Appendix I

Logic Maps

Appendix I Logic Map, Exogenous Contextual Factors and Mechanisms

Table 1. Exogenous Contextual Factors likely to influence the interventions impact

Ref	Context	Evidence base to support context
C1	Socio-economic characteristics	The workday population of the TCF area is 1.4 million, the fifth largest outside London. The conurbation's 425,000 daily commutes are forecast to increase by 11% to 2033, with 55% of trips being into/out of Derby and Nottingham. The overall unemployment rate is 2.1% but ranges from 5.7% to 0.2%.Pockets of Derby and Nottingham have above average levels of unemployment. Many Nottingham residents do not own or have access to a car (0.76 cars per person), and although Derby has higher ownership (1.06 cars per person) there is lower public transport use. The population demographics are also varied with a significant young student population contrasted with an aging population. Derby and Nottingham have developed economies worth over £30bn per annum, that are complementary rather than operating in competition. They have distinct high value sectors; Derby is a UK centre of excellence for transport equipment manufacturing accounting for 30% of its GVA, and Nottingham increasingly grows jobs in niche sectors such as life sciences, digital and financial technology. There are a range of business and professional services, with many in both cities. Lower productivity sectors (e.g. retail, health and care, visitor) provide significant local employment, and jobs growth is forecast over the next decade.
C2	Relevant local transport policies	The local transport policy background features extensive measures to encourage mode switch away from the car and the take up of more sustainable travel options. These initiatives include the Go Ultra Low (GUL) programme, the UK's first ULEV lane, the Workplace Parking Levy (WPL) Programme and the Nottingham Cycle City Ambition Programme (NCCAP). Clearly, the success of these initiatives will impact on the effectiveness of the Transforming Cities Programme (TCF). The TCF evaluation will need to refer to evaluation work being carried out for these initiatives and refer to them for context.
C3	Population growth and demographic change	This will partly determine trends in the demand for travel as well as mode choice.
C4	National & local economic conditions	Economic growth is linked to an increase in demand for transport and this will, therefore, impact on congestion and air quality in Nottingham.
C5	Local background trends in transport costs on sustainable modes	This influences the attractiveness of non car modes use compared with the car.

Ref	Context	Evidence base to support context
C6	Cost of travel by car	This influences the attractiveness of car use compared with other modes. This includes fixed costs such as the cost of buying a car, the cost of insurance and tax, as well as non-fixed costs such as fuel prices.
C7	Local congestion issues	Nottingham City Council estimates, based on an independent study by WS Atkins in 2011, that congestion in the AM peak period costs the City's economy £160m pa. This will manifest itself as a cost to business in lost time, increased transport costs, difficulties in access for the workforce and difficulty in accessing suppliers/customers.
C8	Local arrangements for the provision of public transport	This will influence the ability to work in partnership with the bus, tram and train companies. Nottingham City Council owns the largest local bus company, Nottingham City Transport, and enjoys a good working relationship with other public transport operators.
C9	National trends in congestion levels	Since 2011, DfT measures of congestion have seen a steady rise and this has impacted the ability of transport demand management interventions to realise a reduction in congestion.
C10	National air quality trends	It is assumed that air quality will gradually improve due to the fleet becoming 'cleaner' and this context will need to be taken into account within the evaluation.
C11	National/regional trends in health and wellbeing	These local trends will need to be used to benchmark changes to health indicators.
C12	Suppressed demand for travel by private car	This is released by road space becoming free due to a reduction in congestion or, alternatively, by an increase in household disposable income.
C13	National trends in cycle trip numbers	These background trends upon which TCF Programme is implemented will be important context.
C14	National and local trends in accidents involving cyclists	These background trends upon which TCF Programme is implemented will be important context.

Ref	Context	Evidence base to support context
C15	National trends in the take up of EVs	Government policy and technological advances increasingly make EVs a practical option for motorists, leading to an increase of these vehicles in the national fleet.
C16	Technological progress towards addressing the cost and practicality of EVs	As research and development accelerates in the field of EVs, it is likely that the range and charging time for EVs will improve removing some of the barriers to use.
C17	Cost of EVs and ebikes	This is a straightforward pricing mechanism that will determine demand. It could impact directly by influencing the decision to buy, but also indirectly by determining the viable hire cost.

Figure 1. Derby-Nottingham Transforming Cities Tranche 2: Logic Map Encouraging Active Travel

Context

The Midlands Engine identifies Derby-Nottingham as a priority area with the potential to drive forward the Midlands' economy. It attracts global businesses, with significant out-of-town employment growth hubs emerging between the cities(i.e. HS2 East Midlands Hub Station), driving plans to build ~50,000 new homes.

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The workday population is 1.4 million[1], the fifth largest outside London and is forecast to grow by 8% by 2029. The conurbation's 425,000 daily commutes are forecast to increase by 11% to 2033, with 55% of trips being into/out of Derby and Nottingham, generating significant congestion. This is estimated to cost the East Midlands £825 million p.a., with over half falling to business. Both cities have areas exceeding European air quality limits for Nitrogen Dioxide (NO_2). These pressures are a function of the inter-connected nature of the two cities' urban areas and the airport employment area that sits between them. The unemployment rate is 2.1% but there are pockets where this is significantly higher, up to 5.7%. Many Nottingham residents do not own or have access to a car (0.76 cars per person). Derby has higher ownership (1.06 cars per person).

Cycling is growing in popularity in the main urban areas of Derby and Nottingham (where there has been a 47% increase in the latter on 2010 cycling levels to 2018/19, albeit from a low baseline) with high cycling levels already occurring amongst some large organisations in the cities, suggesting there is potential for further growth. Investment in dedicated cycle routes, and resurfacing and widening existing links, has accelerated this increase in the last four years. However, cohesive networks of suitable safe, segregated routes are not yet comprehensive. Consequently, cycling levels are well below full potential in the Derby and Nottingham area. Travel surveys, such as that regularly conducted with East Midlands Airport employees, often show that although less than 1.6% of employees cycled, 5.2% would consider cycling if infrastructure was improved.

The local pressures and opportunities arising from recent and planned future growth, and the challenges evidenced in relation to current levels of investment in and demand for, urban transport connectivity illustrates the need for interventions that further increase connectivity for sustainable transport modes in order to alleviate current pressures and cater for future growth

Inputs

DfT Funding

Nottingham City Council Match funding

Procurement of external contractors/consultants to deliver the schemes

Staff project management resources.

Monitoring and evaluation costs including staff time and equipment.

Knowledge sharing activities and events

Communications resources

Nottingham TCF Package Objectives

O1 – Contribute to strong foundations for sustainably-connected future growth

O2 –.Alleviate transport pressures from recent growth and past underinvestment

O3 – Improve access to employment, productivity and inclusivity

TCF Objectives

TCF1 – Invest in new local transport infrastructure to boost productivity

TCF2 –.Improve public and sustainable transport connectivity

TCF3 – Improve access to employment sites, Enterprise Zones, development sites, or an urban centre that offer particular growth / employment opportunities

Outputs

Strategic inter-urban Cycle Expressways linking Derby, Nottingham and East Midlands Airport/Gateway employment area and Enterprise Zones, with e-Bike charging facilities **Package B O1, TCF1, TCF2**

Network of additional high quality cycle corridors across Nottingham and Derby aligned with Local Cycling and Walking Infrastructure Plan **Packages C & D O1, TCF1, TCF2**

Workplace travel capital grants **Packages C & D**

Bike Share Programme **O3 Package B**

Short and Medium Term Outcomes

Interurban trips by bike are more practical **O1**

Interurban trips by e-bike are more practical **O1**

Safer to travel by foot, bike or ebike

Reduction in journey time by bike **O1**

Travelling by bike and foot becomes more convenient **O1**

Decrease in the cost of travelling by bike

From Electric Travel Logic Map (ebike outcomes)

An increase in the number of trips made by foot, bike and ebike

Increased use of active modes as a component of a multi modal journey

Key outcome: Increased cycle connectivity especially between residential areas and employment locations – **TCF2, TCF3, O1, O3**

Improved equality of access to cycling for lower income groups **TCF3, O3**

Key outcome: Easier to travel across the Derby Nottingham City Region **– O1, O3**

Derby - Nottingham Future Mobility Zone

From Public Realm Logic Map (More Walking/cycling)

Key outcome: Larger mode share for cycling & walking - Reduced car dependency **O1, O2**

Improved access to employment **O3**

Key outcome: Congestion constraint – **O2**

WPL

Go ultra low

Key outcome: Decrease in levels of CO_2 and NO_2 and particulates **O2**

Reduced transport costs to business– **O1, O3**

Improved access to labour and employment **– O1, O3**

Key outcome: Reduced unemployment, especially in deprived areas **O3**

Derby - Nottingham Future Mobility Zone

Cleaner air and reduced Carbon footprint **O2**

Improved public health and wellbeing

Evaluation of the Nottingham TCF

Knowledge and experience from the scheme is disseminated as an exportable template

Longer Term Impacts

Key impact: Contributes to economic growth **– O1**

Supports local industry **– O1**

Key impact: Improves productivity– **TCF1, O3**

Contributes to making Nottingham a better place to live and work **O2. O3**

Key impact: Improved social inclusion and reduction in inequality **– O3**

Other local authorities take up similar options, contributing to national transport, emissions and environmental objectives

Key:

= Environmental/health outcome or impact

= Key transport demand management outcome or impact

= Economic outcome or impact

= Socio-economic outcome or impact

= Current NCC scheme which also contributes to TCF outcomes/impacts

= Key outcome

= Key impact

= Outcome or impact related to evaluation activities

A11 = Mechanism that facilitates change

O1 – O3 =Local TCF objectives to which outcome/impact contributes

TCF1 –TCF3 = National TCF Fund Objective to which outcome/impact contributes

External factors: National and local economic conditions, cost of running a car, public transport costs, national and local trends in congestion, demographic factors, national trends in cycling and walking

Core assumptions: Probability of population growth, desirability of economic growth, no additional road capacity for private traffic, current levels of transport funding, moving towards carbon neutrality

Table 2. Mechanism for Encouraging Active Travel

Ref	Mechanism for change:	Evidence to assess if mechanism is active	Relevant contextual factors see following table
A1	**Provision of interurban cycle lanes** makes it more viable to habitually travel further by bike by providing a bespoke link	Stakeholder surveys: Cycle corridor users (**I_2)**. Before and after cycle (inc ebikes) counts **(I_18)**	C13
A2	**Provision of interurban cycle lanes** provides the facility to use ebikes to make longer trips with less physical effort than using a conventional bike		
A3	**Provision of cycle corridors** makes cycling/walking safer and promotes that perception amongst users	Stakeholder surveys: Cycle corridor users (cyclists and pedestrians) (**I_2)**. Accident rates involving cycles **(I_31)** Km of cycle routes introduced **(I_32)**	C14
A3a	**Provision of infrastructure at the workplace -** cycle shelter or cycle parking, shower facilities, for example, facilitate cycling	Stakeholder surveys: Cyclists (**I_2)**. Travel surveys of those businesses receiving the Cycle Infrastructure Grant **(I_33)**	na
A4	**Cycle route network easier to use -** encourages a mode switch from car and stimulates additional demand for travel by bike and foot.	Stakeholder surveys: Cyclists (**I_2)**, with questions regarding changes to travel behaviour and the causes of this. Mode share of travel across cordons in Derby and Nottingham **(I_15)** Before and after cycle and pedestrian counts around the in locations relevant to the TCF T2 packages **(I_18)**	C1 C3 C4 C5 C13
A5	**Cycling perceived as safer** thus those who want to cycle but did not previously regard it as safe enough now switch mode to the bike	Stakeholder surveys: Cyclists (**I_2)** with questions regarding perceptions of safety	na
A6	**Multimodal journeys** incorporating cycling now more practical due to high quality cycle links which encourage a mode switch from car only journeys and stimulate additional demand for travel.	Stakeholder surveys: Cyclists (**I_2)**.	C1 C3 C4 C5
A7	**Quicker journey times by bike** make travel by bike more attractive thus prompting mode switch away from other modes including the car	Stakeholder surveys: Cyclists (**I_2)**.	C7 C9
A8	**Increased cycle connectivity** makes travel by bike more attractive relative to other modes prompting switch to this mode	Stakeholder surveys: Cyclists (**I_2)**.	C1 C3 C4 C5 C13
A9	**Mode share mechanism –** more trips by bike and foot due to mode switch and additional demand for travel being catered for by bike leads to an increase in cycle/walking trips while trips by private car are constrained by existing network capacity despite considerable suppressed demand for travel by this mode.	Stakeholder surveys: Cycle corridor users (cyclists and pedestrians) (**I_2)** with questions regarding changes to travel behaviour and the causes of this. Mode share of travel across cordons in Derby and Nottingham **(I_15)** Bespoke before and after modal	C1 C3 C4 C5 C13

Ref	Mechanism for change:	Evidence to assess if mechanism is active	Relevant contextual factors see following table
		share surveys in corridors benefitting from TCF interventions **(I_16)**	
A10	**The introduction of a coherent high quality cycle link between urban and interurban centres** makes journeys by bike or ebike practical	Stakeholder surveys: Cyclists (**I_2)**, Before and after cycle counts at key points on the network **(I_18)**	C13
A11	**Greater availability of hire bike options** means that it is not necessary to own and maintain a bike thus lowering the cost of travel by bike	Number of hire bikes available **(I_9)**. Stakeholder surveys: Hire bike user surveys carried out by service providers **(I_2a)**	na
A12	**Flexible bike hire options** allow for journeys with different start and end points without the need to transport or store a bike thus making it more practical to use cycling as part of a multimodal journey	Number of hire bikes available **(I_9)**. Hire bike user surveys carried out by service providers **(I_2a)**	na
A13	**Increased cycle connectivity** makes some journeys practical/easier which increases access to transport for lower income groups with low levels of car ownership	Stakeholder surveys: Cyclists (**I_2)**.	na
A14	**Reduction in demand for travel by car** constrains traffic growth and congestion	Delay per vehicle mile **(I_11)** and journey time reliability **(I-12)** Before and after traffic flows in locations relevant to the TCF T2 Packages **(I_19)** Estimate number of car trips saved due to observed mode switch **(I_25).**	C9, C12
A15	**Improved air quality** - a reduction in nitrogen dioxide (NO2) and particulate matter, reduces the impacts of transport on people's health, leading to a lower incidence of episodes of poor health, especially respiratory and cardiovascular conditions.	Number of health episodes linked to poor air quality **(I_23)**. NCC/DCC sickness records **(I_24)** Modelled changes in NO2, PM2.5 and CO2 emissions **(I_13)** NO2 and PM2.5 levels from the NCC and DCC AQ monitoring network **(I_13a)**	C10, C11
A16	**An improvement in public health** leads to a reduction in the number of days taken off sick within the workforce and then leads to an increase in productivity, a significant advantage of a low emissions economy. Health impacts upon people of working age have economic effects, for instance if they have to take days off work. It is estimated that in 2012, poor air quality had a total cost of up to £2.7 billion In UK through its impact on productivity.	Number of health episodes linked to poor air quality **(I_23)**. NCC/DCC sickness records **(I_24)**	C11
A17	**More efficient/greater use of cycling by the workforce** makes new employment opportunities viable due to greater accessibility.	Stakeholder surveys: Cyclists (**I_2)** Mode share of travel across cordons in Derby and Nottingham **(I_15)** Bespoke before and after modal share surveys in corridors	C4

Ref	Mechanism for change:	Evidence to assess if mechanism is active	Relevant contextual factors see following table
		benefitting from TCF interventions **(I_16)**	
A18	**Greater mobility** connects people to jobs.	Stakeholder surveys: Cycle corridor users (cyclists and pedestrians) (**I_2**).	C4
A19	**Higher levels of employment** stimulate economic growth due to an increase in household income	Employment and unemployment data **(I_8)** GVA **(I_21)**	C4
A20	**Labour force effects -** improved accessibility leads to an increase in the quantity and quality of labour and associated productivity improvements. This will also potentially lead to an increase in wage levels and disposable income as the existing labour pool seeks to use the new transport options to maximise their earnings and save on travel costs.	Survey of local businesses and their views on the supply of labour **(I_7)** GVA **(I_21)**Productivity measures **(I_22)**	C4
A21	**General equilibrium effects -** increased productivity, time and cost savings associated with increased transport capacity with increased usage of PT and active modes and shorter journey times cause a general economic improvement as a new equilibrium of increased economic activity is achieved.	GVA **(I_21)**Productivity measures **(I_22)** Employment and unemployment data **(I_8)**	C4
A22	**Reduction in journey time and increased reliability** reduces costs of transport from suppliers and to customers and lowers business costs	Delay per vehicle mile **(I_11)** and journey time reliability **(I-12)** Survey of local businesses and their views on the supply of labour and transport costs **(I_7)**	C9
A23	**Improved access to a larger pool of labour** makes Nottingham a more attractive place to do business	Survey of local businesses and their views on the supply of labour **(I_7)**	C4
A24	**Less queuing traffic and less traffic overall** lowers emissions of NO2, carbon and PM2.5	Modelled changes in NO2, PM2.5 and CO2 emissions **(I_13).** NO2 and PM2.5 levels from the NCC and DCC AQ monitoring network **(I_13a)**	C9, C10
A25	**Reduction in journey time and increased reliability** makes travel around the FMC easier	Delay per vehicle mile **(I_11)** and journey time reliability **(I_12)**	C9
A26	**Increased levels of activity lead to health benefits**	Number of health episodes linked to poor air quality **(I_23)**. NCC/DCC sickness records **(I_24)**	C11
A27	**Increased levels of exercise leads to higher levels of Well being**	Stakeholder surveys: cycle corridor users (cyclists and pedestrians) **(I_2)**	C11
A28	**The potential demand factor - desire for more exercise/healthy lifestyle is**	Stakeholder surveys: Cycle corridor users (cyclists and pedestrians)	C1 C3

Ref	Mechanism for change:	Evidence to assess if mechanism is active	Relevant contextual factors see following table
	unlocked by the new cycle corridors	**(I_2)**	C4 C5 C13

Figure 2. Derby-Nottingham Transforming Cities Tranche 2: Logic Map For Public Transport Improvements

Context

The Midlands Engine identifies Derby-Nottingham as a priority area with the potential to drive forward the Midlands' economy. It attracts global businesses, with significant out-of-town employment growth hubs emerging between the cities (i.e. HS2 East Midlands Hub Station), driving plans to build ~50,000 new homes.

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The workday population is 1.4 million[1], the fifth largest outside London and is forecast to grow by 8% by 2029. The conurbation's 425,000 daily commutes are forecast to increase by 11% to 2033, with 55% of trips being into/out of Derby and Nottingham, generating significant congestion. This is estimated to cost the East Midlands £825 million p.a., with over half falling to business. Both cities have areas exceeding European air quality limits for Nitrogen Dioxide (NO_2). These pressures are a function of the inter-connected nature of the two cities' urban areas and the airport employment area that sits between them (which are also the locations for the majority of jobs in the local area). It reflects the area's extremely high (89%) 'economic self-containment' rate, with 92% of D2N2 workers living in the D2N2 area and 87% of D2N2 residents working in the D2N2

The unemployment rate is 2.1% but there are pockets where this is significantly higher, up to 5.7%. Many Nottingham residents do not own or have access to a car (0.76 cars per person). Derby has higher ownership (1.06 cars per person).

Nottingham already has a comprehensive and well integrated public transport system. It has three tram lines, a publically owned bus company and an integrated ticketing system, the Robin Hood Card, covering bus, tram and rail. This is underpinned by the UKs only Workplace Parking Levy (WPL) which acts as a transport demand management measure.

The local pressures and opportunities arising from recent and planned future growth, and the challenges evidenced in relation to current levels of investment in and demand for, urban transport connectivity illustrates the need for interventions that further increase connectivity for sustainable transport modes in order to alleviate current pressures and cater for future growth

Inputs

DfT Funding

Nottingham City Council match funding

Procurement of external contractors/consultants to deliver the schemes

Staff project management resources.

Monitoring and evaluation costs including staff time and equipment.

Knowledge sharing activities and events

Communications resources

Co-development of schemes with public transport operators and passenger groups

Nottingham TCF Programme Objectives

O1 – Contribute to strong foundations for sustainably-connected future growth

O2 –.Alleviate transport pressures from recent growth and past underinvestment

O3 – Improve access to employment, productivity and inclusivity

TCF Fund Objectives

TCF1 – Invest in new local transport infrastructure to boost productivity

TCF2 –.Improve public and sustainable transport connectivity

TCF3 – Improve access to employment sites, Enterprise Zones, development sites, or an urban centre that offer particular growth / employment opportunities

Outputs

- Area-wide real-time digital information and ticketing upgrades inc realtime public transport information display **TCF1 All Packages**
- Upgrades to digital information and smart / contactless ticketing. **TCF1 All Packages**
- Workplace travel capital grants **TCF2 Packages A & B**
- Derby DRT and links **TCF2 Packages B & D**
- Nottm Tram Park & Ride capacity upgrades inc. new bus P&R **TCF2 Package C**
- Three new Smart Park & Ride Hubs in Derby **TCF2, Package D**
- DRT brokerage to better connect East Midlands Airport/Gateway employment area/Parkway rail station to the Derby – Nottingham urban fringe **TCF3, Package B**
- Inter-urban bus lane and traffic light priority on key approaches to Derby, Nottingham and East Midlands Airport/Gateway employment area.**TCF2/3 Package B**
- Bus priority along Nottingham growth corridors to include extended traffic light priority, bus lanes, upgrades, level crossing and bus station works. **TCF2, Package C**
- Derby Northern, Southern and east-west growth corridors bus priority improvements **TCF3, Package D**
- Evaluation of the Nottingham TCF

Short and Medium Term Outcomes

- Public transport network becomes easier to access and use **TCF2**
- Increased park and ride capacity facilitates multimodal journeys incorporating PT **TCF2**
- Better connectivity to key growth areas and mainstream PT. **TCF3**
- Quicker and more reliable to travel by bus between the cities and to inter urban campuses **TCF2**
- Improved journey times and reliability by public transport along key growth corridors in Nottingham and Derby. **TCF1 TCF2 TCF3**
- Derby - Nottingham Future Mobility Zone
- Easier to travel across the Derby-Nottingham city region**– O1, O3**
- From Public Realm logic map
- Increase in demand for travel due to economic growth catered for by enhanced PT capacity – **TCF2, O1, O2**
- An increase in the number of trips made by public transport
- **Key outcome:** Increased public transport connectivity especially between residential area and employment locations – **TCF2, TCF3, O1,**
- TCF T1
- From EV logic map
- Improved equality of access to transport for lower income groups **TCF3, O3**
- Improved access to employment **O3**
- **Key outcome:** Larger mode share for public transport - Reduced car dependency **O1, O2**
- **Key outcome:** Congestion constraint – **O2**
- WPL
- Reduced transport costs to business– **O1, O3**
- Improved access to labour and employment – **O1, O3**
- Go ultra low
- Derby - Nottingham Future Mobility Zone
- **Key outcome:** Decrease in levels of CO2 and NO2 and particulates **O2**
- Cleaner air and reduced carbon footprint**O 2**
- **Key outcome:** Reduced unemployment , especially in deprived areas **O3**
- Knowledge and experience from the scheme is disseminated as an exportable template for good practice

P1 P2 P3 P4 P5 P5a P6 P7 P8 P9 P10 P11 P12 P13 P14 P15 P16 P17 P18

Longer Term Impacts

- **Key impact:** Contributes to economic growth – **O1**
- Supports local industry – **O1**
- **Key impact:** Improves productivity– **TCF1, O3**
- Contributes to making Nottingham a better place to live and work **O2, O3**
- Improved public health
- **Key impact:** Improved social inclusion and reduction in inequality – **O3**
- Other local authorities take up similar options, contributing to national transport, emissions and environmental objectives

Key:

- = Environmental/health outcome or impact
- = Key transport demand management outcome or impact
- = Economic outcome or impact
- = Socio-economic outcome or impact
- = Current NCC scheme which also contributes to TCF outcomes/impacts
- = Key outcome
- = Key impact
- = Outcome or impact related to evaluation activities
- P11 = Mechanism that facilitates change
- O– = Local TCF objectives to which outcome/impact contributes
- TCF1 –TCF3 = National TCF fund objective to which outcome/impact contributes

External factors: National and local economic conditions, cost of running a car, public transport costs, national and local trends in congestion, demographic factors, technological changes

Core assumptions: Probability of population growth, desirability of economic growth, no additional road capacity for private traffic, current levels of transport funding, moving towards carbon neutrality

Table 3. Mechanisms for Public Transport Improvements

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
P1	**Public transport network easier to use -**encourages a mode switch from car and stimulates additional demand for travel by bus.	Stakeholder surveys: Public transport users **(I_1)**, with questions regarding changes to travel behaviour and the causes of this. Mode share of travel across cordons in Derby and Nottingham **(I_15)** Bespoke before and after modal share surveys in corridors benefitting from TCF interventions **(I_16).** Public transport patronage **(I_26).**	C1 C3 C4 C5
P2	**Increased public transport capacity –** increased supply facilitated by additional services and greater park and ride capacity	Number of additional bus trips. (bus patronage) Number of additional park and ride spaces.	NA
P3	**Multimodal journeys** incorporating PT now more practical which encourages a mode switch from car only journeys and stimulates additional demand for travel.	Stakeholder surveys: Public transport users **(I_1)**, with questions regarding changes to travel behaviour and the causes of this. Mode share of travel across cordons in Derby and Nottingham **(I_15)** Bespoke before and after modal share surveys in corridors benefitting from TCF interventions **(I_16).** Public transport patronage **(I_26).**	C1 C3 C4 C5
P4	**Quicker bus journey times** make travel by bus more attractive thus prompting mode switch away from other modes, including the car	Average bus journey times on routes subject to TCF interventions **(I_28),** Stakeholder surveys: Public transport users **(I_1)**, with questions regarding perceptions of travel time. .	C7 C9
P5	**Increased public transport connectivity** makes travel by bus more attractive relative to other modes prompting modal switch to this mode	Public transport user surveys **(I_1)**, with questions regarding perceptions of connectivity	C8
P5a	**Mode share mechanism –** More public transport trips due to mode switch and additional demand for travel	Stakeholder surveys: Public transport users **(I_1)**, with questions regarding changes	

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
	being catered for by PT leads to an increase in PT trips while trips by private car are constrained by existing network capacity despite considerable suppressed demand for travel by this mode.	to travel behaviour and the causes of this.	
P6	**Increased public transport connectivity** makes some journeys practical/easier which increases access to transport for lower income groups with low levels of car ownership	Stakeholder surveys: Public transport users **(I_1)**, with questions regarding perceptions of connectivity. Stakeholder surveys: Low income groups **(I_3)**	NA
P7	**Reduction in demand for travel by car -** constrains traffic growth and congestion	Average journey time/delay per vehicle mile **(I_11)** Journey time reliability **(I_12)** Before and after traffic flows in locations relevant to the TCF T2 packages **(I_19)** Mode share of travel across cordons in Derby and Nottingham **(I_15)**	C9, C12
P8	**Improved air quality** - a reduction in nitrogen dioxide (NO2) and particulate matter, reduces the impacts of transport on people's health, leading to a lower incidence of episodes of poor health, especially respiratory and cardiovascular conditions.	Modelled changes in NO2, PM2.5 and CO2 emissions **(I_13)** NO2 and PM2.5 levels from the NCC and DCC AQ monitoring network **(I_13a)** Health episodes related to poor air quality **(I_23)**	C10, C11
P9	**An improvement in public health leads to a reduction in the number of days taken off sick within the workforce -** leads to an increase in productivity, a significant advantage of a low emissions economy. Health impacts upon people of working age have economic effects, for instance if they have to take days off work. It is estimated that in 2012, poor air quality had a total cost of up to £2.7 billion through its impact on productivity.	Health episodes related to poor air quality **(I_23)** Sickness records from partner employers **(I_24)**	C9b
P10	**More efficient/greater use of public transport modes by the workforce -** makes new employment opportunities viable due to greater accessibility.	Stakeholder surveys: Public transport users **(I_1)**, with questions regarding changes to accessibility to employment opportunities. Mode share of travel across cordons in Derby and Nottingham **(I_15).** Bespoke before and after modal share surveys in	C4

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
		corridors benefitting from TCF interventions **(I_16).** Public transport patronage **(I_26).**	
P11	**Greater mobility connects people to jobs.**	Stakeholder surveys: Public transport users **(I_1)**, with questions regarding changes to accessibility to employment opportunities Stakeholder surveys: Low income groups **(I_3)**	C4
P12	**Higher levels of employment -** stimulates economic growth due to an increase in household income	Employment and unemployment data **(I_8)** GVA by Local Authority area, sectoral analysis **(I_21)**	C4
P13	**Labour force effects -** improved accessibility leads to an increase in the quantity and quality of labour and associated productivity improvements. This will also potentially lead to an increase in wage levels and disposable income as the existing labour pool seeks to use the new transport options to maximise their earnings and save on travel costs.	Stakeholder surveys: Businesses in areas benefitting from TCF measures **(I_7)** with questions relating to their access to labour GVA by Local Authority area, sectoral analysis **(I_21)** Productivity measures **(I_22)**	C4
P14	**General equilibrium effects -** increased productivity, time and cost savings associated with increased transport capacity with increased usage of PT and active modes and shorter journey times cause a general economic improvement as a new equilibrium of increased economic activity is achieved.	GVA by Local Authority area, sectoral analysis **(I_21)** Productivity measures **(I_22)**	C4
P15	**Reduction in journey time and increased reliability -** reduces costs of transport from suppliers and to customers and lowers business costs	Average journey time/delay per vehicle mile **(I_11)** Journey time reliability **(I_12)** Stakeholder surveys: Businesses in areas benefitting from TCF measures **(I_7)** with questions relating to changes to their transport costs	C9
P16	**Improved access to a larger pool of labour -** makes Nottingham a more attractive place to do business	Stakeholder surveys: Businesses in areas benefitting from TCF measures **(I_7)** with questions relating to their	C4

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
		access to labour	
P17	**Less queuing traffic and less traffic overall - lowers emissions of NO2, carbon and PM2.5**	Modelled changes in NO2, PM2.5 and CO2 emissions **(I_13)** NO2 and PM2.5 levels from the NCC and DCC AQ monitoring network **(I_13a)**	C9, C10
P18	**Reduction in journey time and increased reliability –** makes travel around the TCF area easier	Average journey time/delay per vehicle mile **(I_11)** Journey time reliability **(I_12)**	C9

Figure 3. Derby-Nottingham Transforming Cities Tranche 2: Logic Map For Public Realm/City Centre Access Improvements

Context

The Midlands Engine identifies Derby-Nottingham as a priority area with the potential to drive forward the Midlands' economy. It attracts global businesses, with significant out-of-town employment growth hubs emerging between the cities (i.e. HS2 East Midlands Hub Station), driving plans to build ~50,000 new homes.

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The workday population is 1.4 million[1], the fifth largest outside London and is forecast to grow by 8% by 2029. The conurbation's 425,000 daily commutes are forecast to increase by 11% to 2033, with 55% of trips being into/out of Derby and Nottingham, generating significant congestion. This is estimated to cost the East Midlands £825 million p.a., with over half falling to business. Both cities have areas exceeding European air quality limits for Nitrogen Dioxide (NO2). These pressures are a function of the inter-connected nature of the two cities' urban areas and the airport employment area that sits between them (which are also the locations for the majority of jobs in the local area). It reflects the area's extremely high (89%) 'economic self-containment' rate, with 92% of D2N2 workers living in the D2N2 area and 87% of D2N2 residents working in the D2N2 area.

The unemployment rate is 2.1% but there are pockets where this is significantly higher, up to 5.7%. Many Nottingham residents do not own or have access to a car (0.76 cars per person). Derby has higher ownership (1.06 cars per person).

Nottingham already has a comprehensive and well integrated public transport system. It has three tram lines, a publically owned bus company and an integrated ticketing system, the Robin Hood Card, covering bus, tram and rail. This is underpinned by the UKs only Workplace Parking Levy (WPL) which acts as a transport demand management measure.

The local pressures and opportunities arising from recent and planned future growth, and the challenges evidenced in relation to current levels of investment in and demand for, urban transport connectivity illustrates the need for interventions that further increase connectivity for sustainable transport modes in order to alleviate current pressures and cater for future growth.

Inputs

DfT Funding

Nottingham City Council Match funding

Procurement of external contractors/consultants to deliver the schemes

Staff project management resources.

Monitoring and evaluation costs including staff time and equipment.

Knowledge sharing activities and events

Communications resources

Nottingham TCF Programme Objectives

O1 – Contribute to strong foundations for sustainably-connected future growth

O2 –.Alleviate transport pressures from recent growth and past underinvestment

O3 – Improve access to employment, productivity and inclusivity

TCF Fund Objectives

TCF1 – Invest in new local transport infrastructure to boost productivity

TCF2 –.Improve public and sustainable transport connectivity

TCF3 – Improve access to employment sites, Enterprise Zones, development sites, or an urban centre that offer particular growth / employment opportunities

Outputs

- Station Street access + pax facilities **TCF3, Package A**
- Derby city centre to Derby Rail Station Access Improvement Scheme **TCF3 Package A**
- Broadmarsh Public Realm Stage 1 & 2 **Package A**
- Derby Public Realm work within the key areas of the city centre (The Spot, Becketwell, Victoria/Albert Street) **Package A**
- Strategic Cross City Cycleway in Nottingham **TCF3, Package A**

Short and Medium Term Outcomes

- Public transport network becomes easier to access and use **TCF2, TCF3**
- Improved walk times from City Centre and tram stops, bus and train stations
- City centres more pleasant to visit and spend time in
- Increase in cycling trips to the Nottingham city centre **TCF3**
- Increase in walking as a component of a multimodal journey
- **Key Outcome:** Increase in people visiting the City Centres **O1**
- More demand for leisure and retail services **– O1. O3**
- **Key Outcome:** Inward investment in city centre from retail and leisure SMEs **– O1, O3**
- More city centre based jobs
- **Key outcome:** Reduced unemployment , especially in deprived areas **O3**

Mechanisms: R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17

To Public Transport logic map

To Active Travel logic map

Longer Term Impacts

- **Key impact:** Contributes to economic growth **– O1**
- Supports local industry **– O1**
- **Key impact:** Improves productivity– **TCF1, O3**
- Contributes to making Derby and Nottingham better places to live and work **O2. O3**
- **Key impact:** Improved social inclusion and reduction in inequality **– O3**

Evaluation of the TCF

Knowledge and experience from the scheme is disseminated as an exportable template for good practice

Other local authorities take up similar options, contributing to national transport, emissions and environmental objectives

Key:

- = Environmental/health outcome or impact
- = Key transport demand management outcome or impact
- = Economic outcome or impact
- = Socio-economic outcome or impact
- = Current NCC scheme which also contributes to TCF outcomes/impacts
- = Key outcome
- = Key impact
- = Outcome or impact related to evaluation activities
- R11 = Mechanism that facilitates change

O1 – O3 =Local TCF objectives to which outcome/impact contributes

TCF1 –TCF3 = National TCF Fund Objective to which outcome/impact contributes

External factors: National and local economic conditions, cost of running a car, public transport costs, national and local trends in congestion, demographic factors, technological changes

Core assumptions: Probability of population growth, desirability of economic growth, no additional road capacity for private traffic, current levels of transport funding, moving towards carbon neutrality

Table 4. Mechanisms for Public Realm/City Centre Access Improvements

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
R1	**Access improvements to PT hubs make PT system easier to use**	Stakeholder surveys: Visitors to the city centres **(I_4)**	na
R2	**Access improvements to PT hubs reduces over all journey times**	Stakeholder surveys: Visitors to the city centres **(I_4)**	na
R3	**Public Realm improvements enhances the amenity of City Centre locations**	Stakeholder surveys: Visitors to the city centres **(I_4)**	na
R4	**Presence of new cycle route attracts journeys by bike to the City Centre**	Survey of cyclists accessing city centres and of those using the Nottingham cross city cycle route **(I_2)**	na
R5	**Improved access to and from public transport nodes to the city centres encourages more people to use the PT system** to access the city centre due to induced demand especially amongst deprived communities with limited car ownership and mode shift away from car	Public transport patronage on key bus and tram services **(I_26)** Stakeholder surveys: Public transport users **(I_1)**	C1 C2 C3 C4 C5 C6
R6	**A reduction in the time taken to walk from public transport nodes to city centre amenities** makes bus/tram + walk journeys more attractive leading to an increase in walking through both mode switch and trip generation.	Before and After Footfall between PT Hubs and city centres **(I_29)**	na
R7	**The city centres are perceived as being nicer/more pleasant to spend time in** leading to an increase in people now visiting the city centres (and their dwell time) for shopping and leisure purposes.	Stakeholder surveys: Visitors to the city centres **(I_4)**	na
R8	**Overall perception and reputation of Nottingham and Derby is enhanced** as the city centres are perceived as being nicer/more pleasant to spend time in		na
R9	**Nottingham city centre is now more accessible by bike** which attracts those whose preferred mode of travel is bike to visit the city centre	Survey of cyclists accessing city centres and of those using the Nottingham cross city cycle route **(I_2)**	na
R10	**An increase in the number of people accessing the city centres leads to an increase in demand for goods and services in these centres**	Stakeholder surveys: Businesses in city centres **(I_7)**	C4
R11	**More demand for leisure and retail services** generates inward investment from SMEs supplying these services	Stakeholder surveys: Businesses in city centres **(I_7)** Case studies of inward investment **(I_30)** Inward investment indicators **(I_36)**	C4
R12	**General equilibrium effects** – according to economic theory this combination of an increase in supply (inward investment) and demand (more visitors) leads to a higher level of economic activity within the area	GVA by Local Authority area, sectoral analysis **(I_21)**	C4
R13	**Agglomeration effects** – A higher		C4

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
	concentration of similar businesses leads to productivity improvements		
R14	**More vibrant city centres** makes Derby and Nottingham more attractive cities in which to live and work	Stakeholder surveys: Visitors to the city centres **(I_4)**	na
R15	**Inward investment in the city centres** generates additional jobs based in these areas	Stakeholder surveys: Businesses in city centres **(I_7)**	C4
R16	**Additional jobs in the retail and food sectors** leads to a reduction in unemployment	Employment and unemployment data **(I_8)**	C4
R17	**Higher levels of employment** stimulates economic growth due to an increase in household income		C4

Figure 4. Derby-Nottingham Transforming Cities Tranche 2: Logic Map For Enhancing Electric Transport Options

Context

The Midlands Engine identifies Derby-Nottingham as a priority area with the potential to drive forward the Midlands' economy. It attracts global businesses, with significant out-of-town employment growth hubs emerging between the cities (i.e. HS2 East Midlands Hub Station), driving plans to build ~50,000 new homes.

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The workday population is 1.4 million[1], the fifth largest outside London and is forecast to grow by 8% by 2029. The conurbation's 425,000 daily commutes are forecast to increase by 11% to 2033, with 55% of trips being into/out of Derby and Nottingham, generating significant congestion. This is estimated to cost the East Midlands £825 million p.a., with over half falling to business. Both cities have areas exceeding European air quality limits for Nitrogen Dioxide (NO_2). These pressures are a function of the inter-connected nature of the two cities' urban areas and the airport employment area that sits between them. The unemployment rate is 2.1% but there are pockets where this is significantly higher, up to 5.7%. Many Nottingham residents do not own or have access to a car (0.76 cars per person). Derby has higher ownership (1.06 cars per person).

Both cities are participating in the delivery of the Go Ultra Low (OLEV funded) initiatives to increase the uptake of Ultra Low Emission Vehicles (ULEVs), helping to contribute to air quality improvements. This includes the creation of a publically accessible charge point network across the area, comprehensive support for businesses (advice and sustainable transport grants) and events/campaigns to raise the awareness of electric and other ULEV vehicles to the public. The Transforming City Fund investments already implemented through Tranche 1, and those proposed in Tranche 2, will make a demonstrable contribution to improving air quality along the key corridors highlighted through local air quality monitoring and model forecasting.

The local pressures and opportunities arising from recent and planned future growth, and the challenges evidenced in relation to current levels of investment in and demand for, urban transport connectivity illustrates the need for interventions that further increase connectivity for sustainable transport modes in order to alleviate current pressures and cater for future growth.

Inputs

DfT Funding

Nottingham City Council match funding

Procurement of external contractor to deliver the cshemes

Staff project management resources.

Monitoring and evaluation costs including staff time and equipment.

Knowledge sharing activities and events

Communications resources

Nottingham TCF Programme Objectives

O1 – Contribute to strong foundations for sustainably-connected future growth

O2 –.Alleviate transport pressures from recent growth and past underinvestment

O3 – Improve access to employment, productivity and inclusivity

TCF Objectives

TCF1 – Invest in new local transport infrastructure to boost productivity

TCF2 –.Improve public and sustainable transport connectivity

TCF3 – Improve access to employment sites, Enterprise Zones, development sites, or an urban centre that offer particular growth / employment opportunities

Outputs

- Expanded availability of ebike hire interurban cycle corridors **O1, TCF2 Package B**
- Provision of ebike charging points along interurban cycle corridors **O1, TCF1 Package B**
- Provision of ULEV priority lanes **O1, TCF1, TCF2, Package C**
- Expansion of charging points for electrical vehicles across D2N2 **O1, TCF1 Packages B,C &D**
- Evaluation of the Nottingham TCF

Short and Medium Term Outcomes

- Travelling by ebike becomes cheaper
- **Key outcome:** Improved equality of access to transport for lower income groups **TCF3, O3**
- Improved access to employment **O3**
- **Key outcome:** Reduced unemployment, especially in deprived areas **O3**
- **Key outcome:** Increased connectivity especially between residential areas and employment locations **TCF2, TCF3, O1, O3**
- Travelling longer distances by ebike becomes more viable
- Journey times by EV are quicker than those for ICE powered vehicles
- Increase in the use of ebikes **O3**
- Go to Cycle Logic Map
- Increase in the use of electric cars and vans **O3**
- Go ultra low
- More practical to use electric vehicles
- Increased use of park and ride due EV PT Multimodal Journeys
- Increase in the mode share for Public Transport
- Go to PT Logic Map
- **Key outcome:** Decrease in levels of CO_2, NO_2 and particulates **O2**
- Cleaner air and reduced carbon footprint**O2**
- E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20, E21, E22
- Knowledge and experience from the scheme is disseminated as an exportable template for good practice

Longer Term Impacts

- **Key impact:** Improved social inclusion and reduction in inequality – **O3**
- **Key impact:** Improves productivity **O3, TCF1**
- **Key impact:** Improved public health – **O2**
- **Key impact:** Contributes to making Nottingham a better place to live and work **O2, O3**
- Other local authorities take up similar options, contributing to national transport, emissions and environmental objectives

Key:

- = Environmental/health outcome or impact
- = Key transport demand management outcome or impact
- = Economic outcome or impact
- = Socio-economic outcome or impact
- = Current NCC scheme which also contributes to TCF outcomes/impacts
- = Key outcome
- = Key impact
- = Outcome or impact related to evaluation activities
- E11 = Mechanism that facilitates change
- **O1 – O3** =Local TCF objectives to which outcome/impact contributes
- **TCF1 –TCF3** = National TCF Fund Objective to which outcome/impact contributes

External factors: National and local economic conditions, cost of running a car, public transport costs, national and local trends in congestion, demographic factors, technological change

Core assumptions: Probability of population growth, desirability of economic growth, no additional road capacity for private traffic, current levels of transport funding, moving towards carbon neutrality

Table 5. Mechanisms for enhancing electric transport options

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
E1	**The facility to hire rather than purchase an ebike** reduces the average cost of travel by ebike	Number and cost of ebike hires **(I_17)**	NA
E2	**The ability to re-charge an ebike in the course of a longer journey** prevents the risk of stranding	Stakeholder surveys: ebike users **(I_5)** Hire bike/ebike user surveys carried out by service providers **(I_2a)** Before and after cycle counts **(I_18)**	NA
E3	**ULEV priority measures** reduce average journey times by ULEV	Observed journey time savings for ULEVs on stretches of routes featuring ULEV lanes **(I_34)**	C7
E4	**ULEV priority measures** enable ULEV users to bypass congestion		C7
E5	**Availability of a denser network of charging points** makes using an EV easier and more practical	Stakeholder surveys: EV users **(I_6)** EV charge point usage measures **(I_35)**	na
E6	**Increased confidence in the availability of charging points encourages EV take up**	Stakeholder surveys: EV users **(I_6)** Number and % of ULEVs registered in the Derby Nottingham travel to work area **(I_14)** EV charge point usage measures **(I_35)**	C15 C16 C17
E7	**EV only charging bays guarantee EVs a space and ability to recharge at park and ride sites -** this makes multimodal journeys by EV and bus more attractive thus increasing use of P&R bus services. This additional demand is generated as those with ICE will have preferential access to parking.	Stakeholder surveys: EV users **(I_6)** Public transport patronage on key bus and tram services **(I_26)**	
E8	**Trips by ebike** – new trips generated or switch from a different	Stakeholder surveys: ebike users **(I_5)**	C1 C3 C4 C5
E9	**ULEV journey times** now quicker than those of conventional vehicles prompting some to swap to ULEVs	Observed journey time savings for ULEVs on stretches of routes featuring ULEV lanes **(I_34)**	C7 C9
E10	**Increased convenience of travel by ULEVs** prompts some to swap to this mode	Stakeholder surveys: EV users **(I_6)**	C1 C3 C4 C5 C16
E11	**Travelling by ebike** now an option for low income groups with hire availability.	Stakeholder surveys: ebike Users **(I_5)**	C1 C3 C4 C5 C17
E12	**Cost mechanism** - low cost of hiring prompts demand for travelling by ebike	Stakeholder surveys: ebike users **(I_5)** Before and after cycle and pedestrian counts in locations relevant to the TCF T2 packages **(I_18)**	C1 C3 C4 C5 C6
E13	**ebikes provide a cost effective option for low income groups** makes journeys that previously were too expensive, viable	Stakeholder surveys: ebike users **(I_5)** Stakeholder surveys: Low income groups **(I_3)**	C5 C6 C17
E14	**More efficient/greater use ebikes by the workforce** makes new employment opportunities viable due to greater accessibility.	Stakeholder surveys: ebike users **(I_5)**	C1 C4

Ref	Mechanism for change: Mobility as a Service	Evidence to assess if mechanism is active	Relevant Contextual Factors
E15	**Greater mobility** connects people to jobs.		C4
E16	**Higher levels of employment –** promote social inclusion	Stakeholder surveys: ebike users **(I_5)** Stakeholder surveys: Low income groups **(I_3)**	C4
E17	**Higher levels of employment -** stimulate economic growth due to an increase in household income	Employment and unemployment data **(I_8)** GVA by Local Authority area, sectoral analysis **(I_21)**	C4
E18	**A switch to ebikes from other ICE powered modes** leads to a reduction in tail pipe emissions	Stakeholder surveys: ebike Users **(I_5)** Modelled changes in NO2, PM2.5 and CO2 emissions **(I_13)** NO2 and PM2.5 levels from the NCC and DCC AQ monitoring network **(I_13a)** Before and after cycle and pedestrian counts around the in locations relevant to the TCF T2 packages **(I_18)**	C10 C16 C17
E19	**Increased physical activity** due to active travel	Stakeholder surveys: ebike users **(I_5)** Number of ebike hires **(I_20)** Before and after cycle and pedestrian counts around the locations relevant to the TCF T2 packages **(I_18)**	None
E20	**The percentage of vehicles in the overall fleet that are electrically powered –** this increases and then reduces tail pipe emissions	Number and % of ULEVs registered in the Derby Nottingham travel to work area **(I_14)**	C15 C16 C17
E21	**Improved air quality -** a reduction in nitrogen dioxide (NO2) and particulate matter, reduces the impacts of transport on people's health, leading to a lower incidence of episodes of poor health, especially respiratory and cardiovascular conditions.	Modelled changes in NO2, PM2.5 and CO2 emissions **(I_13)** NO2 and PM2.5 levels from the NCC and DCC AQ monitoring network **(I_13a)** Health episodes related to poor air quality **(I_23)** Sickness records from partner employers **(I_24)**	C10 C11
E22	**An improvement in public health leads to a reduction in the number of days taken off sick within the workforce -** leads to an increase in productivity, a significant advantage of a low emissions economy. Health impacts upon people of working age have economic effects, for instance if they have to take days off work. It is estimated that in 2012, poor air quality had a total cost of up to £2.7 billion nationally through its impact on productivity.	Health episodes related to poor air quality **(I_23)** Sickness records from partner employers **(I_24)**	C11