associated with health effects even below thresholds that are generally considered acceptable).

9.29. Based on the findings presented in the noise assessment, effects primarily relate to a small but permanent change in noise levels distributed across a large population. Such effects are reported as being significant at a number of dwellings for both daytime and night-time noise.

9.30. It is concluded that the magnitude of the change due to the project is **low** (negative). In [X assessment year] the project will result in an increase in the number of people exposed to noise. Three outcomes are discussed. Firstly, the effect on daytime noise levels. Secondly, the relatively localised effects relating to night-time exceedance of the Significant Observed Adverse Effect Level (SOAEL) for a small minority of the [X study area] population. Thirdly, the wider incremental increase above the night-time Lowest Observed Adverse Effect Level (LOAEL) for a large minority of the [X study area] population. Whilst other points are discussed in the noise assessment, these three outcomes are considered the most relevant for human health. Daytime and night-time noise exposure are considered to be of equal importance. The current scientific evidence for cardio-metabolic health outcomes is in terms of Lden, which is a composite day-evening-night metric.

- In relation to the first point, currently [X number] people experience daytime noise above the LOAEL of [X level]. The project will result in an increase of [X number] people above the LOAEL in [X assessment year]. Of these, [X number] would experience a change between 0 and 1 dB, and [X number] a change between 1 and 3 dB. No changes would be greater than this. Currently [X number] people experience daytime noise above the SOAEL of [X level]. No increase in daytime noise exposure above the SOAEL is expected. For daytime noise

there is a very low change in exposure, albeit over the long-term and experienced frequently. The change in exposure corresponds to a minor change in risk factors for cardio-metabolic- and annoyance-related morbidity and quality-of-life for a *large minority* of the study area population. There are not expected to be quantifiable healthcare service implications. The change in daytime noise is considered to be of low magnitude. This takes into account the following project measures designed to lower noise exposure [X measures].

- In relation to the second point, currently [X number] people in the study area experience night-time noise above the SOAEL of [X level]. The project will result in an increase of [X number] people above the night-time SOAEL in [X assessment year]. Of these, [X number] would experience a change between 0 and 1 dB, and [X number] a change between 1 and 3 dB. No changes would be greater than this. The effect would be *frequent* over the *long-term*. In terms of severity, the health outcomes relate predominantly to a *minor* change in morbidity, e.g., a population change in risk or odds of cardio-metabolic and mental health outcomes, for a *small minority* of the local population. Such effects relate to the risk of additional awakenings, as discussed in the physiological awakening assessment set out in the noise assessment. There is potential for this to have *slight* implications for routine health service planning compared to the 'without development' scenarios. The noise assessment describes a noise insulation scheme secured by planning consent condition that would be available to all those affected by increases above the SOAEL. On this basis, the potentially medium magnitude negative effect is likely reduced to a low magnitude effect.
- In relation to the third point, currently [X number] people in the study area experience night-time noise above the LOAEL of [X level]. The project will result in an increase of [X number] people above the night-time LOAEL in [X assessment year]. Of these,

[X number] would experience a change between 0 and 1 dB, and [X number] a change between 1 and 3 dB. No changes would be greater than this. Effect characteristics relate to a *frequent, very low* additional noise exposure, over the *long-term*, for a *large minority* of the [X study area] population. This may result in a *minor* change in risk factors for cardio-metabolic- and annoyance-related morbidity. At a population level, the small scale of change very close to the LOAEL is rated as low magnitude.

9.31. The effect would be **minor adverse (not significant)**.

The conclusion can be broken down for more transparency. Overall, the majority of the study area population would be below the SOAEL. In relation to the small minority affected above SOAEL (particularly at night) the effects are potentially moderate adverse; however, taking into account the noise insulation scheme, it is anticipated that the majority of those affected would have their effects reduced. A minor adverse effect is considered appropriate to reflect that not all people would take up the scheme and there may be practical limitations on its effectiveness for some people (e.g., for structural reasons or due to open windows in summer).

In line with good practice, the noise insulation scheme has had specific regard to indoor air quality and provides solutions that both increase sound insulation while maintaining adequate ventilation and thermal comfort. In relation to those between LOAEL and SOAEL that will experience a very low increase in noise (1-3 and 0-1dB) the incremental effect to a large number of people is, in population health terms, noteworthy (i.e., not negligible); but equally given the very small change (likely barely perceptible for most people) and the many other sources contributing to the local soundscape, it is not considered a significant project level effect.

9.32. The minor adverse effect aligns with scientific literature and evidence, insofar as the low magnitude of change due to the project would likely give rise to only a *slight* change in the population health baseline, even accounting for the presence of more vulnerable sub-populations. The effect is considered to have only a *marginal* effect on the ability to deliver current health policy and the project's embedded noise mitigation measures (including noise insulation scheme) already appropriately target vulnerable groups such that a widening of health inequalities is appropriately mitigated. This conclusion places weight on the project's mitigation measures, including minimising noise emissions at source, protecting local areas valued for their tranquillity, effective communication between the Applicant and local communities, and the noise insulation scheme, the effectiveness of which will be monitored by [X protocol]. Further action in response to monitoring includes further targeted support to promote uptake of the insulation scheme amongst vulnerable groups. Monitoring results will be shared with the relevant public health teams.

Community identity determinants

9.33. The sensitivity of the general population is **medium**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in Section X. X receptor is a prominent feature of the natural, cultural and economic landscape, on account of its ecological and historic heritage, which also generate important tourism revenues for the population. The general population of X are therefore likely to have an interest in, and awareness of, the project, with potential for many people to feel uncertain as to the impacts. Most residents of X are likely to have a reliance on, or few alternatives to, the resources affected, including the road networks themselves and the community assets whose setting is affected by the new highway improvements.

9.34. The sensitivity of the vulnerable group population is **high**. Vulnerability in this case is particularly linked to the proportion of people who have strong expectations that their community or way of life would be changed to a large degree by the project. Outlooks may range from support to concern. People living in homes with direct views of the project, or adjacent to roads that experience a large change in traffic flows, may be particularly sensitive, with very low capacity to adapt. Some of those who are reliant on visitor-related incomes may also have limited capacity to adapt. Those reliant on X centre for social networking, particularly those with risk of social isolation, may be more sensitive to a more favourable psychosocial environment.

9.35. The magnitude of change due to the project is **medium** (positive). Chapter X describes wide ranging effects on views from representative vantage points, with some locations experiencing large adverse changes. Chapter X describes significant positive influences of the project on residential amenity, journey amenity, severance, accessibility and economic activity. For population health, the scale of change is considered to be *medium*, as one of many influences of community identity. The effects are *long-term* with effects experienced *frequently* or *continuously*. The expectation is that the benefits to community identity and well-being will persist, whilst adverse influences *gradually* decline as there is adaptation to views and increased screening as planting matures. The benefits are expected to the majority of the community of X. Adverse effects are expected for a small minority. In both cases the changes relate to minor effects on mental health-related morbidity and quality-of-life.

9.36. The conclusion of the assessment for human health is that the effect would range up to **moderate beneficial (significant)**. The improvements to the psychosocial environment within X and economic opportunities of the project are likely to positively influence community identity with long-term benefits to community cohesion and mental health. Where the setting of homes or culturally or ecologically important community assets is affected, this has the potential for some adverse influence. The inclusion of both adverse and beneficial outcomes reflects that the population response would be highly subjective and is likely to encompass a range of views. Some people may focus on the economic and travel benefits of the project, whereas others may focus on the reduction in landscape amenity inherent to the project. The overall change in the health baseline is likely to be small and driven by the beneficial influences. These changes are supportive of healthy planning policy and relate *generally* to local health priorities, including on 'Community Connectivity'.

10. Annex 3 – Links To Other Guidance

10.1. The following further resources set out additional detail on health in EIA significance:

- The Institute of Public Health (IPH), Health Impact Assessment Guidance, Standalone HIA and health in environmental assessment (2021).
- International Association for Impact Assessment (IAIA) and European Public Health Association (EUPHA), Human health: Ensuring a high level of protection. A reference paper on addressing Human Health in Environmental Impact Assessment (2020)

10.2. Other relevant guidance to cross-refer to, though not including health in EIA significance analysis methods, includes:

- Wales Health Impact Assessment Support Unit (WHIASU) Health Impact Assessment A Practical Guide, 2012.
- Scottish Health and Inequalities Impact Assessment Network (SHIAN) Health Impact Assessment Guidance for Practitioners, August 2016, updated March 2019.
- London Healthy Urban Development Unit (HUDU), Rapid Health Impact Assessment Tool, Fourth Edition, October 2019.
- IEMA, Health in Environmental Impact Assessment: A Primer for a Proportionate Approach, 2017.
- Public Health England (PHE) guidance, Health Impact Assessment in spatial planning (PHE, 2020).
- PHE, Advice on the content of Environmental Statements accompanying an application under the Nationally Significant Infrastructure Planning (NSIP) Regime (2021).
- Design Manual for Roads and Bridges LA 112 – Population and human health.

10.3. It is noted that the Office for Health Improvement and Disparities is in the process of producing updated guidance on the coverage of human health within NSIPs.



11. References

- ¹ Environmental Law Alliance Worldwide, EIA legal framework. Online. <https://www.elaw.org/elm/eia-legal-framework>
- ² European Commission. Environmental Impact Assessment of Projects: Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU). Luxembourg: European Union. 2017. http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf
- ³ Pyper, R., Cave, B., Purdy, J. and McAvoy, H. (2021). Health Impact Assessment Guidance: A Manual and Technical Guidance. Standalone Health Impact Assessment and health in environmental assessment. Institute of Public Health. Dublin and Belfast.
- ⁴ Cave, B., Claßen, T., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martín-Olmedo, P., Mekel, O., Pyper, R., Silva, F., Viliani, F., Xiao, Y. 2020. Human health: Ensuring a high level of protection. A reference paper on addressing Human Health in Environmental Impact Assessment. As per EU Directive 2011/92/EU amended by 2014/52/EU. International Association for Impact Assessment and European Public Health Association.
- ⁵ Cave, B., Pyper, R., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martín-Olmedo, P. Lessons from an International Initiative to Set and Share Good Practice on Human Health in Environmental Impact Assessment. Int. J. Environ. Res. Public Health 2021, 18, 1392. <https://doi.org/10.3390/ijerph18041392>
- ⁶ Cave, B., Fothergill, J., Pyper, R., Gibson, G. and Saunders, P. (2017) Health in Environmental Impact Assessment: A Primer for a Proportionate Approach. Ben Cave Associates Ltd, IEMA and the Faculty of Public Health. Lincoln, England. Available at www.iema.net
- ⁷ Environmental Protection Agency (Republic of Ireland). Guidelines on the information to be contained in Environmental Impact Assessment Reports. May 2022.
- ⁸ Public Health England. Health Impact Assessment in spatial planning, a guide for local authority public health and planning teams. October 2020
- ⁹ Kindig D, Stoddart G. 2003. What Is Population Health? American Journal of Public Health 2003; 93(3): 380-3. <http://dx.doi.org/10.2105/AJPH.93.3.380>

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