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CLONASLEE FLOOD RELIEF SCHEME

Environmental Impact Assessment Report
Chapter 8: Human Health

MDW0867
27 February 2025
S5.P01

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
S5. P01	Issue for Planning	LN, SM	SM, RP	RP	27 Feb 2025

Approval for issue

Ryngan Pyper	27 February 2025

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GLOSSARY & ACRONYMS

Term	Meaning
%	Percent
dB	Decibel - unit of sound pressure level, calculated as a logarithm of the intensity of sound
dB(A)	Decibel (weighted) - unit used to measure the intensity of sound, "A" denotes that levels were "A" weighted"
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
km	Kilometres
LVIA	Landscape and Visual Impact Assessment
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Particulate matter measuring 10 micrometres or less in diameter
$PM_{2.5}$	Particulate matter measuring 2.5 micrometres or less in diameter
WHO	World Health Organisation
ZoI	Zone of Influence

8 HUMAN HEALTH

8.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the potential population health impacts relating to the construction and operation of the proposed Clonaslee Flood Relief Scheme (the 'Proposed Scheme').

The assessment of human health in Environmental Impact Assessment (EIA) takes a public health approach, meaning it reaches conclusions on the health outcomes of defined populations, rather than the health outcomes of individuals. Guidance explaining this approach is set out is Section 8.2.1

This chapter has been prepared by RPS and meets the EIA requirements in relation to assessing the likely significant, beneficial and adverse effects of the Proposed Scheme on human health. Details and competencies of the specialists who prepared this chapter can be found in **Chapter 1: Introduction**

The potential for the Proposed Scheme to affect population health outcomes may arise from various health pathways. Potential effects on physical and mental health link to impacts discussed throughout this EIAR. In particular, the health assessment draws inputs from the following chapters:

- Chapter 5: Project Description
- Chapter 6: Traffic and Transportation
- Chapter 7: Population
- Chapter 11: Water
- Chapter 12: Air Quality
- Chapter 13: Climate
- Chapter 14: Noise and Vibration
- Chapter 15: Waste and Utilities

The health assessment takes as its input the residual effect conclusions of the EIAR technical chapters listed above. In this regard the health assessment relies on the mitigation measures set out in those chapters and does not repeat them. This avoids duplication and keeps the assessment proportionate.

Furthermore, the scope of this Human Health chapter has been kept proportionate, considering only those determinants of health with the potential for likely and significant population health effects. The issues covered by this assessment are listed in section 8.2.6.

8.2 Methodology

8.2.1 Legislation, Policy and Guidance

The following legislation in **Table 8-1** is relevant to the assessment of the effects on human health.

Table 8-1: Health legislation

Legislation	Description
The EIA Regulations 2018 (Government of Ireland 2018)	Sets the requirement to consider the likely significant effects on human health
The Safety, Health and Welfare at Work etc Act 2005 (as amended) (Government of Ireland, 2005)	Sets out general duties on employers, including ensuring, so far as is reasonably practicable, that employees and individuals at the place of work who are not employees are not exposed to risks to their safety, health or welfare.
The Environmental Protection Agency Act 1992 (as amended) (Government of Ireland, 1992)	Governs environmental exposures, including provisions in relation to nuisance.
Environmental Noise Regulations 2018 (as amended) (Government of Ireland, 2018b)	Sets a common approach to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise.

The following guidance in **Table 8-2** has informed the assessment.

Table 8-2: Health guidance

Guidance	Description
Institute of Environmental Management and Assessment (IEMA) 2022 guidance on health in EIA series, effective scoping (Pyper, Lamming, et al., 2022) and determining significance (Pyper, Waples, et al., 2022).	EIA practitioner guidance on assessing human health, applicable to Republic of Ireland and Northern Ireland. Guidance sets out principles and methods of assessment.
Institute of Public Health (IPH), Guidance, Standalone Health Impact Assessment and health in environmental assessment, 2021 (Institute of Public Health, 2021).	Sets current good practice for the assessment of human health in EIA, including assessment methods. This updates the 2009 guidance from the IPH.
International Association for Impact Assessment (IAIA) and European Public Health Association. A reference paper on addressing Human Health in EIA (International for Impact Assessment & European Public Health Association, 2020) and academic discussion of the same (Cave et al., 2021).	This international consensus piece informed the IPH 2021 guidance. The publication explains EIA for public health stakeholders and sets out transparent assessment approaches adopted by the IPH.
International Association for Impact Assessment. Health Impact Assessment International Best Practice Principles, 2021 (Winkler et al., 2021).	Confirms the relationship between HIA and EIA. Confirms the application of HIA principles when undertaking health in EIA.
Environmental Protection Agency. Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022).	The EPA present a health protection position statement on the coverage of health in EIA. The wider public health remit is covered by the IPH 2021 guidance.

In addition, due regard has been given, as appropriate, to World Health Organization advisory guidelines, e.g. World Health Organization, (2021), (WHO, 2009) and World Health Organization, (2018). The application of such guidelines for health in EIA is described by IEMA (Pyper, Waples, et al., 2022), IPH (Pyper et al., 2021) and Cave et al. (2021).

8.2.2 Policy Context

The following policies are associated with the human health assessment:

- National Planning Framework (NPF) (Government of Ireland, 2018a)
- National Development Plan 2021 - 2030 (Department of Public Expenditure, NDP Delivery and Reform, 2021)
- Healthy Ireland Framework (HIF) (2019-2025) (Department of Health, 2019)
- Roadmap for Social Inclusion (2020-2025) (Government of Ireland, 2023)
- Laois County Development Plan 2021-2027 (Laois County Council, 2022)
- Healthy Laois Strategic Plan 2018-2020 (Laois Local Community Development Committee, 2018)

8.2.2.1 National Planning Framework

The NPF states that "*Our health and our environment are inextricably linked. Specific health risks that can be influenced by spatial planning include heart disease, respiratory disease, mental health, obesity and injuries. By taking a whole-system approach to addressing the many factors that impact on health and wellbeing and which contribute to health inequalities,* […] *it will be possible to improve health outcomes, particularly for the next generation of citizens*" (section 6.2, p.82).

An overarching aim of the NPF is "*Creating a clean environment for a healthy society*" through three main objectives:

- Water Quality - Recognising the links and addressing on-going challenges between development activity, water quality and our health.
- Promoting Cleaner Air - Addressing air quality problems in urban and rural areas through better planning and design.

- Noise Management - Incorporating consistent measures to avoid, mitigate and minimise or promote the pro-active management of noise (p.117)

Section 6.2, Healthy Communities states that "*decisions made regarding land use and the built environment, including transportation, affect these health risks in a variety of ways, for example through influencing air and water quality, traffic safety, opportunities for physical activity and social interactions as well as access to workplace, education, healthcare and other facilities and services such as food and alcohol outlets*" (p.82).

The draft first revision to the National Planning Framework (2024) (Government of Ireland, 2024) has also been considered. The draft states that 'An attractive environment is important for mental and physical health, tourism and a vibrant, well-planned area with good amenities will contribute to attracting skilled employees and investment to underpin long-term development'.

8.2.2.2 National Development Plan 2021-2030

The National Development Plan (NDP) recognises the importance of both climate adaptation and access to good quality education and healthcare as part of its areas of investment, stating also that infrastructure improvements such as flood relief measures can retain and attract people to the area and help diversify rural economies.

8.2.2.3 Healthy Ireland Framework (HIF) 2019-2025

HIF states that "*many health and wellbeing indicators are affected by individuals' personal lifestyle choices. … The effects of these risk factors can be minimised if individuals can be motivated and supported to make healthier choices. To be effective, action to control the determinants of health must include developing understanding and skills, and promoting informed health choices*" (p.14) (Department of Health, 2019).

It also states "*Those working in non-health sector disciplines and settings such as educationalists, city planners, housing and transport officials, probation officers and welfare officers, also have a critical role to play in improving health and wellbeing*." (p. 26) (emphasis added).

This recognises that some of the burden of poor health is due to factors beyond the control of the Proposed Scheme. It also recognises that access to opportunities to be physically active and being able to afford and access healthy food is paramount to public health.

The four goals of Healthy Ireland are relevant and have informed the assessment:

- Goal 1: Increase the proportion of people who are healthy at all stages of life;
- Goal 2: Reduce health inequalities;
- Goal 3: Protect the public from threats to health and wellbeing; and
- Goal 4: Create an environment where every individual and sector of society can play their part in achieving a healthy Ireland.

8.2.2.4 Road for Social Inclusion 2020-2025

The introduction states that *"Education, health, housing, employment and social integration (i.e. a person's sense of "connectedness" with their community) are all factors that contribute to a person's overall sense of wellbeing or welfare"* (p. 10).

8.2.2.5 Laois County Development Plan 2021-2027

The Laois County Development Plan (Laois County Council, 2022) sets out a framework for the sustainable spatial and physical development of the County Laois while considering the conservation and protection of the built and natural environment. The Plan aims to carefully consider all needs of society, its individuals and groups. Key to this is ensuring that equal opportunities are promoted under all the various themes of the Plan.

The plan advances strategic aims under the cross-cutting themes of sustainable communities, placemaking, social inclusion, regeneration, green infrastructure and climate action; to ensure the needs of citizens, communities, built and natural environments, infrastructure and economic/employment development are met, while also combatting and adapting to climate change.

This assessment has been informed by the strategic aims of the Plan, specifically:

- Infrastructural development – "*To protect, improve and provide water, wastewater, surface water and flood alleviation services throughout the country*" (p.23).
- Sustainable Communities – "*To develop and support vibrant sustainable communities in Laois where people can live, work and enjoy access to a wide range of community, health, educational facilities and amenities […] thereby supporting a high quality of life for all to enjoy*" (p. 23).

8.2.3 Local Health and Wellbeing Plans

8.2.3.1 Healthy Laois Strategic Plan 2018 – 2020

The vision of the Healthy Laois Strategic Plan 2018 – 2020 is to ensure *"All people of Laois will enjoy physical and mental health and wellbeing to their full potential. Through a series of partnerships and cross-sectoral cooperation, health and wellbeing is valued and supported at every level of society and is everyone's responsibility. Health and wellbeing for all will be improved and health inequalities reduced no matter what their age, gender, ability, geographic location or economic circumstances."* (p.14).

8.2.4 Zone of Influence

Two rivers, Clodiagh River and Gorragh River flow through Clonaslee with Clodiagh River to the west and Gorragh River to the east of the village. The Clodiagh River flows northwards through the village, from its source on Knockachoora Mountain. The Gorragh River passes to the east before its confluence with the Clodiagh River approximately 1.5 km north of the village. The Clodiagh River is the main source of flood risk in Clonaslee. The Proposed Scheme includes flood relief measures in Clonaslee for the Clodiagh River.

The Proposed Scheme, as detailed in **Chapter 5: Project Description**, is mainly concerned with works to three distinct locations around the village of Clonaslee as follows:

- Area 1: Brittas Wood
- Area 2: Chapel Street
- Area 3: Tullamore Rd and the Integrated Constructed Wetlands (ICW)

The human health study area has regard to localised health effects and wider health effects. Bio-physical health determinants (such as changes to noise exposure) are likely to have a localised impact as potential changes in hazard exposures are limited by physical dispersion characteristics. Social and behavioural determinants (such as changes to community factors) are likely to have both localised and wider impacts. The study area for baseline statistics relating to health effects focuses on electoral divisions (EDs), with Laois County and Ireland averages as comparators. Regard is also given to the study areas of other EIAR chapters.

The following geographically defined human health populations are used in the assessment.

- The 'site specific' area of Clonaslee ED. This is also referred to as the Site Specific Study Area.
- The 'local' area is the local authority of Laois County.
- The 'regional' area is the province of Leinster.
- The 'national' area is Republic of Ireland (and beyond for transboundary effects).

As study areas do not necessarily define the boundaries of potential health effects, particularly mental health effects, the health chapter uses study areas to broadly define representative population groups, including in relation to sensitivity rather than to set boundaries on the extent of potential effects.

The health assessment has regard to the zones of influence defined by other EIAR chapters that are interrelated technical disciplines for the health assessment. Those chapters provide data inputs to the health assessment. Those zones of influence are relevant and inform the health chapter's consideration of effect magnitude.

8.2.5 Sources of Information to Inform the Assessment

Data informs the health assessment by identifying potential receptors and community assets for these disciplines, such as schools, residential properties, walking and cycling routes, as well as tourism and recreational amenities. No separate health field surveys have been undertaken. The health analysis is informed by scheme-wise consultation.

The following data sources have informed the health baseline assessment:

- Central Statistics Office 2022 Census (Central Statistics Office, 2022a)
- Pobal HP Deprivation Indices 2022 (Pobal, 2023)
- Google Earth Pro 2021 aerial and street level photography

8.2.6 Key Parameters for Assessment

Following guidance on Human Health in EIA (see **Table 8-2**) the following determinants of health are scoped into the health assessment:

- **Housing:** During operation, the Proposed Scheme will increase protection of commercial and residential areas from flood risk; according to **Chapter 5: Project Description** of this EIAR, it is estimated that 72 no. residential properties and 2 no. commercial properties currently at risk of flooding will be protected by the Proposed Scheme. This is expected to have a beneficial effect in reducing the physical and mental health effects of flooding, as well as also reducing the incidence of secondary effects of health, such as poor housing quality and damp as a result of flooding. Additionally, as stated in **Chapter 11: Water**, the Proposed Scheme has been designed to eliminate the potential for increased flooding elsewhere.
- **Open space, leisure and play:** During the construction phase, a short term diversion of the Brittas Wood walking loop will be in place and a short term closure of the main pedestrian access into the Wood will be required, with users directed to another existing entrance**.** During the operation and maintenance phase the Proposed Scheme would improve flood relief measures in Clonaslee making recreational use of the River Clodiagh, Brittas Wood and other public open spaces safer and more accessible.
- **Transport modes, access and connections:** During the construction phase the Project would include ≈ 6 no. vehicles and 2 no. Heavy Goods Vehicles (HGV) per day during the peak construction period. Further details are set out in **Chapter 6: Traffic and Transportation.**
- **Employment and income:** During the construction phase the Proposed Scheme will provide direct employment for approximately c. 20-25 no. construction related jobs and support employment in the sector more widely. Further details are set out in **Chapter 7: Population.** Construction activities may disrupt access to businesses, through temporary traffic management measures such as lane closures and stop/go systems, parking or temporary traffic disruption. During operation, will safeguard businesses from flooding thus mitigating against loss of income and employment as a result of flooding**.**
- **Noise and vibration:** During the construction phase the Proposed Scheme would include noise generating plant, equipment and vehicles within the site boundary and on public highways, including 2 no. heavy duty vehicle movements per day during peak construction times and 6 car trips on an average day. Further details are set out in **Chapter 14: Noise and Vibration.**

The following issues have been considered again at EIA stage and remain scoped out.

- **Air Quality:** Construction works are likely to lead to localised dust and emissions. Effects on individual receptors have been assessed in **Chapter 12: Air Quality**. Chapter 12 concludes the human health risk due to demolition works, earthworks and construction works is negligible. The human health risk due to track out is also considered low. Further details are set out in **Chapter 12: Air Quality**. Based on the findings of Chapter 12, changes to air quality during construction will not be of a scale that will result in significant population level effects. This issue is not assessed further in this chapter.

- **Built environment (including water and waste utilities):** Issues related to the built environment including water, waste and electricity utilities are scoped out. Disruption to these utilities as a result of construction activities is not anticipated to be of a scale that will result in significant population level effects. Further details on these issues are set out in **Chapter 11: Water** and **Chapter 15: Material Assets: Waste and Utilities**. Construction mitigation and management measures that will be put in place to further minimise and/or avoid risks are detailed in **Chapter 5: Project Description**.

Other EIAR technical assessments with the potential to impact human health have been reviewed and it is concluded that they do not require further discussion from a public health perspective, i.e. their findings do not have the potential for significant population health effects.

8.2.7 Assessment Criteria and Significance

This section sets out the methods for assessment of any likely significant population health effects of the Proposed Scheme.

The generic scheme-wide approach to the assessment methodology is set out in **Chapter 1: Introduction** of the EIAR. This section sets how the generic approach is refined to address the specific needs of the EIA human health assessment. Namely criteria for sensitivity, magnitude and significance that inform a professional judgment and reasoned conclusion as to the public health implications of the Proposed Scheme.

Regard has been had to the EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022). The guidelines provide generic definitions for significance, but also note that when more specific definitions exist within a specialised factor or topic, these should be used in preference to the generalised definitions. In the case of Human Health, specific definitions are set out by IPH (Pyper et al., 2021) and IEMA (Pyper, Waples, et al., 2022).

The methodology outlined in this section primarily follows the IEMA 2022 guidance, which sets out best practice for the consideration of health in EIA. The IEMA guidance was informed by IPH (Pyper et al., 2021) and the international consensus publication between impact assessment and public health practitioners: the IAIA/EUPHA Reference Paper (Cave et al., 2020).

Where significant adverse population health effects are identified, including for vulnerable groups, then mitigation has been proposed to avoid or reduce these effects. Mitigation is secured as part of the Proposed Scheme design or development consent. In line with good practice the Proposed Scheme takes a proportionate approach to identifying opportunities to enhance beneficial population health effects, including for vulnerable groups.

Cumulative effects are considered, including inter-related effects of the Proposed Scheme. This analysis considers how the same geographic or vulnerable group populations may be affected by more than one change in relevant health determinants, for example the combined effects of changes in air quality and noise on population health outcomes.

Where proportionate, the need for monitoring has been considered, including relevant governance.

8.2.7.1 Determinants of Health, Risk Factors and Health Outcomes

The chapter uses the World Health Organization (WHO) definition of health, which states that health is a "*state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*" (WHO, 1948).

The chapter also uses the WHO definition for mental health, which is a "*state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community*" (WHO, 2022).

Health and wellbeing are influenced by a range of factors, termed the 'wider determinants of health'. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.

Impacts of the Proposed Scheme that result in a change in determinants have the potential to cause beneficial or adverse effects on health, either directly or indirectly. The degree to which these determinants influence health varies, given the degree of personal choice, location, mobility and exposure.

A change in a determinant of health does not equate directly to a change in population health. Rather the change in a determinant alters risk factors for certain health outcomes. The assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Proposed Scheme. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.

Typically, 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 (Pyper, Waples, et al., 2022).

8.2.7.2 Population Health Approach and Vulnerable Groups

In line with IEMA and IPH guidance, a population health approach has been taken, informed by discussion of receptors within the other technical chapters of the EIAR. Population health refers to "*the health outcomes of a group of individuals, including the distribution of such outcomes within the group"* (Kindig & Stoddart, 2003).

It is helpful to clarify that all these guides direct that a population health outcomes approach should be adopted. This approach is consistent with the originating European Commission EIA guidance (European Commission, 2017) which states that "*environmentally related health issues … would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population*". This follows the European Commission guidance on assessing the health impacts of its own work programs, which takes the approach of assessing the effects on "*the health of the population*" (European Commission, 2001).

The WHO policy brief on incorporating health into environmental assessments (WHO, 2023) directs a focus on "*the potential for population health effects that are likely and significant*". This is consistent with the WHO publication on health in EIA (WHO, 2022) which states that "*good practice for human health in … EIA is met when … the focus is on assessing the likely significant effects of a proposal on population health outcomes*". That WHO publication specifically cites the IPH guidance (Pyper et al., 2021) and EUPHA guidance (Cave et al., 2020) as approaches that represent good practice. The former directs to take a "*population health outcome perspective*". The latter confirms "*EIA takes a population health approach*." The IEMA guidance was published after these two guides and follows their approach, confirming that "*a population health approach should be taken*", but also acknowledging that "*Where the effect is best characterised as only affecting a few individuals, … 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*."

Informed by these European Commission, WHO, pan-European, national and practitioner guidance documents a robust health assessment has been undertaken that focuses on population health outcomes, but in doing so also has regard to individual level effects.

For each determinant of health, the human health chapter identifies relevant inequalities through consideration of the differential effect to the 'general population' of the relevant study area and effects to the 'vulnerable population group' of that study area. The vulnerable population group being comprised of relevant sensitivities for that determinant of health. The following population groups have been considered:

- The 'general population' including residents, visitors, workers, service providers, and service users; and
- The 'vulnerable group population'.
- The methods draw on the list of vulnerable population groups set out in the IEMA guide to effective scoping, Table 9.2 (Pyper, Lamming, et al., 2022). The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the assessment. People falling into more than one group may be especially sensitive:
- **Young age:** Children and young people (including pregnant women and unborn children).
- **Old age:** Older people (particularly frail elderly).
- **Low income:** People on low income, who are economically inactive or unemployed/workless.
- **Poor health:** People with existing poor health; those with existing long-term physical or mental health conditions or disability that substantially affects their ability to carry out normal day-to-day activities.

- **Social disadvantage:** People who suffer discrimination or other social disadvantage, including relevant protected characteristics under the Irish Human Rights and Equality Commission Act 2014 or groups who may experience low social status or social isolation for other reasons.
- **Access and geographical factors:** People experiencing barriers in access to services, amenities and facilities and people living in areas known to exhibit high deprivation or poor economic and/or health indicators.

The assessment covers these populations within two groups: The general population for the geographic area, notably residents of the site-specific area defined in Section 8.2.4, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

The following general characterisations of how the 'general population' may differ from 'vulnerable group populations' were considered when scoring sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction and operation.

- In terms of life stage, the general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care. By contrast, the vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant.
- The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).
- The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status.
- The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
- Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.
- Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Proposed Scheme (e.g. shared routes or community assets). For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources.
- The general population includes the proportion of the community whose outlook on the Proposed Scheme includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Proposed Scheme.

8.2.7.3 Temporal Scope

The temporal scope of the assessment is consistent with the period over which the Proposed Scheme will be carried out and therefore covers the construction and operational periods. It is anticipated that construction will take place over an approximate 24-month period.

With respect to the duration of impacts, the IEMA (Pyper, Waples, et al., 2022) terminology has been used as a guide within this assessment. The terms have been defined by this assessment as follows:

- 'Very short term' relates to effects measured in hours, days or weeks;
- 'Short term' relates to effects measured in months (up to 23 months duration);
- 'Medium term' related to effects measured in years (2 years and more); and
- 'Long term' relates to effects measured in decades (e.g. the long-term effects on health from long-term employment) (10 years or more).

8.2.7.4 Determining Effect Significance

The assessment of EIA health significance is an informed expert judgement about what is important, desirable or acceptable for public health with regards to changes triggered by the Proposed Scheme. These judgements are: value-dependant (underpinned by scientific data, but also informed by professional perspectives); and are context-dependent (judgements reflect relevant social, economic and political factors for the population).

The determination of significance has two stages:

- Firstly, the sensitivity of the receptor affected, and the magnitude of the effect upon it are characterised. This establishes whether there is a relevant population and a relevant change to consider; and
- Secondly, a professional judgement is made as to whether the expected change in a population's health outcomes would be significant in public health terms. This judgement is explained using an evidence-based narrative setting out reasoned conclusions.
- Table 8-3, Table 8-4, Table 8-5 and Table 8-6 together summarise the assessment methodology that has been adopted. This approach shows how the general EIA methods of using sensitivity and magnitude to inform a judgement of significance, are applied for human health. The approach uses professional judgement, drawing on consistent and transparent criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain what significance means for human health in public health terms.

The EIA human health assessment uses qualitative analysis following the 2022 IEMA guidance approach (Pyper, Waples, et al., 2022). This draws on qualitative and quantitative inputs from other EIAR topic chapters. This reflects the consensus position amongst public health and impact assessment practitioners that qualitative analysis is the most appropriate methodology for assessing wider determinants of health proportionately, consistently and transparently.

The EIA health chapter conclusions are both EIA scores, such as major, moderate, minor or negligible; and a narrative explaining this score with reference to evidence, local context and any inequalities.

Terms in bold in **Table 8-3**, **Table 8-4** and **Table 8-6** indicate terms that qualitatively describe levels within criteria that are discussed across the scoring options. For example, high, moderate, low or very low levels of deprivation. These are the terms from the guidance that are used within the assessment narrative.

Table 8-3: Health Sensitivity Methodology Criteria

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

Table 8-4: Health Magnitude Methodology Criteria

Category/ Score	Indicative criteria (judgment based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories) *The narrative explains that the change due to the project has (select as appropriate):*
High	**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.
Medium	**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.
Low	**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.
Negligible	**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.

Table 8-5: Assessment Matrix (Indicative)

Magnitude of Impact	Sensitivity			
	High	Medium	Low	Very low
High	Major	Moderate or major	Moderate or minor	Minor or negligible
Medium	Moderate or major	Moderate	Minor	Minor or negligible
Low	Moderate or minor	Minor	Minor	Negligible
Negligible	Minor or negligible	Minor or negligible	Negligible	Negligible

Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.

Table 8-6: Health Significance Methodology Criteria

Category/ Score	Indicative criteria (judgment based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories)
Major (significant)	The narrative explains that this is significant for public health because (select as appropriate): ➢ Changes, due to the project, have a **substantial** 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 scores), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show **consensus** on the importance of the effect. ➢ Change, due to the project, could result in a regulatory threshold or statutory standard being **crossed** (if applicable). ➢ There is likely to be a **substantial** change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a **causal** relationship between changes that would result from the project and changes to health outcomes. ➢ In addition, health priorities for the relevant study area are of **specific** relevance 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 **influential** 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 **mixed views**. ➢ Change, due to the project, could result in a regulatory threshold or statutory standard being **approached** (if applicable).

	➢ There is likely to be a **small** change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a **clear** relationship between changes that would result from the project and changes to health outcomes. ➢ In addition, health priorities for the relevant study area are of **general** relevance 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 **marginal** 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 **no** relevant consultation themes emerge among stakeholders. ➢ Change, due to the project, would be **well within** a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable). ➢ There is likely to be a **slight** change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a **suggestive** relationship between changes that would result from the project and changes to health outcomes. ➢ In addition, health priorities for the relevant study area are of **low** relevance 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.

Population health effects that are scored major or moderate are considered significant.

Ultimately a likely significant health effect is one that should be brought to the attention of the determining authority, as the effect of the Proposed Scheme is judged to provide, or be contrary to providing, a high level of protection to population health. This may include reasoned conclusions in relation to health protection, health improvement and/or improving services.

Where significant adverse effects are identified, mitigation is considered to reduce the significance of such effects. Similarly, enhancements are considered where significant and proportionate opportunities to benefit population health are identified.

8.2.8 Data Limitations

This assessment is based on publicly available statistics and evidence sources. No new primary research or bespoke analysis of non-public data was undertaken for the assessment.

Baseline data includes indicators where the available public data is pre-Covid-19, or that have yet to show the full impacts of the pandemic for public health. The baseline is considered sufficient and robust in evidencing that there are vulnerable population groups with high sensitivity in the study area. New data would be unlikely to change that conclusion as a 'high' sensitivity is already assigned to vulnerable groups, and any new data would not change this.

The health assessment partially draws from and builds upon the technical outputs from other technical chapters of the EIAR. As a consequence, the assumptions and limitations of those assessments also apply to any information used in this chapter (e.g. for modelling work undertaken). It is, however, considered that the information available provides a suitable basis for assessment.

All decision making is within the context of imperfect information and the following steps have been taken to allow confidence in the EIA health assessment conclusions:

- Methods are used that triangulate evidence sources and professional perspectives.
- The scientific literature reviews undertaken give priority to high quality study design, such as systematic reviews and meta-analysis, and strength of evidence.
- Quantitative inputs for other assessments have been used, which included model validation, as described in other chapters.

- The health assessment has been cautious, with conservative assessments, for example in taking account of non-threshold effects and vulnerable group findings.
- The health assessment has been transparent in its analysis and follows good practice.

Regarding the application of the precautionary principle in public health, this is discussed by the WHO (WHO, 2004). The WHO note how the precautionary principle is a two-stage test, requiring both uncertainty and serious threats to health, i.e. large effect sizes indicated by available *evidence. The WHO describe health impact assessments (such as this health assessment) as a "compass to guide public health decisions under uncertainty" and that "a centrepiece of precautionary assessment is environment and health assessment, which weighs the science of hazards and exposure. In this step, evidence of risk and uncertainty is examined to determine the possibility (and plausibility) of a significant health threat and the need for precautionary action."* Such an approach has been taken by this health assessment, which considers levels of exposure, extent of the population exposed and the scale of change in relevant risk factors for health outcomes.

8.3 Description of the Existing Environment

8.3.1 Baseline Environment

Different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstances. The aim of the following information is primarily to put into context the local health circumstances of the communities surrounding the Proposed Scheme site, drawing from available statistics. Where possible, data has been collected for Clonaslee ED. Where ED data is not available, data for Laois County has been used to compare with the national average.

It should be noted that the description of the whole population, and the populations within the local and wider study area, does not exclude the probability that there will be some individuals or groups of people who do not conform to the overall profile.

8.3.1.1 General Health

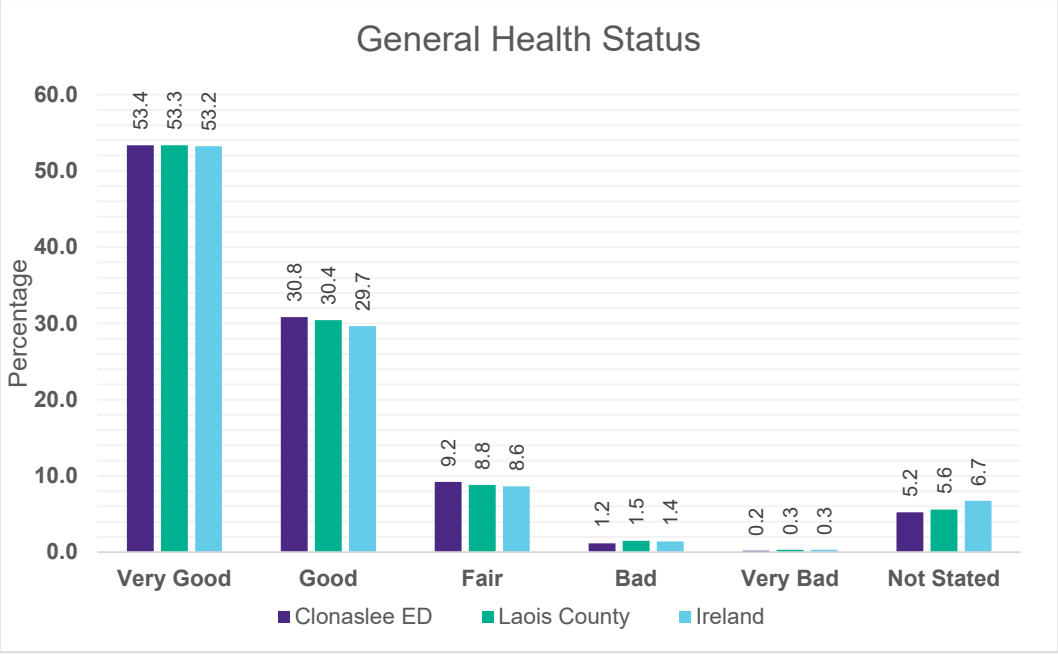

Figure 8.1: General health of the population at ED, county and national level. Census 2022.

Based on 2022 census statistics (Central Statistics Office, 2022b), the general health of Clonaslee ED is good. Consistent with county and national averages, 53.4% of residents in Clonaslee ED report "very good"

health which is similar to the proportion reported in Laois County (53.3%) and Ireland (53.2%). In overall, 93.4% of the population in Clonaslee ED reports fair to very good health with only 1.2% in bad health. Less than 1% of residents have reported having “very bad” health, which is consistent with county and national averages.

8.3.1.2 Life Expectancy

Life Expectancy

Recent (2022) life expectancy statistics are only available at the national (Ireland) level. Life expectancy in Ireland at birth in 2022 was 80.9 for males and 84.2 for females (Central Statistics Office, 2024; Eurostat, 2023b). Life expectancy is increasing with male life expectancy consistently lower than female life expectancy Figure 8.2

Healthy life expectancy (HLE) statistics (i.e. the number of years a person is in good health) are only available at the national (Ireland) level. Healthy life expectancy for both males and females has been increasing over the past decade (between 2009 and 2019) Figure 8.2 (Eurostat, 2023a)). However, there is a decrease in healthy life expectancy (HLE) for both males and females in 2020, which is likely attributable to the Covid-19 pandemic. In 2022, healthy life expectancy in Ireland was 65.2 for males 66.8 for females, a decline from 2021.
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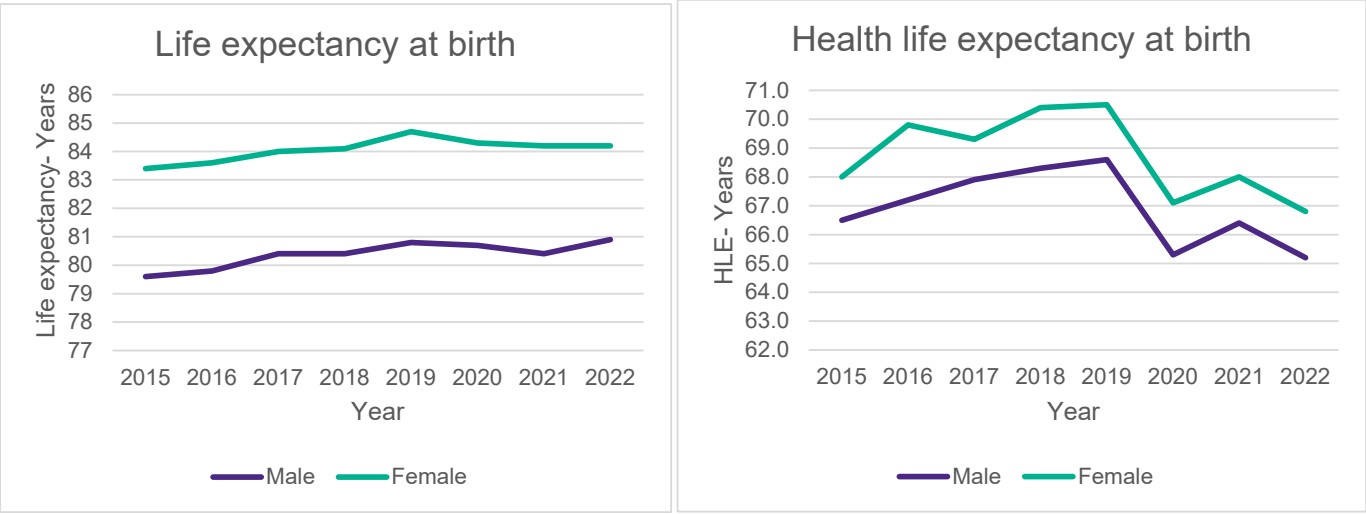

Figure 8.2 Life expectancy and healthy life expectancy in Ireland: Source (Central Statistics Office, 2024) Table WM103 and (Eurostat, 2023a)

8.3.1.3 Physical Health

The rate of procedures on the cardiovascular and respiratory systems in Laois County is illustrated in Figure 8.3 and used as proxy for hospital admissions rates for diseases of the circulatory and cardiovascular system (data for the latter are no longer available). A sharp decline in procedures of the cardiovascular system in Laois County is observed from 169.5 to 77.7 between 2013 and 2021. The rate of procedures on the respiratory system has also decreased from 102.2 to 83.0 between 2013 and 2021 (Central Statistics Office, 2023b).

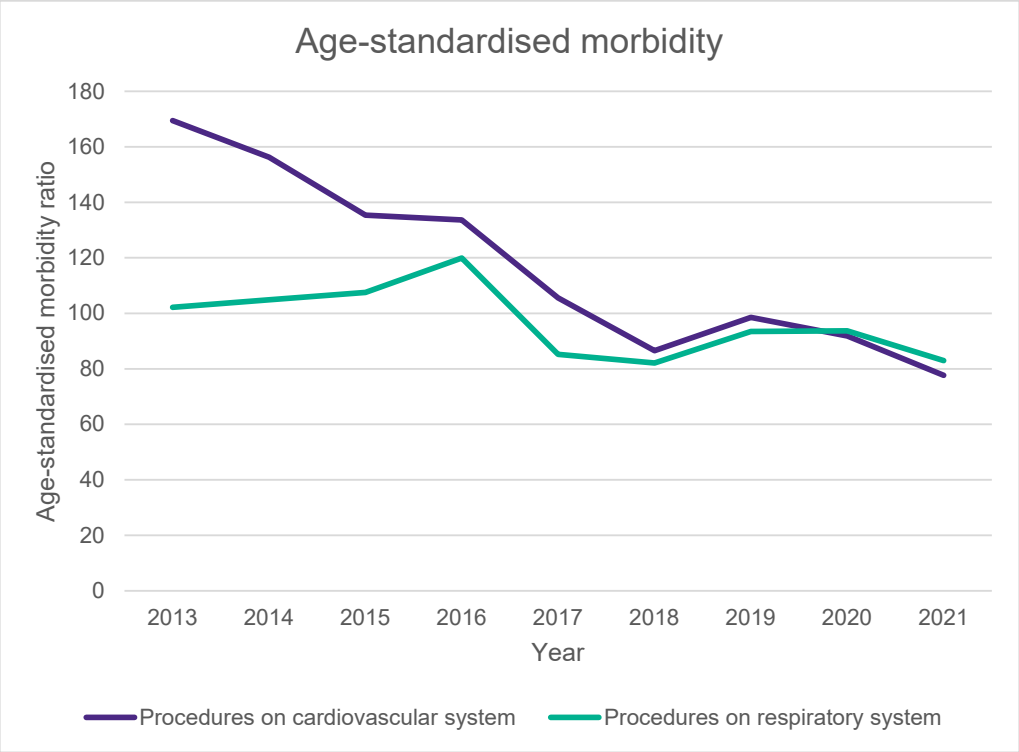

Figure 8.3: Age-standardised morbidity rate for procedures on the cardiovascular and respiratory systems for Laois County (Central Statistics Office, 2023)

Overall, the all-age all-cause mortality rate in Laois County (574.01 per 100,000 population) is lower than the national average (659.6 per 100,000 population) in 2021, and has consistently been lower over the years (Central Statistics Office, 2023a).

Mortality from circulatory diseases is consistently lower in Laois County than the national average, and a decline in the rate has been observed over the years Figure 8.5 (Central Statistics Office, 2023a). Similarly, mortality from respiratory diseases has fluctuated over the years but remains lower than the national average, most recent figures show a decreasing trend Figure 8.6. Cancer mortality statistics in 2021 show a lower rate in Laois County (152.8 per 100,000 population) compared to the national average (188.3 per 100,000 population) Figure 8.7.

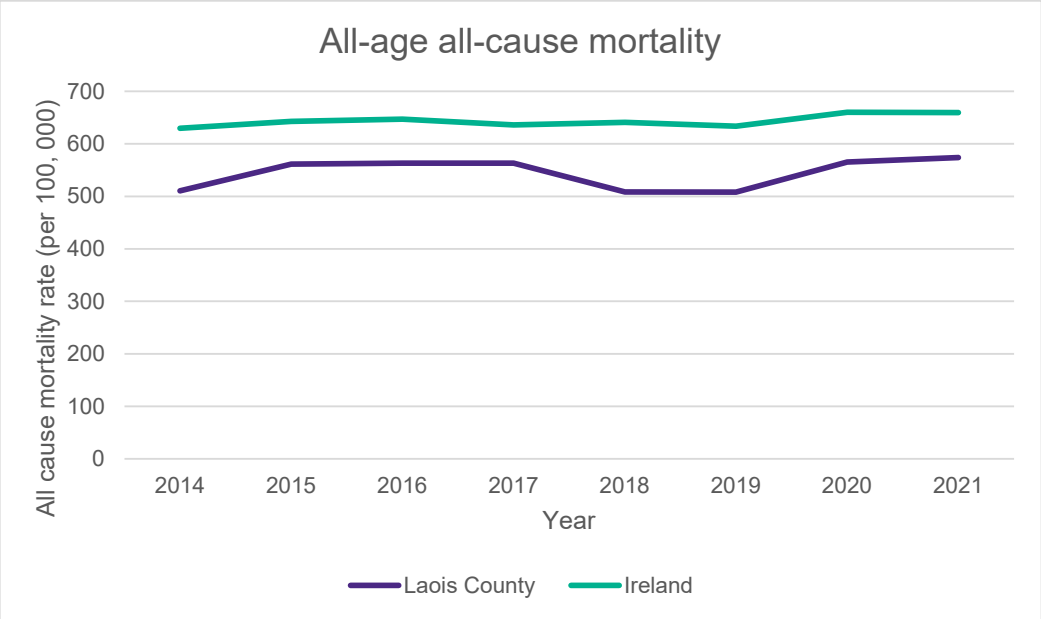

Figure 8.4: All-age all-cause mortality rate (Central Statistics Office, 2021) (Table DHA12)

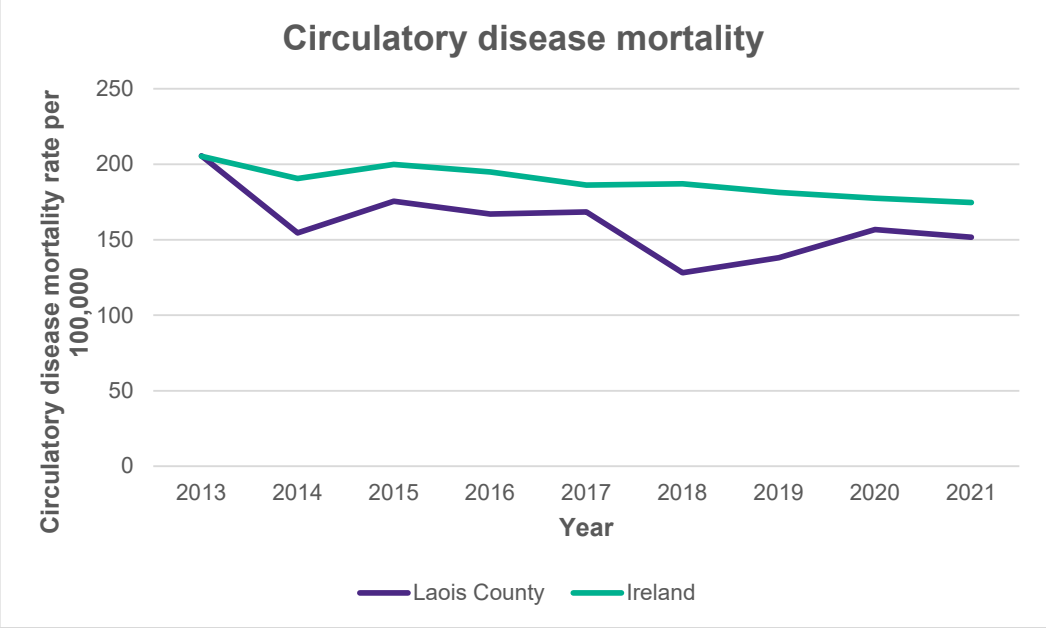

Figure 8.5: Circulatory disease mortality (Central Statistics Office, 2023)

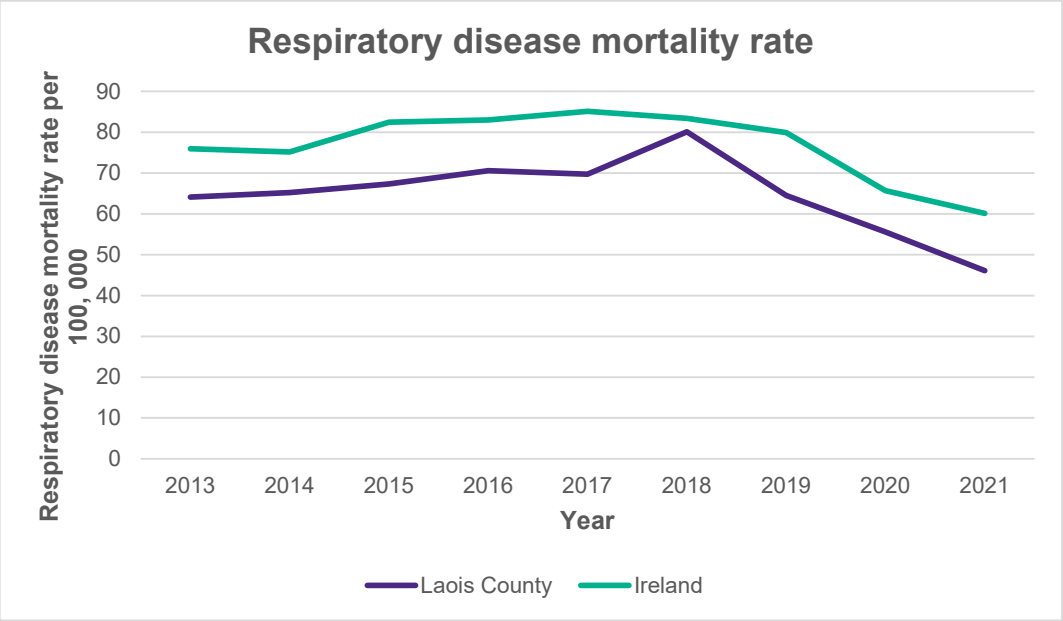

Figure 8.6: Respiratory disease mortality (Central Statistics Office, 2023)

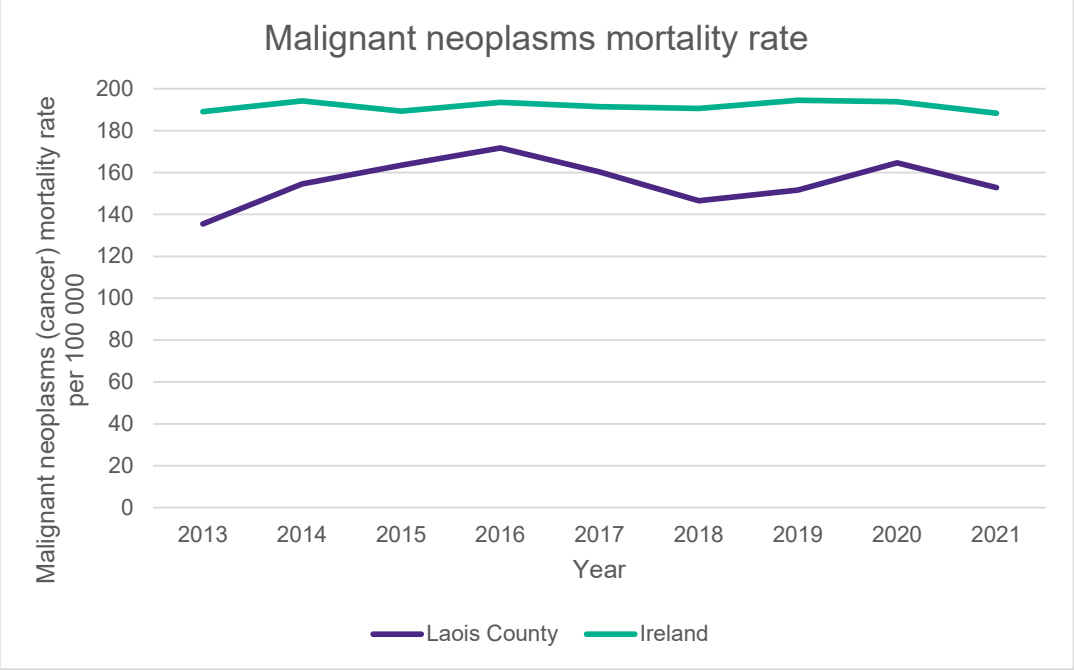

Figure 8.7: Malignant neoplasms mortality (Central Statistics Office, 2021) (Table DHA12)

8.3.1.4 Mental Health

Self-reported mental health status is only reported at the regional and national levels. Accordingly, the Midlands region performs similar to the national comparator. In 2019, the percentage of persons aged 15 years and over that reported to have experienced moderately severe to severe depression is 2% in the Midland region and 2% in Ireland (Central Statistics Office, 2023c).

Death from mental and behavioural disorders is lower in Laois County (27.0 per 100,000 population) compared to the national rate (35.1 per 100,000) (Central Statistics Office, 2023a). Similarly, death from suicide and intentional self-harm is higher in Laois County (16.9 per 100,000 population) compared to Ireland (8 per 100,000 population) (Central Statistics Office, 2023a).

8.3.1.5 General and Vulnerable population statistics of Clonaslee ED

Indicator	Clonaslee ED	Republic of Ireland
Population by Age		
Age 0-19	27%	26.2%
Age 20-64	57%	58.7%
Age 65+	17%	15.1%
Population by Sex		
Male	51%	49.4%
Female	49%	50.6%
Population by Ethnicity		
White Irish	92%	76.6%
White Irish Traveller	1%	0.6%
Other White	2%	9.9%
Black or Black Irish	0%	1.5%
Asian or Asian Irish	0%	3.3%
Other	0%	2.0%
Not stated	5%	6.2%
Population by Religion		
Catholic	87%	68.8%
Other religion	2%	9.9%
No religion	6%	14.7%
Not stated	5%	6.7%

Considering different population groups and vulnerability in the site-specific study area, recent statistics show a similar proportion of people of the working age group (aged 20-64) in Clonaslee ED compared to the national average. The proportion of children and young people aged 0-19 is similar to the national average and the proportion of the elderly population is slightly higher than the national average. There is no significant difference observed in the proportion of males and females in Clonaslee ED and the national average.

The majority of the people in the ED are white Irish, with Clonaslee ED having a higher white Irish population than the national average. Other minority ethnicities found in the study area include White Irish Traveller, Other White, Black or Black Irish, Asian or Asian Irish with the Other White being the second most prevalent ethnicity in the Study Area.

Catholicism is the most prevalent religion in the ED. The second most prevalent religion within the district Study Area is "no religion". There is a lower proportion of the population in the district Study Area who fall under ‘Other Religions, compared to the national average.

8.4 Description of the Likely Significant Effects

8.4.1 Do Nothing Scenario

Longer term trends and interventions in population health may influence the future baseline. Health and social care, public health initiatives and government policies aim to reduce inequalities and improve quality of life. The historic success of such interventions is increasingly challenged by national trends such as an aging population, rising levels of obesity, the COVID-19 pandemic, cost-of-living crisis and climate change. The implications of these pressures for public health will take years to be reflected within statistical data releases, but it is expected that they will exacerbate public health challenges. These factors disproportionately affect vulnerable groups, including due to age and ill-health.

Climate change may exacerbate physical and mental health risk factors, particularly around flooding, extremes of temperature and uncertainty for future generations. The baseline highlights pockets of deprivation which would be most vulnerable to climate change stresses. Typically, low resource groups, e.g. in areas of high deprivation, are most sensitive to the adverse health effects of climate change.

To reflect these trends the assessment scores all vulnerable groups as having high sensitivity for all determinants of health. This appropriately captures any increase in sensitivity within the future baseline.

It would not be proportionate (or consistent with the qualitative assessment approach taken) to quantitatively model the population's future health. This reflects the complexities of interactions between the wider determinants of health, as well as the potential for macro-economic changes in the next decade that are hard to predict. Any prediction would have such wide error margins that it would greatly limit the value of the exercise.

8.4.2 Construction Phase

8.4.2.1 Open space, leisure and play

This section considers the effects on *open space, leisure and play* during construction of the Proposed Scheme. Supporting people to be active is an important determinant of physical health. Time spent near green and blue space can also positively affect mental wellbeing.

The construction phase of the Proposed Scheme will comprise a number of activities including site clearance, utility diversion works, excavations and demolition works. This assessment considers the impact of the development of flood defences i.e. debris trap, reinforced flood wall, embankments and remediated culvert including adjacent areas required for the construction of such defences; and the upgrade of existing flood management infrastructure, including areas to be disturbed during such upgrade activities.

This section has been informed by **Chapter 5: Project Description, and Chapter 7: Population** and **Chapter 6: Traffic and Transportation** which sets out relevant assessment findings and mitigation measures which have been taken into account.

The availability of a natural environment and attractive views of nature within an individual's living environment are important contributors to physical activity. Peoples' experiences in using the natural environment can enhance attitudes toward physical activity and perceived behavioural control via positive psychological states and stress-relieving effects, which lead to firmer intentions to engage in physical activity (Calogiuri & Chroni, 2014).

Improvements in health behaviour influence health outcomes like mortality, chronic diseases, mental and obesity disorders (Salgado et al., 2020). Physical activity can improve cognitive and mental health, particularly improvements in physical self-perceptions, which accompany enhanced self-esteem (Lubans et al., 2016). Physical can also improve mental health such as stress, anxiety or depression. Use of open spaces may be affected by not only physical barriers but also changes in the amenity or setting of the destination.

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is changes in access to the River Clodiagh and surrounding green spaces due to construction.
- The pathway is disruptions to recreation generated by construction activities.

- The receptors are residents and recreational users of the River Clodiagh.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The 'site specific' populations of Clonaslee ED.
- The sub-population vulnerable due to:
  - Young age vulnerability (specifically children who are overweight or who have low physical activity levels);
  - Old age vulnerability (specifically the elderly for whom familiar routes with appropriate mobility considerations play a part in regular exercise);
  - Low income vulnerability (specifically people with limited access to alternative physical activity opportunities or means of transport);
  - Poor health vulnerability (people with existing poor physical or mental health);
  - Access and geographical vulnerability (people for whom close proximity to the proposed changes increases sensitivity); and
  - Social disadvantage (people who may have limited access to other forms of recreation).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Laois County, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 8.2.7.2** of this report. The general population comprise those members of the community in *good* physical and mental health and with resources that enable a *high* capacity to adapt to change such as selecting alternative forms of recreation or different routes to avoid any temporary disruption.

The sensitivity of the vulnerable sub-population is **high**. This reflects that the sub-population includes representation of dependants including children and people with existing poor physical or mental health. This sub-population may have *fewer resources* and *less capacity* to adapt to changes. The population may therefore be *more reliant* on recreation within the affected area with greater likelihood that any disruption or disturbance could affect physical activity and recreational behaviours.

Magnitude

Chapter 7: Population of this EIAR concludes that the Proposed Scheme will have a negative, slight and temporary effect during the construction phase on recreational and tourism facilities.

Chapter 6: Traffic and Transportation of this EIAR reports that there is a temporary impact predicted during construction of Area 1 works including embankment, culvert remediation and debris trap at Brittas Wood on the L6002 local road. Public access to the Brittas Loop Trail will be restricted during the works, and signage erected at the trail head to direct people to the alternative entrance on the eastern side of the Clodiagh River. A CTMP will be prepared by the appointed contractor which outlines measures to be implemented during the construction phase.

As reported in **Chapter 7: Population**, construction works and associated activities will occur within and or adjacent to Brittas Woods as well as the associated recreational walk loops, in line with the Proposed Scheme's construction activities at Area 1 – Brittas Wood. The construction of the Proposed Scheme will include designated pedestrian areas that will be clearly demarcated with appropriate barriers and signage. Construction activities are expected to involve machinery, plant equipment, temporary traffic diversions, and temporary construction compounds. Recreational use of Brittas Wood will be temporarily disrupted as a result.

Area 1 Brittas Wood includes a publicly accessible amenity trail, which is used by walkers and cyclists from the local area. A flood relief embankment is proposed on a portion of this amenity trail, which will be temporarily closed with users directed to an alternative entrance during construction.. Access to sports facilities such as St Manman's GAA Club adjacent to Area 2, may also be disrupted by the construction of the Proposed Scheme. These changes are likely to mostly affect residents in the local communities of Clonaslee.

Accordingly, for population health, the magnitude of change due to the Proposed Scheme is **low**. The health implication of the above effects is that there would be a *medium-term* change in experience of recreational river users and public rights of way (PRoW) users, which may be *frequent* to *occasional* depending on levels of use and will reverse upon completion of the construction work. The literature suggests associations between access to greenspace and recreation amenity with heath including both physical (e.g. cardiometabolic factors, all-cause mortality, sleep quality) and mental (Yang et al., 2021). The scale of change is considered *small*. Only very *minor changes* in the quality of physical activity opportunity (and associated cardiovascular and mental health outcomes) would be expected for a *small minority* of the population due to *temporary* disruption during construction.

Significance

The significance of the population health effect for this determinant of health is **minor adverse** (not significant). The professional judgment is that there would, at most, be a very *slight* adverse change in the health baseline for the local population. This conclusion reflects that physical activity is a local public health priority and the scientific literature on the benefits of physical activity to health is well established, however the level of change due to the Proposed Scheme is appropriately alleviated by standard good practice measures that minimise disruption and disturbance through the CEMP, such as the construction restriction measures mentioned above. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, no widening of health inequalities would be expected, and no influence is expected on the ability to deliver local or national health policy.

8.4.2.2 Transport modes, access and connections

This section considers population health implications of changes in construction road traffic affecting health-related travel times and accessibility (including emergency services); road safety; and active and sustainable travel for local residents (bus users, pedestrians and cyclists). Construction works and constructed-related vehicles and traffic have the potential to disrupt local vehicle traffic (private and public transport) as well as some sustainable travel (bus routes) and active travel (pedestrians and cyclists). This may include health-related journey times, community severance or road safety.

The duration of the construction works for the Proposed Scheme would be approximately 24 months.

This section has been informed by **Chapter 6: Traffic and Transport**, which sets out relevant assessment findings and mitigation measures that have been considered.

Transportation barriers are important to healthcare access, particularly for those with lower incomes. Transportation barriers lead to rescheduled or missed appointments, delayed care, and missed or delayed medication use. These consequences may lead to poorer management of chronic illness and thus poorer health outcomes (Syed et al., 2013). The scientific literature identifies the general points relevant to potential exposures and health outcomes. Walking and cycling for transportation (i.e. active transportation), provide substantial health benefits from increased physical activity. Health gains exceed detrimental effects of traffic incidents and air pollution exposure (Mueller et al., 2015).

Active transport to work or school is significantly associated with improved cardiovascular health and lower body weight (Xu et al., 2013). The provision of convenient, safe and connected walking and cycling infrastructure is at the core of promoting active travel (Winters et al., 2017). Physically active transport (i.e. walking or cycling) has been directly related to increased residential density, street connectivity, mixed land use and amenities within a walkable distance (Thomson et al., 2008).

Therefore, with regard to health-related travel times and accessibility, health effects may be associated with emergency response times or non-emergency treatment outcomes associated with delays or non-attendance; with regard to active and sustainable travel, health effects may be associated with reductions in levels of active travel such and walking and cycling, including physical health (e.g. cardiovascular health) and mental wellbeing (e.g. increased stress and anxiety); and with regard to road safety, health effects may be associated with the severity or frequency of road traffic incidents.

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is the presence of construction vehicles and traffic restrictions on the existing network.

- The pathway is changes in health-related travel times / accessibility, changes to levels of active travel due to increased vehicle traffic, and changes to road safety.
- The receptors are local road users, including those using motor vehicles as well as pedestrians and cyclists, and emergency services using the road network.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The 'site-specific' population of Clonaslee ED.
- The 'local' population of Laois County.
- The sub-population vulnerable due to:

  – Young age vulnerability (children and young people as potentially more vulnerable road users);
  – Old age vulnerability (older people as potentially more vulnerable road users);
  – Poor health vulnerability (people with existing poor physical and mental health in relation to health trip journey times);
  – Low-income vulnerability (people living in deprivation, including those on low incomes for who travel costs or alternatives may be limiting); and
  – Access and geographical vulnerability (people who experience existing access barriers or who rely on the affected routes, including healthcare and other amenities).

The scientific literature indicates that there is an association between the transport changes, road safety and accessibility. The literature does not identify particular thresholds for effects. The assessment has had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, pregnant women and cyclists (particularly older cyclists) are generally more vulnerable in terms of road safety. People with lower socio-economic status typically face more transportation barriers in accessing health care.

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Clonaslee Village, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 8.2.7.2** of this chapter. This reflects that most people in the local area (Laois County) would only make *occasional* use of the affected section of the road network. It also includes those for whom the road network affords *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.

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. It also relates to 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. traveling to schools), and those in areas of greater deprivation. Deprived populations may already face more access barriers compared to 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). Ambulances are generally less affected by congestion due to the priority given to them travelling under blue lights. People in poor or very poor health may be more frequent users of healthcare service and therefore be more sensitive to access changes.

Magnitude

As reported in **Chapter 6: Traffic and Transport**, the temporary effect on the road network during the construction phase is slight to moderate which is not significant in EIA terms. The R442 Birr / Mountmellick Road and Chapel Street / Tullamore Road (L2006) have road widths more than 6.0 m. This is in the upper range of the standard carriageway width for Link Streets with low to moderate design speeds. The L6002 Brittas Wood Road has a width of 5.8 m, which exceeds the standard carriageway widths for Local Streets (5.5 m). Therefore, these roads have sufficient width to accommodate the heavy goods vehicles (HGV) travelling to the site of the Proposed Scheme.

For population health, the overall magnitude of change for this determinant due to the Proposed Scheme is **low**.

- In relation to health-related travel times and accessibility, the scale of change in delays is expected to be *small* and *medium-term*. The frequency with which health related journeys may be affected is likely to be *occasional* for most people though for a few people, severity could relate to a *small* change in risk for morbidity or mortality. The temporary nature of the work and ability for people to adapt to known planned diversions or delays means there is unlikely to be a significant change to population health outcomes associated with access to social infrastructure such as shops, employment and educational facilities. A **low** magnitude is assigned to health-related travel times.
- In relation to road safety at the population level the scale of change in accidents would be *small*. The frequency of any incidents would be *occasional*, with severity related to a very minor change in risk of injury or mortality (with outcome reversal gradual or permanent). The expectation is that *very few* people would be affected, with *no or slight* implications for healthcare services. Reflecting the residual effects reported in **Chapter 6: Traffic and Transport** the health chapter identifies a **low** magnitude of change on this issue.
- In relation to active travel, the scale of change is considered *small* and *medium-term*, albeit of limited duration at any given location, including due to the transitory nature of construction works across the three project areas. Only *minor* changes in *morbidity* for *cardiovascular* and *mental health* outcomes would be expected for a *small minority* of the population due to temporary disruption during construction works. Most adverse effects on health behaviours and outcomes would be expected to *reverse* on completion of the construction works. A **low** magnitude is assigned to active travel.

Significance

The overall significance of the population health effect for this determinant of health is **minor adverse** (not significant).

In relation to health-related travel times and active travel, the significance of the population health effect is **minor adverse** (not significant). The professional judgment is that there would, at most, be a *slight adverse* change in the population health baseline. This conclusion reflects that road safety and access to health supporting services are *specific* public health priorities and there is *causal* association that is supported by the scientific literature. However, the change due to the Proposed Scheme is appropriately mitigated by standard good practice measures that minimise disruption and disturbance, as described in **Chapter 6: Traffic and Transport**. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, *no widening of health inequalities* would be expected, and no influence is expected on the ability to deliver local or national health policy.

For road safety the significance of the population health effect is **minor adverse** (not significant). This conclusion reflects the potential for *slight* change in the health baseline due to slightly *increased risk* of high severity road accident outcomes. Such an outcome reflects the inherent incremental risk associated with construction works and vehicles on the highway and is not significant in public health terms. The change is not expected to widen inequalities and at most would have a *marginal* influence on the achievement of health policy relating to road safety.

8.4.2.3 Employment and income

This section considers the effects on employment and income from construction of the Proposed Scheme. In a small town context, even minor changes to employment and income can be influential to population health.

This section has been informed by **Chapter 7: Population** which sets out relevant assessment findings and mitigation measures which have been taken into account.

The scientific literature identifies the following general points relevant to potential effects and health outcomes. Employment and income are both determinants that can negatively and positively affect health and mental wellbeing (PHE, 2021; Royal College of Physicians, 2022; The Lancet Public Health, 2020). This includes by making health-promoting resources available to an employee and any dependants (PHE, 2021); improved living conditions and the potential to make healthier choices, e.g., eating a healthier diet and undertaking more physical activity (Royal College of Physicians, 2022).

Unemployment is associated with poor health outcomes, with more negative health effects linked to lower socio-economic status and unemployment due to health reasons, whilst a strong social network is beneficial in reducing the health effects of unemployment (Norström et al., 2014).

There is potential for the construction phase of the Proposed Scheme to increase economic activity in Clonaslee Village as a result of the presented of construction workers in the area. The construction phase is likely to bring indirect beneficial employment to the local population within Clonaslee. Additionally, it is possible that recreational and tourism activities will be adversely impacted by construction works.

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is construction activities associated with the Proposed Scheme.
- The pathway is changes in employment and income due to construction.
- Receptors are residents and other people who rely on the River Clodiagh for income.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The ‘site-specific’ geographic population of Clonaslee ED;
- The ‘local’ population of County Laois, including other fishermen from the surrounding area who rely on access to the River Clodiagh.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people who are dependants, as well as young adults early in their careers);
  - Old age vulnerability (older people who are dependant);
  - Poor health: (people with existing poor physical and mental health, including for employment opportunities and as dependants);
  - Low income vulnerability (people on low income, who are economically inactive or unemployed/workless); and
  - Access to geographical factors (people experiencing barriers in access such as the ability to access employment and income outside the local area).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Clonaslee, and the vulnerable sub-population for this area. The latter is a comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 8.2.7.2** of this report. The general population comprise those members of the community in employment with good socio-economic status and low levels of deprivation.

The sensitivity of the vulnerable sub-population is **high**. As stated in **Chapter 7: Population**, unemployment in Clonaslee is similar to the national average. Vulnerability in this case relates to people and their dependants who are on low incomes, have poor job security, poor working conditions or who are unemployed.

Magnitude

As reported in **Chapter 7: Population**:

The proposed construction works will be confined to specific areas within Clonaslee village, and therefore it is expected that local businesses within and/or adjacent to areas where of construction works and construction compounds be placed will continue operating normally.

- The construction phase of this project will increase economic activity in the area primarily as a result of the presence of construction workers in the area. The demand for local businesses, leisure centres and accommodation services will likely increase, thus creating local economic growth. In addition to this, it is considered that the construction phase will bring indirect employment to the local services within Clonaslee village.
- Local businesses within and/or adjacent to areas where of construction works and construction compounds be placed will continue to operate normally. The construction works would involve temporary restrictions on traffic movements as described above and in **Chapter 6: Traffic and Transport** of this EIAR. Temporary road closures may impact businesses due to loss of parking and disruptions to the regular flow of traffic.
- With regard to the above, the construction of the Proposed Scheme will have positive, not significant and temporary effects on economic activity during the construction phase.

Accordingly, for population health, the magnitude of change due to the Proposed Scheme is **low**. This reflects a *small scale of change* within the context of the study area employment market from construction employment, and local economic activity from increased demand for local businesses and services. Construction employment would be *medium-term* and would reverse on completion of the construction work. Such jobs are likely to be associated with *minor changes* in morbidity and quality of life for a *small minority* of the population.

As detailed in **Chapter 7: Population**, disruption to local businesses and livelihoods during construction are anticipated to be minimal, with businesses operating normally. It is noted also that construction interruptions to recreational and tourism facilities will be kept to a minimum. Any associated changes to income can also be mitigated through the CEMP by designating safe alternative transport through Clonaslee during construction. There is therefore expected to be limited adverse changes in income and employment through disruptions during construction.

Significance

The significance of the population health effect for this determinant of health is **minor beneficial** (not significant). The construction of the Proposed Scheme is likely to have *slight* positive impacts on economic activity as a result of the presence of construction workers in the area. These opportunities are likely to affect a *small* part of population and to last for a relatively short period of time, yet increased income can have beneficial health effects even in the short-term. This conclusion reflects that the scientific literature establishes a *clear relationship* between good quality employment and factors that promote health or are protective against poor health, particularly mental health. The scale and nature of employment is expected be *marginal* in narrowing health inequalities locally, and more generally *supporting delivery of health policy* to improve local population health. Upskilling through the Proposed Scheme's construction works has potential legacy of supporting improved employment and income opportunities for those workers into the future.

8.4.2.4 Noise and Vibration

This section discusses changed to environmental conditions, in particular, *noise* during the construction of the Proposed Scheme, and related effects on population health.

This section has been informed by **Chapter 15: Noise and Vibration**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

It is proposed that standard construction working hours will apply as follows: Monday to Friday: 08:00 to 19:00; Saturdays: 08:00 to 14:00; and no work on Sundays and Bank Holidays

The literature highlights cardiovascular effects, annoyance and sleep disturbance (and consequences arising from inadequate rest) as being the main pathways by which population health may be affected (Peris & Fenech, 2020). The literature also notes the potential for chronic noise to have a detrimental effect on learning outcomes (e.g. noise distracting and affecting communication within classrooms) (Peris & Fenech, 2020).

Whilst the literature supports there being thresholds at which effects (such as annoyance and sleep disturbance) are likely, it also acknowledges the subjective nature of responses to noise. In this regard noise effects can be considered to have non-threshold effects, with characteristics other than sound levels also determining the influence on health outcomes (WHO, 2018). The assessment had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, the elderly, the chronically ill, people with a hearing impairment, shift-workers and people with mental illness (e.g., schizophrenia or autism).

Construction of the Proposed Scheme has the potential to result in noise nuisance from construction activities, particularly night-time noise that may be detrimental to population health where sleep is disturbed to a high degree. Changes in the distribution of day-time noise are also considered. As stated in **Chapter 15: Noise and Vibration**, construction traffic numbers and associated noise levels are below relevant thresholds for detailed assessment, and there is limited potential for noise impacts from construction traffic.

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is noise generated by construction activities.
- The pathway is pressure waves through the air.
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The ‘site-specific’ geographic population Clonaslee ED.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people particularly with regard to educational and sleep disruption);
  - Old age vulnerability (older people particularly with regard to sleep disruption);
  - Poor health vulnerability (people with existing poor physical or mental health);
  - Low-income vulnerability (people living in deprivation, including those on low incomes may have fewer resources to adapt, e.g., seek respite or insulation furthermore, those who are economically inactive may spend more time in affected dwellings); and
  - Access and geographical vulnerability (people for whom close proximity to the proposed changes increases sensitivity).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Clonaslee ED, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 8.2.7.2** of this report. The general population comprise those members of the community in good physical and mental health and with resources that enable a high capacity to adapt to change.

The sensitivity of the vulnerable group population is **high**. This reflects that the sub-population includes a high representation of dependants, both children, elderly and those receiving care due to poor health. This sub-population may experience existing widening inequalities due to living in areas with increasing noise and moderate deprivation, with limited capacity to adapt to changes. Vulnerability particularly relates to those living close to the construction activities, including those spending more time in affected dwellings, e.g. due to low economic activity, shift work or poor health. People who are concerned or have high degrees of uncertainty about construction noise and its effect on their wellbeing may be more sensitive to changes in noise. People with heightened sensitivity to noise effects, including due to existing physical and mental health conditions or due to neurological diversity, are acknowledged as likely to be present within the affected population and have been taken into account by the assessment.

Magnitude

As reported in **Chapter 14: Noise and Vibration**, construction of the Proposed Scheme will involve the various combination of plant items which will be in use at different phases at each of the three construction sites, for instance the use of rock breakers and consaws will be for brief periods when breaking out footpaths or road surfaces before trench excavation. **Chapter 14: Noise and Vibration** concludes:

- Significant noise effects from construction activities at each of the construction compounds in Area 1, Area 2 and Area 3, is predicted to be moderate, significant and slight, respectively.
- No significant noise effects are predicted from construction activities at Area 1 – Brittas Wood and Area 3 – Tullamore Road and ICW. No significant effects predicted for construction traffic noise.
- Due to the close proximity of noise sensitive locations along Chapel Steet, the predicted noise levels from all activities at the Area 2 – Chapel Street works area predicted to be high in magnitude, with effects ranging from moderate to significant post-mitigation. Following implementation of construction noise mitigation efforts, some noise impacts will remain. Effect of enabling works at construction compound B (Area 2) is predicted to be moderate.
- Regarding predicted construction vibration impacts, **Chapter 14: Noise and Vibration** states that construction vibrations arise during piling, rock breaking and use of heavy construction equipment close to sensitive properties. It concludes that vibration associated with the Proposed Scheme and predicted effects are not significant.
- The residual effects due to noise and vibration from elements of the Proposed Scheme range from negligible to moderate depending on the specific location.

Accordingly, for population health, the magnitude of change due to the proposed construction work is **low**. In terms of population health, the *small* scale of change in noise levels is likely to predominantly relate to a *minor* change in quality of life for a *large minority* of the community, and a *very minor* change in cardiovascular and mental wellbeing morbidity for the *small minority* of the community closest to construction activities. The changes would be intermittent, which is considered to represent a series of *short-term* impacts during the construction period and relate to *frequent* construction related noise exposures. Prolonged periods of construction noise at night or daytime disruption of educational activities at schools are not expected.

Significance

Construction noise impacts of the Proposed Scheme are considered to result in a **minor adverse (not significant)** effect on population health. This assessment conclusion reflects that although the scientific literature indicates a *clear association* between elevated and sustained noise disturbance and reduce health outcome, the changes would result in *very limited* effect in the health baseline of the site-specific populations. The temporary and localised construction noise effects are not expected to affect health inequalities or the delivery of health-related policy.

8.4.3 Operational Phase

8.4.3.1 Housing

This section considers *housing* during the operation of the Proposed Scheme. The Proposed Scheme is anticipated to result in increased protection of residential areas from flood risk, affecting physical and mental health impacts of flooding, as well as reducing the incidence of secondary health effects such as poor housing quality and damp.

This section has been informed by **Chapter 7: Population**, which sets out relevant assessment findings and mitigation measures that have been taken into account.

Housing exerts one of the strongest directly measurable effects on physical and mental health (Ige et al., 2019). The influence of housing on population health, particularly mental health, is strongly linked to community and environmental factors. Flood relief exerts protection against the direct health effects associated with flood water (including skin and gut infections from exposure to contaminated flood water), as well as long-term mental health impacts as a consequence of flooding (including deteriorating mental health, stress and anxiety) (UK Health Security Agency, 2023).

A systematic review and meta-analysis of 15 studies in high-income countries found that microbial aerosol exposure (mould) in indoor air environments, including homes, was significantly associated with an increased risk of respiratory symptoms in children (Fakunle et al., 2021). Other systematic reviews suggest that floods are associated with the deterioration of mental health (Weilnhammer et al., 2021), including post-traumatic stress disorder and anxiety (Fernandez et al., 2015).

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is housing quantum, type, quality and conditions.
- The pathway is housing conditions affecting physical and mental health.
- Receptors are residents in the local communities, including new and existing residents.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme

The population groups relevant to this assessment are:

- The 'site-specific' population of Clonaslee ED;
- The 'local' population of Laois County; and
- The sub-population vulnerable due to:

– Young age vulnerability (including those residing in poor housing that can have lasting health effects across their life course);
– Disability and older age vulnerability (for whom flood relief would be protective to their health, wellbeing and independence);
– Low income vulnerability (specifically people with limited resources who are unable to improve their housing conditions);
– Poor health vulnerability (specifically conditions where flood relief would support better health and wellbeing); and
– Access and geographical vulnerability (specifically the population for whom close proximity to the proposed changes provides additional flood protection).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Clonaslee ED, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 8.2.7.2** of this report. The general population comprise those members of the community in good physical and mental health and with greater resources to access good housing and/or improve their housing conditions.

The sensitivity of the vulnerable group population is **high**. The sub-population includes a high representation of dependants, including children, elderly, and those receiving care due to poor health. The sub-population also includes those experiencing high levels of deprivation and low incomes. This sub-population may have fewer resources and less capacity to access good quality housing. This group is less able to prevent or respond to flooding events that affect their property, including appropriately avoiding post flooding risks, including linked to mould, infection and mental health. The group also includes those with high degrees of anxiety or concern about the risks of flooding whose concerns may be allayed by the Proposed Scheme.

Magnitude

As reported in **Chapter 7: Population**, Clonaslee will be less vulnerable to flooding during the operation phase of the Proposed Scheme. The Proposed Scheme will provide flood protection to 72 no. existing residential units. The Proposed Scheme will have a positive, moderate, and long term impact on residential amenities.

Accordingly, for population health, the magnitude of change due to the Proposed Scheme is **medium**. The flood protection provided to residential amenities will be long-lasting and will affect all residents in the area. The benefits will therefore represent a *medium* scale of change relating to a *moderate* change in physical

and mental health morbidity for a *small* minority of the local population. The changes will be *long-term* in duration and relate to *continuous* effects with regard to safeguarded or improved living standards. The Proposed Scheme will be particularly beneficial to the vulnerable population and those who are more disadvantaged socioeconomically. The area where the Proposed Scheme is located, including the 72 homes benefiting from the Scheme (Small Area ID 107028002), is classified as Marginally Below Average in terms of deprivation, indicating higher deprivation levels in the study area.

Significance

The significance of the population health effect for this determinant of health is **moderate beneficial** (significant). This score reflects that the literature establishes a *clear* relationship between living standards and health outcomes. The Proposed Scheme is expected to exert a *small* beneficial effect on the health baseline, as well as being *influential* in reducing health inequalities.

8.4.3.2 Open space, leisure and play

This section considers *open space, leisure and play* during the operation of the Proposed Scheme. Supporting people to be active is an important determinant of physical health. Time spent near green and blue space can also positively affect mental wellbeing.

The availability of a natural environment and attractive views of nature within an individual's living environment are important contributors to physical activity. Peoples' experiences in using the natural environment can enhance attitudes toward physical activity and perceived behavioural control via positive psychological states and stress-relieving effects, which lead to firmer intentions to engage in physical activity (Calogiuri & Chroni, 2014).

Improvements in health behaviour influence health outcomes like mortality, chronic diseases, mental and obesity disorders (Salgado et al., 2020). Physical activity can improve cognitive and mental health, particularly improvements in physical self-perceptions, which accompany enhanced self-esteem (Lubans et al., 2016). Physical can also improve mental health such as stress, anxiety or depression. Use of open spaces may be affected by not only physical barriers but also changes in the amenity or setting of the destination.

This section has been informed by **Chapter 5: Project Description** which sets out relevant assessment findings and mitigation measures which have been taken into account.

The potential effect is considered likely because there is a plausible source-pathway-receptor relationship:

- The source is the proposed flood relief infrastructure.
- The pathway is changes in access to the River Clodiagh, including safety (real and perceived) due to improved flood relief infrastructure; and
- The receptors are users of the River Clodiagh and local residents in Clonaslee.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The 'site-specific' population of Clonaslee ED.
- The 'local' population of Laois County; and
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people as potentially more vulnerable to safety hazards).
  - Old age vulnerability (older people as potentially more vulnerable to safety hazards);
  - Poor health vulnerability (people with existing poor physical and mental health);
  - Low income vulnerability (specifically people with limited access to alternative physical activity opportunities or means of transport); and
  - Access and geographical vulnerability (people who experience existing access barriers or who rely on the existing modes of access).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Clonaslee, and the vulnerable sub-population for this area. The latter is comprised

of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 considered and are listed in **Section 8.2.7.2** of this report. The general population comprise those members of the community in good physical and mental health who are more able to mitigate changes in access to open space and recreation opportunities.

The sensitivity of the vulnerable sub-population is **high**. This reflects that the sub-population includes a high representation of dependants including children, elderly and those receiving care due to poor health. This sub-population may have fewer resources and less capacity to adapt to changes. The population may therefore be more reliant on recreation within the affected area with greater likelihood that any enhancements and safer access could influence physical activity and recreational behaviours.

Magnitude

The Proposed Scheme will improve flood relief measures in Clonaslee making recreational use of the River Clodiagh including for angling and fishing, as well as recreational use of other public open spaces safer and more accessible. As reported in **Chapter 5: Project Description**, the Proposed Scheme will enhance pedestrian access and infrastructure with the modification of Chapel Street and addition of a pedestrian footpath on the eastern side of the road, by the wall alignment. The Scheme will also remove the potential of flood risk in Brittas Wood by the construction of the new embankment in Area 1 securing this amenity provision into the future.

Accordingly, for population health, the magnitude of change due to the Proposed Scheme is **low**. Improvements to safety associated with the Proposed Scheme will be long-lasting and will affect all residents of Clonaslee, including those participating in recreational activities as well as visitors. The Proposed Scheme also provides enhanced public amenity space and areas for active travel along the River Clodiagh. Improved flood relief infrastructure will also encourage the continuation and uptake recreational activities in the area, which will support good physical and mental health, as well as have the potential to support tourism and indirect economic benefits in the area (the latter is discussed further in **Section 8.4.3.4** below). The benefits will therefore represent a *small* scale of change relating to a *minor* change in morbidity for a *small* minority of the local population with regards to the uptake of recreational activities, and the *majority* of the population with regards to safe access to the River Clodiagh and Brittas Wood. The changes will be *long-term* in duration and relate to *frequent* effects with regard to improved opportunities for recreational users.

Significance

Overall, operational impacts on open space, leisure and play are considered to result in a **minor beneficial** (not significant) effect on population health. This assessment conclusion is supported by a strong evidence base in the scientific literature for a *causal* relationship between physical activity and good physical and mental health, and professional judgement on the effect of physical and perceived safety for the uptake of healthy behaviours.

8.4.3.3 Transport modes, access and connections

This section considers population health implications of changes in operational accesses within Clonaslee, affecting: active travel routes, commuting routes, emergency services, and access to health and education facilities. The Proposed Scheme when constructed will mitigate flood risk in Clonaslee Village. This flood risk affects the Chapel Street, the R422 regional road along with other roads in the area. There is also potential for active travel facilities upgrade along Chapel Street with the possibility to add a pedestrian footpath to the wall alignment.

This section has been informed by **Chapter 5: Project Description** and **Chapter 6: Traffic and Transport**, which sets out relevant assessment findings and mitigation measures that have been considered.

The scientific literature identifies the general points relevant to potential exposures and health outcomes. Walking and cycling for transportation (i.e. active transportation), provide substantial health benefits from increased physical activity. Health gains exceed detrimental effects of traffic incidents and air pollution exposure (Mueller et al., 2015).

Active transport to work or school is significantly associated with improved cardiovascular health and lower body weight (Xu et al., 2013). The provision of convenient, safe and connected walking and cycling infrastructure is at the core of promoting active travel (Winters et al., 2017). Physically active transport (i.e. walking or cycling) has been directly related to increased residential density, street connectivity, mixed land use and amenities within a walkable distance (Thomson et al., 2008).

Therefore, with regard to health-related travel times and accessibility, health effects may be associated with emergency response times or non-emergency treatment outcomes associated with delays or non-attendance; with regard to active and sustainable travel, health effects may be associated with reductions in levels of active travel such and walking and cycling, including physical health (e.g. cardiovascular health) and mental wellbeing (e.g. increased stress and anxiety); and with regard to road safety, health effects may be associated with the severity or frequency of road traffic incidents.

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is the proposed flood relief infrastructure;
- The pathway is changes to access within Clonaslee, including safety (real and perceived) due to improved flood relief infrastructure; and
- The receptors are residents and visitors in Clonaslee Village.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The ‘site-specific’ geographic population of Clonaslee ED.
- The ‘local’ population of Laois County.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people as potentially more vulnerable transport users);
  - Old age vulnerability (older people as potentially more vulnerable transport users);
  - Poor health vulnerability (poor people with existing poor physical and mental health in relation to health trip journey times);
  - Low-income vulnerability (people living in deprivation, including those on low incomes for who travel costs or alternatives may be limited); and
  - Access and geographical vulnerability (people who experience existing barriers or who rely on the affected routes, including healthcare and other amenities).

The scientific literature indicates that there is an association between the transport changes, road safety and accessibility. A study that examined the behavioural response of travellers to a range of policy incentives designed to encourage travellers to make greater use of sustainable travel modes showed increased rates of active travel including walking and cycling due to improved access and safety to active travel routes (Carroll et al., 2019). One recent review suggests there is a negative association between parental road safety perception and the likelihood of children’s active travel to school (Amiour et al., 2022). Improved road infrastructure, quality of route provision and accessibility was found to be associated with higher commute satisfaction (Chatterjee et al., 2020).

Sensitivity

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 8.2.7.2** of this report. 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.

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. It also relates to age i.e. 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. traveling to schools), and those in areas of greater deprivation. Deprived populations may already face more access barriers compared to 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 locations affected by flooding. People in poor or very poor health may be more frequent users of healthcare services and therefore may be more sensitive to access changes.

Magnitude

The magnitude of change due to the Proposed Scheme is **low.** The Proposed Scheme would improve safety in active travel routes, commuting routes, emergency services, and access to health and education facilities. The Proposed Scheme would also provide potential upgrades to active travel infrastructure along Chapel Street with the possibility to add a pedestrian footpath to the wall alignment. The benefits will therefore represent a *small* scale of change relating to a *minor* change in quality of life for the *large minority* of the population with regards to safe access to active travel routes, commuting routes, emergency services, and health and education facilities. The changes will be *long-term* in duration and relate to *continuous* effects with regard to improved opportunities for residents and visitors of Clonaslee.

Significance

Overall, operational impacts on transport modes, access and connections are considered to result in a **minor beneficial** (not significant) effect on population health. This assessment conclusion is supported by a strong evidence base in the scientific literature for a *causal* relationship between physical activity, and good physical and mental health, and professional judgement on the effect of physical and perceived safety for the uptake of healthy behaviours.

8.4.3.4 Employment and income

This section considers the effects on *employment and income* from the operation of the Proposed Scheme. In a small-town context, even minor changes to employment and income can be influential to population health.

This section has been informed by **Chapter 7: Population** which sets out relevant assessment findings and mitigation measures which have been taken into account.

The potential population health effect is considered plausible as there is a theoretical source-pathway-receptor linkage:

- The source is the proposed flood relief infrastructure.
- The pathway is changes in access within Clonaslee, including safety (real and perceived) due to improved flood relief infrastructure; and
- The receptors are local residents and visitors in Clonaslee.

Furthermore, the theoretical effect is considered applicable in the context of this Proposed Scheme:

The population groups relevant to this assessment are:

- The ‘site-specific’ geographic population of Clonaslee ED.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people who are dependants, as well as young adults early in their careers);
  - Old age vulnerability (older people who are dependants);
  - Poor health (people with existing poor physical and mental health, including for employment opportunities and as dependants);
  - Low income vulnerability (people on low income, who are economically inactive or unemployed/workless); and
  - Access and geographical factors (people experiencing barriers in access such as the ability to access employment and income outside the local area).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Clonaslee, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

Sensitivity

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 8.2.7.2** of this report. The general population comprise those members of the community in employment with good socio-economic status and low levels of deprivation.

The sensitivity of the vulnerable sub-population is **high**. As stated in **Chapter 7: Population**, unemployment in Clonaslee is similar to the national average. Vulnerability in this case relates to people and their dependants who are on low incomes, have poor job security, poor working conditions or who are unemployed. Future young or older people may also come to rely on those employed.

Magnitude

During operation, the Proposed Scheme will safeguard businesses from flooding thus mitigating against loss of income and employment as a result of flooding. As stated in **Chapter 7: Population**, the Proposed Scheme will provide flood protection to 2 no. commercial and business premises within Clonaslee and the surrounding area. This will safeguard their existing operations and facilitate the growth of existing businesses. The Proposed Scheme will also promote new businesses within Clonaslee, creating future employment and a positive impact on the local economy. Improved employment and income have positive effects associated with physical health (through e.g. improved health literacy) and mental wellbeing (through e.g. increased self-efficacy).

Accordingly, for population health, the magnitude of change due to the Proposed Scheme is **low.** Improvements to flood risk and safety associated with the Proposed Scheme will be long-lasting and will affect all residents of Clonaslee, including those participating in economic and revenue-generating activities. The benefits will therefore represent a *small* scale of change relating to a *minor* change in quality of life for the *large minority* of the local population with regards to the safeguarding of existing and future economic activities. The changes will be *long-term* in duration and relate to *frequent* effects with regard to improved opportunities for the uptake of revenue-generating activities.

Significance

Overall, operational impacts on employment and income are considered to result in a **minor beneficial** (not significant) effect on population health. This assessment conclusion is supported by a strong evidence base in the scientific literature for a *causal* relationship between good physical and mental health, and employment.

8.5 Mitigation Measures

8.5.1 Construction Phase

To reduce likelihood of health and safety risks to the public during the Construction Phase, fencing, signage, adherence to road safety guidelines, and other best practice measures, as detailed in the CEMP and CTMP (**Appendix 6-2**) will be adhered to. Communications will be maintained with local residents and businesses throughout the construction phase to notify them of any road closures, construction noise and other disruptions in advance. As detailed in Chapter 3: Consultation, 3 no. consultation days have been held to communicate details of the Proposed Scheme to locals and take note of their concerns. Additional details on construction phasing and progress will be available and regularly updated on the local authority website.

8.5.2 Operational Phase

No further mitigation is proposed in the health assessment for the operational phase.

8.6 Residual Impacts

The residual effects of the Proposed Scheme during construction and operation remain the same as those presented in section 8.4.

8.7 Monitoring

8.7.1 Construction Phase

Details of construction phase monitoring for the Proposed Scheme can be found in the CEMP and **Chapter 20: Schedule of Environmental Commitments**. No further monitoring is proposed for the human health assessment.

8.7.2 Operational Phase

Details of operational phase monitoring for the Proposed Scheme can be found in **Chapter 20: Schedule of Environmental Commitments**. No further monitoring is proposed for the human health assessment.

8.8 Interactions and Cumulative Effects

8.8.1 Interactions

Inter-relationships are the impacts and associated effects of different aspects of the Proposed Scheme on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Proposed Scheme (construction, and operations and maintenance), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases.
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on human health, such as changes in access, changes in community identity, changes in employment may interact to produce a different, or greater effect on a given population than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

The population health effects identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between effects for a given geographic population are presented in Table 8-7. Vulnerable group effects are expected across all geographic populations, so are not listed separately.

Table 8-7 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, and operational and maintenance of the Proposed Scheme, and also receptor-led inter-related effects that are predicted to arise for human health receptors.

Table 8-7: Interaction between health determinants by geographic populations

	Site Specific	Local	Regional	National
	Site Specific Study Area	Laois County	Leinster Province	Republic of Ireland
Open space, leisure and play	✓	✓		
Transport modes, access and connections	✓			
Employment and income	✓			
Noise and Vibration	✓			
Housing	✓			

Key:	Positive (green)	Positive as a component within wider area assessment (light green)	Negative (blue)	Positive and negative (orange)

8.8.2 Cumulative Effects

The potential for cumulative effects has been considered for the construction and operation of the Proposed Scheme cumulatively with other projects. Table 8-8 provides a list of projects that have been considered for human health.

If the construction periods of the Proposed Scheme and planned developments within the Human Health Study Area are to overlap, there is potential for cumulative impacts on population health through disruptions to recreational activities, access to services and amenities, and increased construction noise. However, these effects are likely to be mitigated through appropriate construction management plans and would be temporary in duration.

Operation of the Proposed Scheme will result in positive impacts to populations in Clonaslee due to improved access, flood safety, recreational opportunities, and business and employment opportunities for cumulative developments identified below.

Table 8-8: Potential Cumulative Impacts and Likely Significance

Project Code	Potential Cumulative Impact	Effect Without Mitigation	Mitigation	Residual Effect
23284	**Construction:** Noise and Vibration	Minor	No further mitigation	No change
22361	**Construction:** Noise and Vibration	Minor	No further mitigation	No change
19193	**Construction:** Noise and Vibration	Minor	No further mitigation	No change
19583	**Construction:** Noise and Vibration	Minor	No further mitigation	No change
20593	**Construction:** Noise and Vibration	Minor	No further mitigation	No change

8.9 Conclusion

Table 8-9 collates all the mitigation and monitoring commitments recommended in this chapter.

Table 8-9: Summary of Likely Significant Effects and Environmental Commitments

Description of Impact	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Controls and Mitigation Measures	Residual Effect
Noise and vibration	Low	**General population**: Low **Vulnerable population**: High	**Construction**: Minor adverse (not significant)	None proposed.	No change
Open space, leisure and play	Low	**General population**: Low **Vulnerable population**: High	**Construction**: Minor adverse (not significant) **Operation:** Minor beneficial (not significant)	None proposed.	No change

Transport modes, access and connections	Low	**General population**: Low **Vulnerable population**: High	**Construction**: Minor adverse (not significant) **Operation:** Minor beneficial (not significant)	None proposed.	No change
Employment and Income	Low	**General population**: Low **Vulnerable population**: High	**Construction**: Minor beneficial (not significant) **Operation:** Minor beneficial (not significant)	None proposed.	No change
Housing	Medium	**General population**: Low **Vulnerable population**: High	**Operation:** Moderate beneficial (significant)	None proposed.	No change

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