

8 POPULATION AND HUMAN HEALTH

8.1 Introduction

This chapter applies a broad socio-economic model of health that encompasses conventional health impacts such as disease, accidents, and risk, along with wider socio-economic health determinants vital to achieving good health and wellbeing. As such, the chapter combines a public health assessment (which focuses on environmental determinants of health), and a socio-economic assessment; providing additional commentary on how changes to some socio-economic factors the potential have to influence health and wellbeing.

This chapter draws from and builds upon detailed project information and the wider technical disciplines within the EIAR (most notably, Chapter 13: Air Quality and Climate; Chapter 10: Water Quality; and Chapter 17: Waste) to communicate the potential influence upon Population and Human Health. For the sake of brevity, this chapter does not seek to repeat text or replicate data from the wider EIAR chapters.

8.2 Assessment Methodology

8.2.1 Study Area

Environmental health determinants (such as changes to air quality and waste emissions) are likely to have a local impact where potential change in hazard exposure is limited by physical dispersion characteristics. As a result, and where available, the study area for health-specific baseline statistics relating to Population and Human Health effects focus on the electoral divisions (EDs) immediately adjacent to the Proposed Scheme, i.e., Birdstown ED and Fahan ED, using Ireland averages as comparators. Where data for EDs are not available, statistics relating to Donegal or the Borders Region are collected using the Ireland average as a comparator.

Socio-economic health determinants (such as employment and related income generation) have a wider geographic scope of influence than environmental health determinants. The willingness to commute significant distances to work indicates that the study area for socio-economic baseline statistics relating to Population and Human Health effects should have a wider focus (i.e., Donegal or the Borders Region), using the Ireland average as a comparator.

8.2.2 Baseline

The overarching approach has been to draw from and build upon the wider technical outputs of the EIAR to facilitate more health-conscious planning, and test the final application for its potential impact (both adverse and beneficial) on Population and Human Health.

8.2.2.1 Scoping Exercise

Scoping is the process by which the focus of the assessment is set, defining the health determinants to be assessed (i.e., aspects with the potential to influence health, both adversely and beneficially); and just as importantly, identifying aspects that are considered to be outside of the scope. This is necessary to ensure the assessment is fit for purpose, meets stakeholder expectations, and identifies potential opportunities to support local and strategic health objectives but does not cover matters that it cannot influence or does not affect.

In this instance, scoping relating to the Population and Human Health chapter has been undertaken iteratively and as part of the wider scoping of the project as detailed in Chapter 3 of the EIA. This included review of the project description and relevant technical chapters of the EIA. This approach ensures that relevant health determinants to be taken forward for assessment, and addressed any stakeholder expectations. The results of the scoping exercise are provided in Table 8.1 and present the relevant health determinants that have been assessed within this chapter.

Table 8.1: Scoping Exercise Results

Phase	Population and Human Health Determinant	Potential Impact	Distribution	Duration
Construction	Air Quality Changes to air quality (PM ₁₀ , NO ₂ , nuisance dust and nuisance odour) Scoped in for assessment	Adverse	Local	Temporary
	Noise Changes in noise exposure (including annoyance). Construction will occur within the existing site and for the most part will take place within the several locations in Burnfoot, including residential areas. Scoped in for assessment	Adverse	Local	Temporary
	Risk of Major Accidents and Disasters On the basis of the information set out in chapter 18, it is concluded that there is potential direct and indirect major accident and disaster risks arising from the Proposed Scheme. Scoped in for assessment	Adverse	Local	Temporary
	Water Quality and Flood Risk The construction will have the potential to impact on water quality in a way that would be detrimental to human health and the surrounding water environment. The Proposed Scheme area has the potential to be impacted by flooding. Scoped in for assessment	Adverse	Local	Temporary
	Traffic and Transportation The construction phase will involve temporary bridge works on the R238 regional road and will involve the use of machinery throughout therefore there is potential to cause traffic disruptions. Scoped in for Assessment	Adverse	Local	Temporary
	Employment Changes in direct, indirect, and induced employment opportunities and associated income generation during the construction phase. The construction will require the use of local materials and labour. Scoped in to Assessment	Beneficial	Local/Regional	Temporary
Operation	Air Quality Changes to air quality (PM ₁₀ and NO ₂). During the operational phase there will be minimal need for maintenance. Scoped out of assessment	Not Significant	n/a	n/a
	Noise Changes in noise exposure (including annoyance). During the operational phase, the only noise may be during maintenance of which there will be little requirement for. Scoped out of assessment	Not Significant	n/a	n/a
	Risk of Major Accidents and Disasters On the basis of the information set out in chapter 18, it is concluded that the potential direct and indirect major accident and disaster	Beneficial	Local, regional	Permanent

Phase	Population and Human Health Determinant	Potential Impact	Distribution	Duration
	risks arising from the Proposed Scheme is unlikely if anything the Proposed Scheme will positively impact by greatly reducing the risk of major accidents and disasters as a result of flooding. Scoped in for Assessment			
	Water Quality and Flood Risk The operational phase of the Proposed Scheme will not negatively impact upon water quality. If anything, the Proposed Scheme will alleviate some existing pressures by affording the WWTPs protection from flood events. Furthermore, the aim of the Proposed Scheme is to alleviate flood risk and therefore the operational phase will be beneficial in this regard. Scoped in for Assessment	Beneficial	Local, regional	Permanent
	Waste The operational phase of the development will not generate waste which could interact with the Population and Human Health. Scoped Out of Assessment	Not significant	n/a	n/a
	Traffic and Transportation The operational phase will not have an impact on traffic volumes or disruption but the Proposed Scheme will potentially improve pedestrian access and movement through Burnfoot with the inclusion of footpaths in the vicinity of the proposed bridge and potential linkages with the proposed Northwest Greenway. Scoped in for Assessment	Beneficial	Local, regional	Permanent
	Employment Changes in direct, indirect, and induced employment opportunities and associated income generation. The Proposed Scheme may improve employment opportunities within the area as a result of flood alleviation. Scoped in for Assessment	Beneficial	Local	Permanent

Definitions

Local – ED’s surrounding the Proposed Scheme

Regional – Donegal Border Region

Temporary – inconsistent activity lasting only a limited period of time

Permanent – consistent activity which goes on for a long-term period

8.2.3 Legislation and Guidance

The Environmental Protection Agency’s Guidelines on the Information to be contained in EIAR (EPA, 2022), highlights the amendments to Article 3(1) of amended European Union (EU) Environmental Impact Assessment (EIA) Directive which states that:

“The environmental impact assessment shall identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of a project on the following factors: a) population and human health; [...]”

Moreover, Annex IV, paragraph 5(d) requires an EIAR to contain:

“A description of the likely significant effects of the project on the environment resulting from, inter alia, ‘the risks to human health’”.

When outlining the scope of environmental factors covered by the EIA Directive within the European Commission's guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017), "population and human health" is defined as follows:

"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population."

Additionally, when describing the likely significant effects of a project, the European Commission's guidance poses the following questions to consider:

"Have the primary and secondary effects on human health and welfare described and, where appropriate, been quantified? (e.g., health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups)."

It is important to ensure that methods employed in a particular Population and Human Health assessment are proportionate and tailored to meet the assessment requirements of the project in question, which can differ considerably depending on the scale and nature of a proposal and are further influenced by local context and varying community circumstance and sensitivity.

There is a large body of guidance on Health Impact Assessment (HIA) generally and in the context of development planning (WMPHO, 2007; Chadderton, et al., 2012; The NHS Centre for Equality and Human Rights, n.d.; Ross & Chang, 2012), drawing from expert evidence and government policy regarding the importance of integrating public health into the planning system (Marmot, et al., 2010; Department of Health, 2010; DHLGH, 2018).

The assessment methodology follows a source-pathway-receptor model to identify and assess Population and Human Health effects that are plausible and directly attributable to the Proposed Scheme. As shown in Table 8.2, a hazard source itself does not constitute a health risk. It is only when there is a hazard source, a receptor, and a pathway of exposure that there is any potential risk to human health. The same is true for potential health benefits where a positive influence must be present alongside a pathway of exposure and a receptor for there to be a potential health improvement.

Where a source-pathway-receptor linkage exists, it is then the nature of the specific hazard source or positive influence; the magnitude of impact via the pathway of exposure; and the sensitivity of the receptor that will determine what level of health risk or benefit is predicted, if any.

When defining potential Population and Human Health determinants associated with a Proposed Scheme, it is also useful to consider three broad domains of public health practice: health protection (i.e., environmental

objective thresholds set to be protective of health); health promotion (i.e., ways in which to support healthy lifestyles, improve socio-economic status and address inequality); and health care (i.e., provision, effectiveness, and equity of access to healthcare services).

In this instance, the assessment provides qualitative and quantitative analysis of potential Population and Human Health effects, and has been prepared using the specialist assessment undertaken in other chapters of the EIAR.

Table 8.2: Example of Source-Pathway-Receptor Model for Population and Human Health Effects

Source	Pathway	Receptor	Plausible Health Impact	Explanation
X	✓	✓	No	There is not a clear source from where a potential health impact could originate.
✓	X	✓	No	The source of a potential health impact lacks a means of transmission to a population.
✓	✓	X	No	Receptors that would be sensitive or vulnerable to the health outcome are not present.
✓	✓	✓	Yes	Identifying a source, pathway and receptor does not mean a health outcome is a likely significant effect; health impacts should be assessed (describing what effect will occur and its likelihood) and likely health effects are then evaluated for significance.

8.2.4 Consultation

As detailed in Chapter 3 Scoping and Consultations, the Proposed Scheme has consulted with the public and prescribed bodies in order to accumulate responses which may impact all receptors. Consultation with the public through the Opening Public Consultation and Public Information Day in particular guided the Proposed Scheme in terms of gathering local knowledge to inform the Proposed Scheme and to ensure public needs are met.

8.2.5 Assessment Criteria & Assignment of Significance

The assessment of significance of effect is based on the sensitivity of the receptor (Section 8.2.5.1) and the magnitude of any change (Table 8.3).

8.2.5.1 Receptor Sensitivity

Within a defined population, individuals will range in level of sensitivity; as such, it is not possible to allocate a fair or accurate sensitivity classification to a population. On this basis, a precautionary approach has been applied by assuming that the population within the study area are of uniformly high sensitivity.

8.2.5.2 Magnitude of Impact

The terms in Table 8.3 have been used to describe the magnitude of predicted impacts.

Table 8.3: Definitions of Magnitude

Magnitude	Typical Descriptors
High	Change in environmental or socio-economic factor sufficient to result in a major change in baseline population health or socio-economic circumstance (adverse or beneficial)
Medium	Change in environmental and socio-economic factor sufficient to result in a moderate change in baseline population health or socio-economic circumstance (adverse or beneficial)
Low	Change in environmental and socio-economic factor sufficient to result in a minor change in baseline population health or socio-economic circumstance (adverse or beneficial)
Negligible	Change in environmental and socio-economic factor below that for which it is possible to result in any manifest health outcome at a population level but may impact at an individual level (adverse or beneficial)
No Change	No opportunity for change in health outcome or socio-economic circumstance (adverse or beneficial)

8.2.6 Significant Effects

8.2.6.1 Significance of Effects

A combination of receptor sensitivity and the magnitude of impact (as defined in the assessment) have been applied to form an assessment as to the significance of effect, using the matrix shown in Table 8.4.

Table 8.4: Significance of Effects

Receptor Sensitivity	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible	Negligible or minor	Minor	Minor or moderate
Medium	Negligible	Minor	Moderate	Moderate or major
High	Negligible	Minor or moderate	Moderate or major	Major

8.3 Baseline Environment

Different communities have varying susceptibility to Population and Human Health effects (both adverse and beneficial) as a result of social and demographic structure, behaviour, and relative economic circumstance. The approach to defining the baseline involves the collation and interpretation of published demographic, socio-economic and existing health, and health care data. From this, the Proposed Scheme can be investigated and the significance of effect assessed. Understanding the existing baseline socio-economic and health status within the study area also supports bespoke mitigation and community support initiatives tailored to local circumstance and need, where appropriate.

8.3.1 Existing Baseline Conditions

The following open-source websites and datasets have been used in order to develop the Population and Human Health baseline: SAPMAP (CSO, 2011; CSO, 2016); Eurostat (European Commission, n.d.); Institute of Public Health (IPH, n.d.); and Pobal (Pobal, 2016).

The remainder of this section summarises the findings of the full Population and Human Health baseline data collection and analysis.

8.3.1.1 Demographic and Socio-economic

The settlement of Burnfoot had a recorded population of 450 in the 2016 census a slight decrease (3%) from the population recorded in 2011 which was 466. A similar trend was noted in the electoral division of Birdstown which had a population of 1,312 in the 2016 census a small decrease from the 1,324 recorded in the 2011 census. The Fahan electoral division showed a different trend than that of Birdstown, with a population of 1,697 in the 2016 census an increase from the 1,670 recorded in the 2011 census. The small decrease in population in Burnfoot and Birdstown Electoral division between the years of 2011 and 2016 is in contrast to the national population growth experienced over the same period, i.e., 3.8 %. The settlement figures differ from those of the electoral division as the settlement boundary is only partially located within the boundary of the electoral division.

The levels of unemployment in Burnfoot (9.3%) during the 2016 census is lower when compared to the national average (12.9%). The electoral divisions of Birdstown and Fahan have a similar or higher unemployment rate than the national average, of 12.6% and 16% respectively based on the 2016 census.

Deprivation statistics are derived for Birdstown EDs using the Pobal All-Island HP Deprivation Index (2016). The most recent statistics show that the population living within the “small area” the Flood Relief Scheme is located within the Birdstown ED (ID 057015001) are categorised as “marginally below average”, with a relative deprivation index score of -3.32. While the “small area” located within the Fahan ED (ID 057063007) are categorised as “disadvantaged”, with a relative deprivation index score of -12.3.

8.3.1.2 Physical Health

Both male and female life expectancy nationally is increasing with male life expectancy consistently lower than female life expectancy. Healthy life expectancy (i.e., the number of years a person is in good health), is also generally increasing for both males and females, with male healthy life expectancy again consistently lower than female healthy life expectancy.

The hospital admission rate for diseases of the circulatory system (Figure 8.1) are generally lower in Donegal compared to the national average and has remained relatively static over the years. Hospital admissions for diseases of the respiratory system (Figure 8.2) in Donegal are higher than the national average and have seen increase numbers in the recent past with a slight decrease in 2015.

The proportion of the population within the study area, settlement of Burnfoot (11.5%) and Birdstown ED (10.2%) with a disability is lower than the national average (13.5%) based on 2016 census information, while the Fahan ED (14.7%) is higher than the national average.

The cancer mortality rate within Donegal fluctuates year-on-year but has generally remained above the national average (Figure 8.3). The respiratory disease mortality rate within Donegal has fluctuated between 80 -100

deaths per 100,000 population over the years and was generally higher than the national average, however the most recent rates are very similar (Figure 8.4). The circulatory disease mortality rate within Donegal has remained relatively static over the years but remains consistently higher than the national average (Figure 8.5).

Suicide rate within Donegal shows a generally consistent trend but remains consistently below the national average year-on-year, with the exception of 2015 (Figure 8.6).

Circulatory Disease Admissions

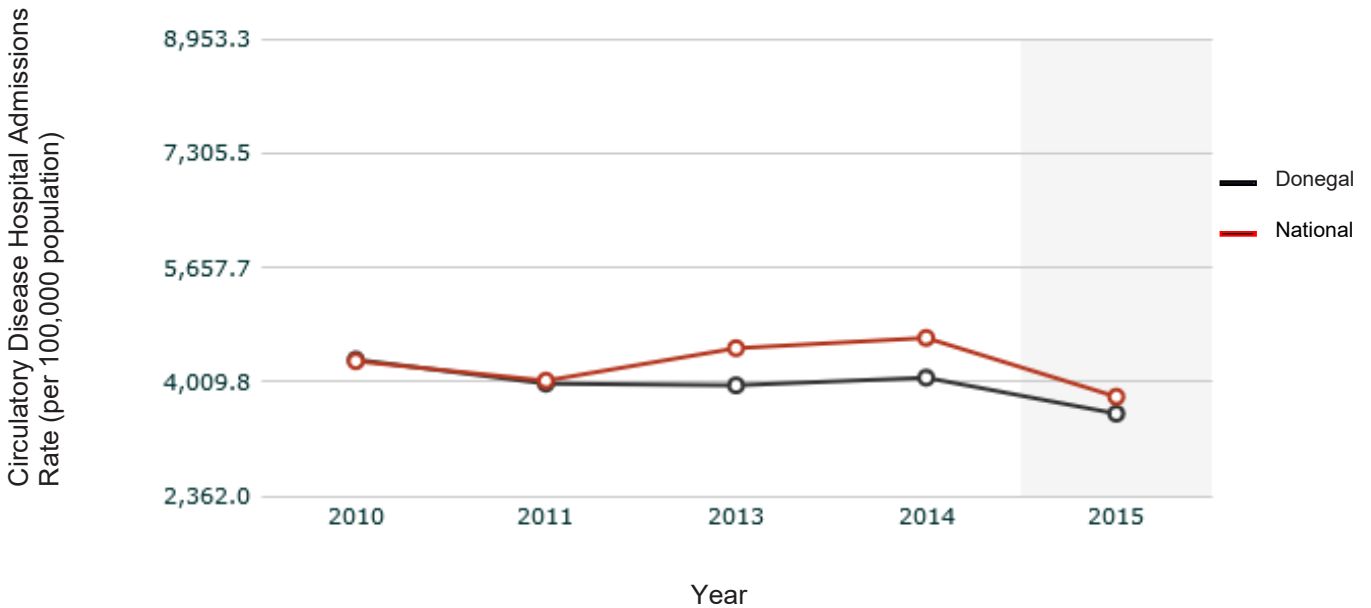


Figure 8.1: Circulatory Disease Admissions (Source Public Health Well Community Profiles)

Respiratory Disease Admissions

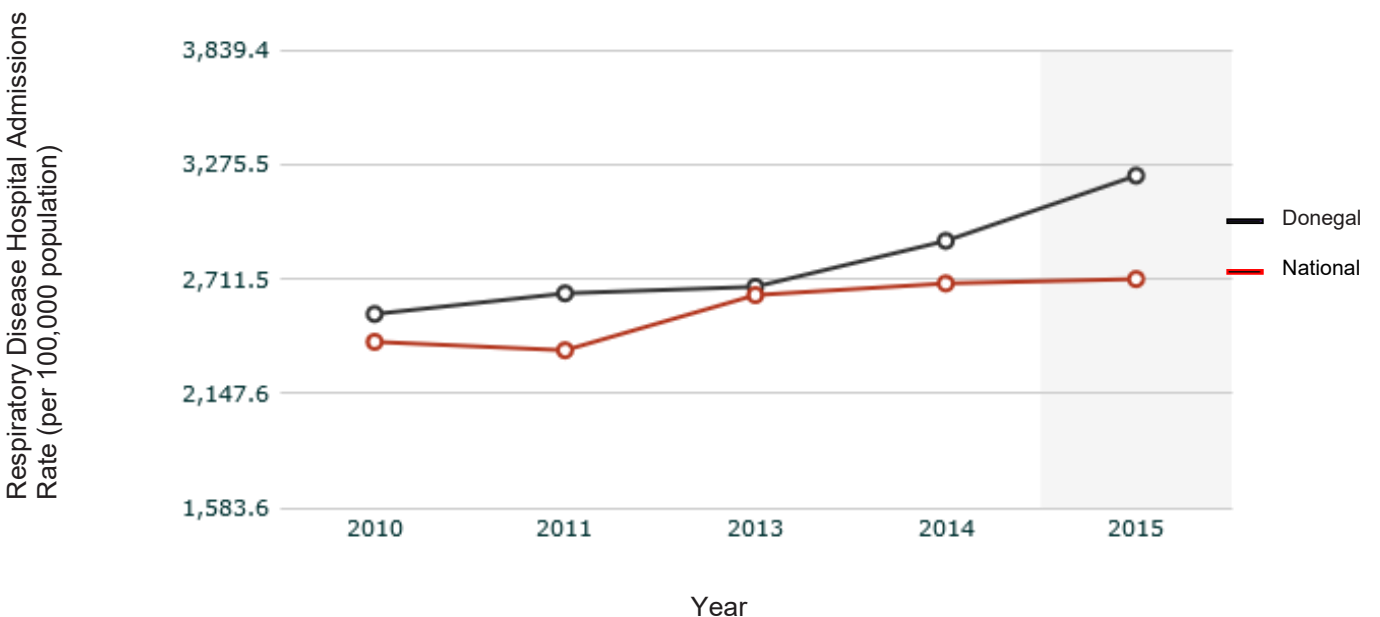


Figure 8.2: Respiratory Disease Admissions (Source Public Health Well Community Profiles)

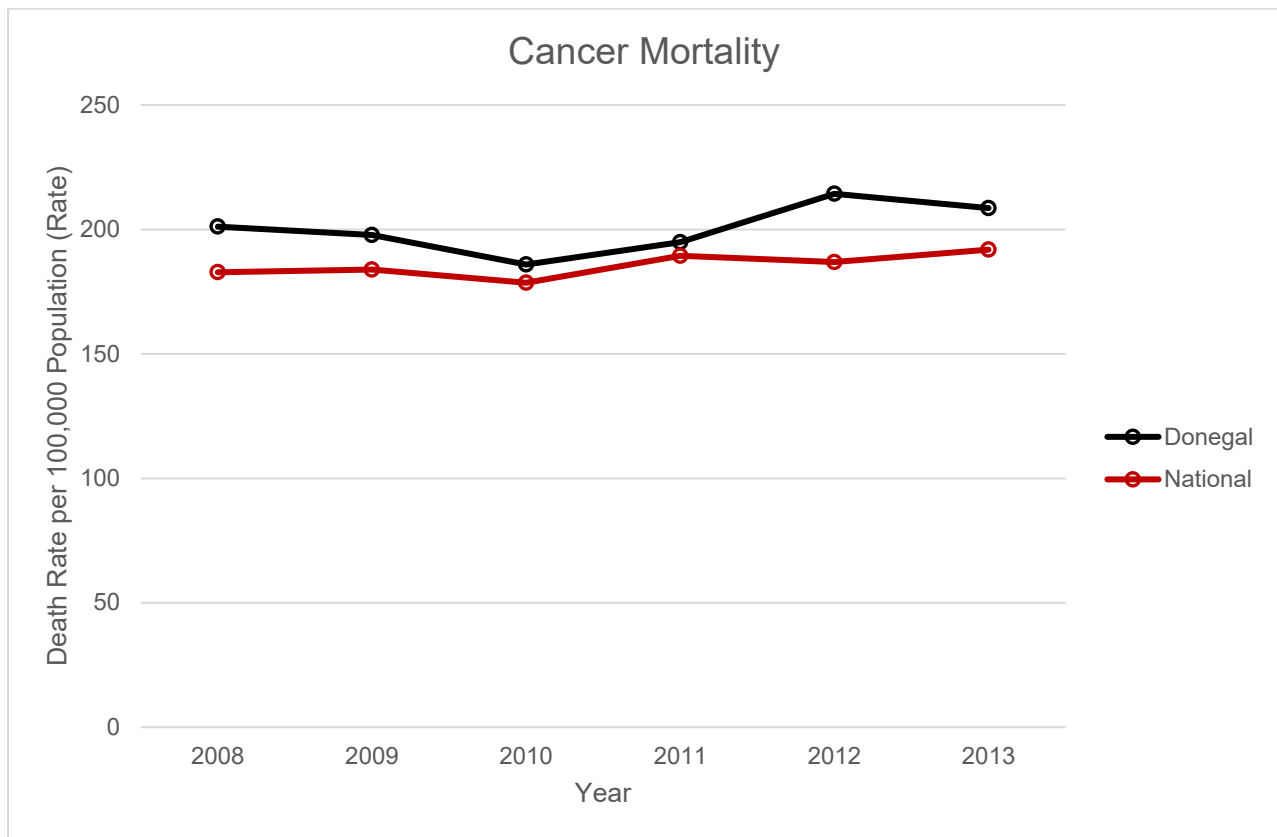


Figure 8.3: Cancer Mortality Rates (Source Statbank (DHA12))

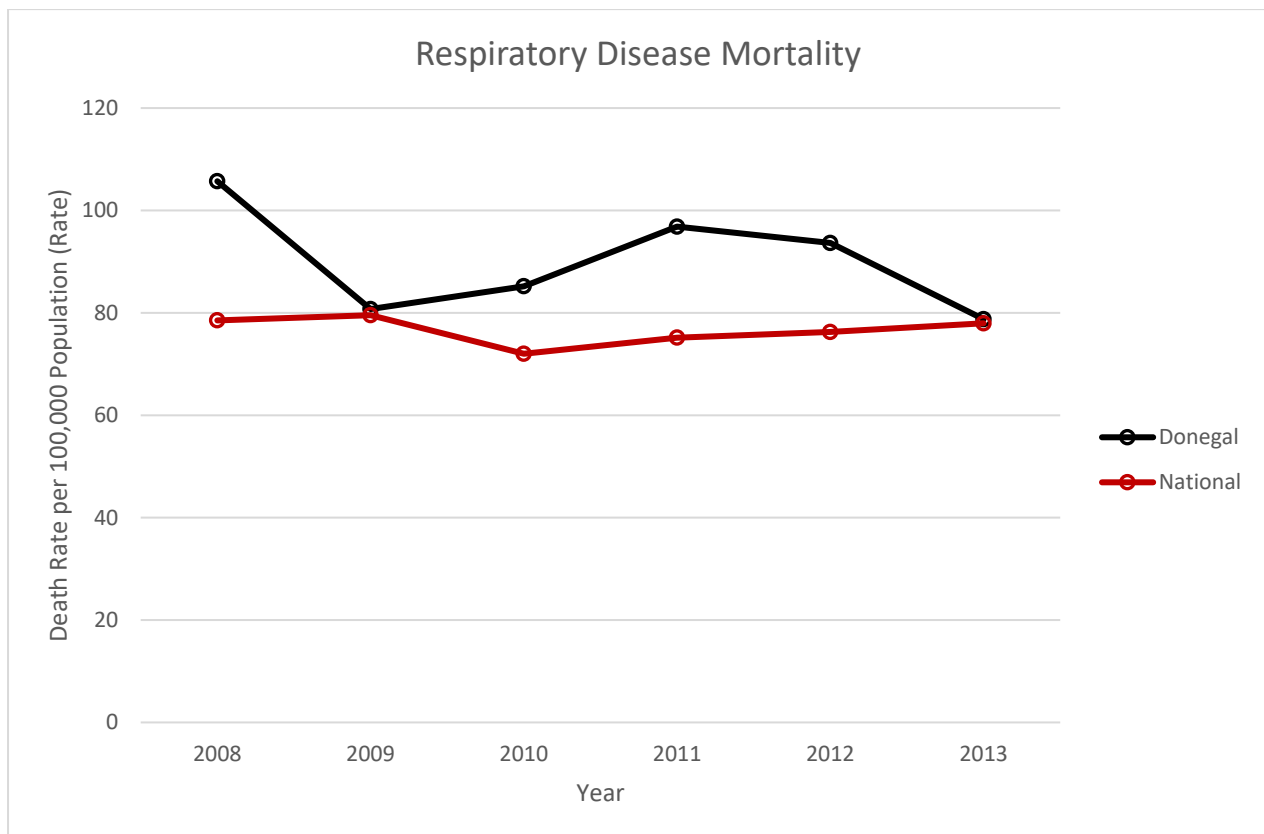


Figure 8.4: Respiratory Disease Mortality (Source Statbank (DHA12))

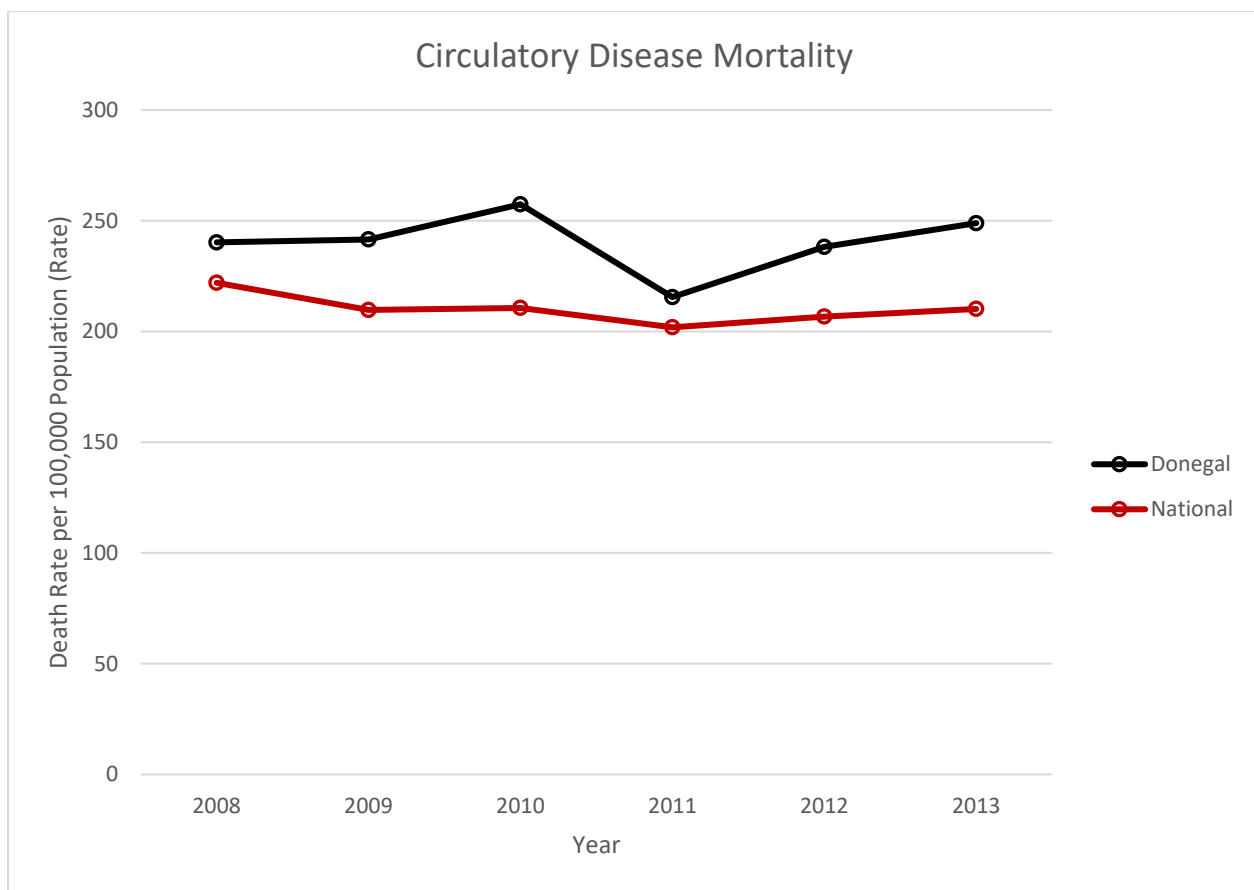


Figure 8.5: Circulatory Disease Mortality Rates (Source Statbank (DHA12))

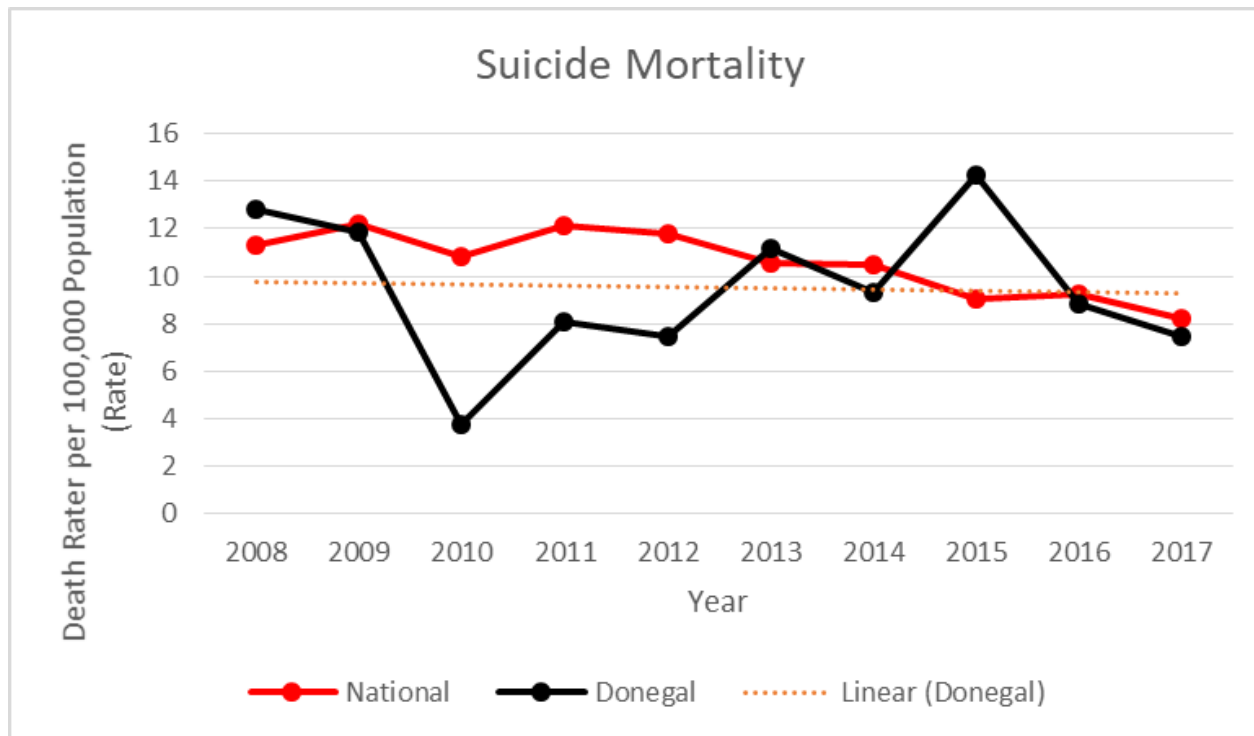


Figure 8.6: Suicide Mortality (Source Statbank (DHA12))

8.3.1.3 Lifestyle

Obesity in Donegal has seen an increase in levels and based on the most recent figures is now higher than the national average and is increasing, following the national trend (Figure 8.7). In addition, there is a higher proportion of the population in Donegal who are physically inactive compared to the national average.



Figure 8.7: Obesity Levels (Source Public Health Well Community Profiles)

The rate of hospital admissions for alcohol related conditions within Donegal are similar to the national average and is increasing following the national trend (Figure 8.8). The rate of hospital admissions for drug related conditions within Donegal is lower than the national average and has remained relatively static over the years (Figure 8.9). Smoking prevalence within Donegal increased between 2002 and 2007, following the national trend. Smoking prevalence in Donegal is lower than the national average (Figure 8.10).



Figure 8.8: Alcohol Related conditions (Source Public Health Well Community Profiles)

Drug related conditions

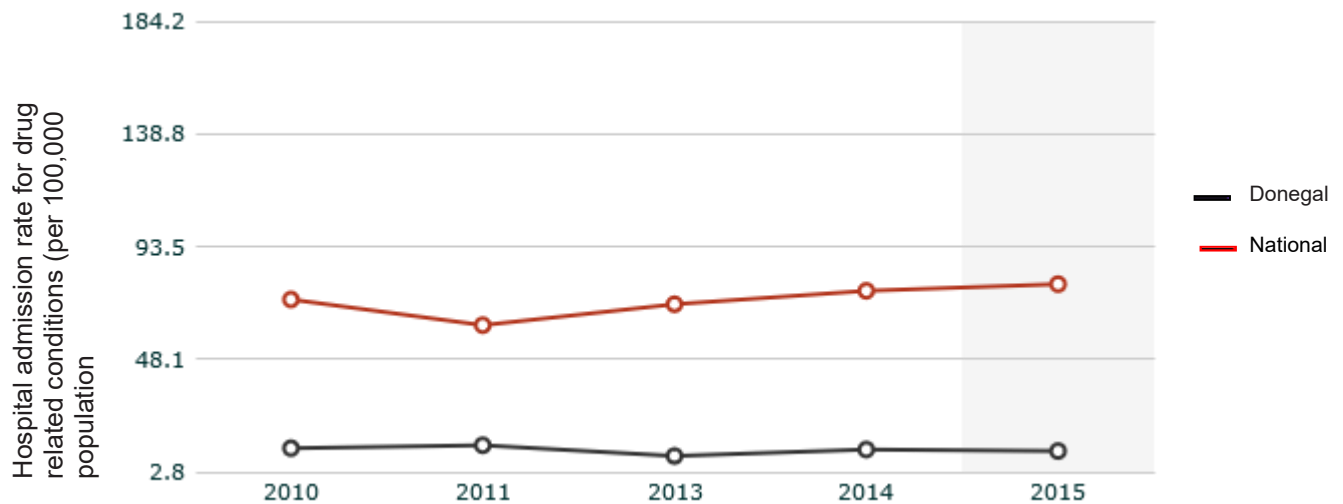


Figure 8.9: Drug related conditions (Source Public Health Well Community Profiles)

Smoking related conditions

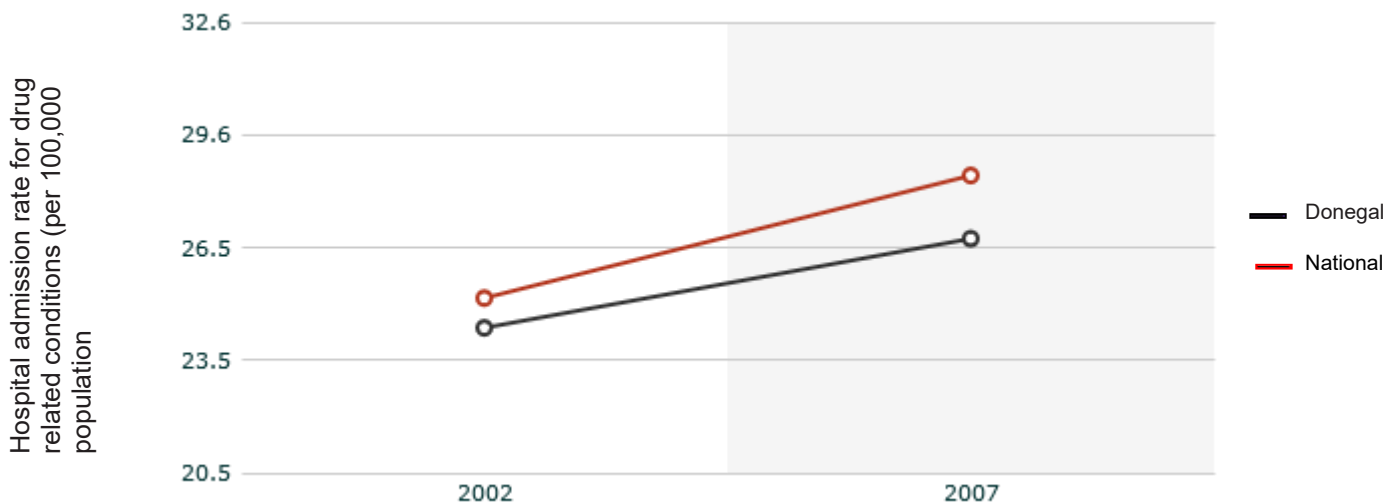


Figure 8.10: Smoking Prevalence (Source Public Health Well Community Profiles)

8.3.1.4 Tourism

Tourism is one of Ireland’s most important economic sectors, contributing 5.6 billion (excluding receipts paid to Irish carriers by foreign visitors) in 2019 alone (Fáilte Ireland, 2021). Furthermore, it increases the necessity for employment in the Irish hospitality sector.

Ireland is split into 8 different regions in respect to tourism, with Donegal located in the Border region. In 2019, the Border region accounted for 19.5% of the total number of tourists to the country and 9% of the overall total tourism expenditure.

Fáilte Ireland estimated that in 2019, tourists to Ireland primarily engaged in hiking/cross-country walking, cycling, golf, equestrian and angling. All of these activities are widely accessible throughout Donegal and the Border tourism region. However, none of the most popular free or paid sites are located within Donegal currently. Donegal has huge potential in terms of tourism in these outdoor recreational activities and this is acknowledged in the current Donegal County Development Plan (2024-2030).

Tourists to Burnfoot can visit nearby Inch Wildfowl Reserve, The Stone Fort of Grianán of Aileach, Wild Ireland, City of Derry/Londonderry and enjoy hiking and golfing activities throughout Inishowen. Inch Levels is one of eight pilot trial sites being enhanced as a walking and recreational area as part of the Atlantic Area Trail Gazers Project. The impact of flooding particularly the flooding of the main access to these facilities, the R238, can have a significant impact on tourism and subsequently impact local and regional economy.

8.3.1.5 Conclusion

Demographic and housing stock statistics show that there is limited population growth in Burnfoot, the Birdstown ED and Fahan ED. Generally, employment, and income levels are all below the national averages and Burnfoot is classified as marginally below average in terms of the deprivation index. Currently in Burnfoot, there are 41 residential properties at risk of flooding.

The Proposed Scheme must be cognisant of the tourism role of the Burnfoot River and downstream amenities connected to the river, including the Inch Wildlife Reserve and walkway, which are key for angling and tourism in the area. Therefore, connectivity and protection of the river for recreational needs is vital.

Overall, the local community surrounding the Proposed Scheme are not considered particularly sensitive to Population and Human Health effects resulting from changes to environmental or socio-economic health determinants. However, the impact of flooding on the homes and businesses affected can have a significant impact on the wellbeing of those affected. In particular, there is potential for human health to be impacted through the flooding of waste water infrastructure within the floodplain.

8.4 Description of Likely Significant Effects

8.4.1 Construction Phase

The following appraisal considers each of the previously identified potential Population and Human Health impacts in Table 8.1 associated with the construction of the Proposed Scheme including:

- the influence on Population and Human Health from changes in emissions to air;
- the influence on Population and Human Health from socio-economic impacts;
- the influence on Population and Human Health from changes to water environment; and
- the influence on Population and Human Health from changes to noise levels;
- the influence on Population and Human Health from changes to traffic and transportation;
- the influence on Population and Human Health in terms of risk of accidents and disasters.

8.4.1.1 Air Quality

On-site construction activities and associated transport movements have the potential to influence Population and Human Health by contributing to nuisance dust, odour emissions and PM10 and NO2 levels (associated with construction traffic).

Sources of nuisance dust include general on-site construction activities,

As stated in Chapter 13: Air Quality and Climate, the construction traffic is deemed to be minimal and does not meet the criteria when screened against the TII Guidance. In this regard, employing the TII criteria the construction traffic volumes will not be significant and the resultant air quality impact from construction traffic is negligible. Similarly, Chapter 13 discusses the impact associated with greenhouse gas emissions during the construction phase and climate change resilience. Both categories were considered to be negligible and not significant.

8.4.1.2 Socio-Economic

Socio-economic factors make up a collection of wider determinants of health which refer to the social, cultural, political, economic, and commercial factors, in addition to environmental factors, which shape the conditions in which people are born, grow, live, work and age – ultimately affecting health and wellbeing (Health Foundation, 2018).

The construction activities associated with the Proposed Scheme are anticipated to span over 2 years. The construction of the Proposed Scheme requires the use of the plant machinery and associated workforce. It will generate direct local construction employment through the construction works.

From the 2016 census data for the Birdstown ED there is a total of 228 residents who class themselves as “skilled manual workers” (which includes construction workers) living within the district. Within Donegal, there is a total of 25,722 residents who class themselves as “skilled manual workers”. As such, it can be concluded that there is a sufficient pool of local labour to meet the construction demands of the Proposed Scheme. However, the uptake of employment locally would depend on the specific procurement strategy.

In addition, expenditure by the Proposed Scheme and associated suppliers for the construction works would result in increased employment in the wider supply chain, this is classified as indirect employment effects. The additional construction employees would be expected to spend some of their increased income, and thereby increase employment in local shops and services, this is classified as induced employment effects.

As a result, and on the basis that construction employment is only likely to provide benefits at an individual level but that there will be indirect and induced employment effects, the magnitude of impact on Population and Human Health from construction-related employment would be medium, where in an area of high sensitivity, would result in a moderate beneficial significance of effect, which is considered significant in EIA terms.

8.4.1.3 Water Quality & Flood Risk

Construction activities have the potential to impact on human health through potential spills of fuels or chemicals to waterbodies, particularly during flood events when the wastewater infrastructure may also be impacted.

Chapter 10 Water Quality takes into consideration the impacts the Proposed Scheme may have on the water environment and additionally details the mitigation measures which must be adhered to prevent impact. With the mitigation measures in place, the magnitude of impact on population would be negligible, where in an area of high sensitivity, would result in a negligible significance of effect, which is not significant in EIA terms.

8.4.1.4 Noise

Impacts from noise is detailed in Chapter 12 Noise and Vibration for the construction phase.

Overall, it is concluded that there is the potential for moderate to major significant impacts arising from the Proposed Scheme during the construction phase without mitigation, however these effects will be temporary in nature.

Residents will be informed of the timing and duration of activities that may produce high noise. Elevated levels can be tolerated if prior notification and explanation is given. Temporary slight adverse impacts due to construction noise have been identified at the closest receptors to proposed construction works. No permanent residual noise and vibration impacts are predicted during construction of the Proposed Scheme. With construction mitigation measures in place as proposed through the Construction Environmental Management Plan (CEMP) and associated appendices, construction noise monitoring, and temporary construction noise barriers, the noise impacts of construction activities is predicted to be reduced to temporary minor which is not significant in EIA terms.

8.4.1.5 Traffic and Transportation

During the construction phase of the Proposed Scheme, there is potential for traffic congestion in the vicinity of the works areas, particularly in the temporary bridge location where restricted speed limits may be necessary if visibility is reduced.

However, the installation of the temporary bridge and maintaining two lane traffic will help manage traffic flows throughout the construction phase. If restricted speed limits or temporary measures are required, these will be short term and the impact on population and human health would be low, where in an area of high sensitivity, would result in minor adverse significance of effect.

8.4.1.6 Risk of Major Accidents & Disasters

During the construction phase, there is potential for risk of major accidents and disasters, particularly as a result of works within the flood risk area. The areas vulnerable to flood impact have been heavily investigated as part of the Proposed Scheme, therefore, the mitigation measures listed within the CEMP will ensure that the correct procedures are undertaken to minimise any impact in the event of flooding.

On the basis of the information set out in chapter 18, it is concluded that the potential direct and indirect major accident and disaster risks arising from the Proposed Scheme is unlikely.

The impact on population and human health during the construction stage would be low, where in an area of high sensitivity, would result in minor adverse significance of effect.

8.4.2 Operational Phase

The following assessment investigates each of the previously identified potential Population and Human Health determinants in Table 8.1 associated with the operation of the Proposed Scheme, including:

- the influence on Population and Human Health from changes in risk of major accidents and disasters;
- the influence on Population and Human Health from potential risks Water Quality and Flooding;
- the influence on Population and Human Health from traffic and transportation.

8.4.2.1 Major Accidents and Disasters

The aim of the Proposed Scheme is to alleviate the risk of flooding, therefore during the operational phase the Population and Human Health aspects will be beneficially impacted by the reduction of major accidents and disasters incurred from flood events.

On the above basis, the magnitude of impact on Population and Human Health would be high, where in an area of high sensitivity, would result in a major beneficial significance of effect.

8.4.2.2 Water Quality and Flood Risk

Water Quality

The wastewater treatment plants currently at risk of flooding will be afforded protection by the Proposed Scheme during the operational phase. Changes as a result in operational emissions to the aquatic environment will be minimised during flood events. On the above basis, the magnitude of impact on Population and Human Health would be high, where in an area of high sensitivity, would result in a major beneficial significance of effect.

Flood Risk

The aim of the Proposed Scheme is to alleviate the risk of flooding, therefore during the operational phase the Population and Human Health aspects will be beneficially impacted by the reduction of flood risk. On the above basis, the magnitude of impact on Population and Human Health would be high, where in an area of high sensitivity, would result in a major beneficial significance of effect.

8.4.2.3 Traffic and Transportation

During the operational phase of the Proposed Scheme, there will not be an increase in vehicular traffic and transportation volumes as a result, however, there will be beneficial pedestrian passage in relation to the bridge upgrade works. Additionally, linkages with the proposed Northwest Greenway project will improve cycle and pedestrian access to both Inishowen and Derry.

As a result, the magnitude of impact on Population and Human Health from operational transportation in terms of cycle ways and pedestrian access, would be medium, where in an area of high sensitivity, would result in a moderate beneficial significance of effect, which is considered significant in EIA terms.

8.5 Interactions

This chapter has reviewed the potential interactions in relation to Chapter 9 Flood Risk, Chapter 10 Water Quality, Chapter 12 Noise and Vibration, Chapter 13 Air Quality and Climate; and Chapter 17 Waste to communicate the potential influence upon Population and Human Health.

8.6 Mitigation and Monitoring

8.6.1 Mitigation

During construction, there are a number of mitigation measures outlined within the relevant chapters and detailed in the Chapter 21 Mitigation Measures. Similarly, during the operational phase of the Proposed Scheme there are mitigation measures in place to maintain the elements and ensure effective flood risk throughout its the design life. Furthermore, as the pressures of climate change are exacerbated over time, built in mechanisms are planned to allow adaptation of the Proposed Scheme to seamlessly evolve and to provide the Standard of Protection required for the local population throughout the design life of the scheme. This adaptation will ensure the population and human health are afforded protection from flood risk in the future.

8.6.2 Monitoring

Where necessary, monitoring would focus on environmental precursors to any health impact, thereby enabling a monitoring regime that enables intervention before any manifest health outcome. The necessity of such monitoring would be established within the relevant technical disciplines.

8.7 Potential Cumulative Effects

Due to the inter-relationship between Population and Human Health and the wider technical disciplines, potential cumulative effects from other developments have already been considered within the technical disciplines on which the Population and Human Health assessment is derived. No further cumulative effects on Population and Human Health are considered likely.

8.8 Residual Impacts

All mitigation measures which provide intervention to prevent any manifest health outcome have been taken into consideration within Section 8.6. As such, there is no change to the assessment conclusions reached with the impacts ranging from major beneficial to minor or negligible adverse.