Benefits of full fibre networks

Economic development opportuntiies, public service improvements and efficiency savings

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# Introduction

The Local Full Fibre Network (LFFN) programme provides the opportunity to install fibre networks across the Vale of Glamorgan. Fibre is the core infrastructure of any future digital economy as innovations such as virtual reality, smart home applications, telehealth and online learning require high quality and high speed broadband. The Vale needs to investment in its digital infrastructure in order to facilitate these innovations and create the economic opportunities and efficiency savings full fibre is set to create. The same technologies could help players in the agriculture sector improve crop yields, farm management, and water usage. This report seeks to give an indication of the potential economic uplift fibre could bring and efficiency savings.

## What is full fibre?

## Regeneris report – the economic potential of fibre

A report from Regeneris (2018) has quantified the potential economic impact could be of full fibre networks 15 years across 100 towns and cities. Businesses, in particular SME’s could see substantial benefits as the report says that access to full fibre could unlock **£4.5bn in business productivity and innovation**, whilst the benefit that fibre could bring in offering **flexible working is valued at £1.9 bn**. The report also estimates the value it fibre could bring in **attracting new start ups at £2.3bn** across 100 towns and cities.

Asides from the core impacts that the report addresses, there are a number of other areas which fibre can have a demonstrable impact on. Most notably, full-fibre provides the platform from which one can operate **5G, predicted to unleash £28bn in benefits**. 5G is considered so much faster than previous mobile operating platforms (3G, 4G) that it creates opportunities for mobile signals to be used for far more than its current uses.

Smart cities, where electronic sensors collect data which is used to efficiently manage resources and assets could bring in £**5bn, through efficient management of energy and congestion**.

The **Internet of things (IoT)**, which consists of all devices connected to the internet and **Industry 4.0**, the automation and exchange of data in manufacturing (commonly referred to as the 4th industrial revolution) is predicted to **bring in £10bn of benefits**.

**Health care**, both in the public health service and through social care services are set to bring in **savings of £1.1bn** across 100 towns and cities, through the use of monitoring equipment such as telehealth and telecare.

Good fibre technology is also set to have an impact on house values as it is now considered that house hunters will not buy a house unless it has good connectivity, thus having a detrimental impact on homes that have poor connectivity.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Impact category | | Impact Focus | 50 Towns and Cities | 100 Towns and Cities |
| Core Economic Impacts | Direct Employment | 1. Network build | £1.4bn | £2.1bn |
| Business impacts | 1. Productivity improvements | £1.5bn | £2.2bn |
| 1. Innovation | £1.6bn | £2.3bn |
| 1. Flexible working | £1.4bn | £1.9bn |
| 1. New business start-ups | £1.5bn | £2.3bn |
| Private benefits to households | 1. Housing wealth | £4bn | £7bn |
| Wider Impacts | 5G | 1. Total economic value | £20bn | £28bn |
| Smart Cities Infrastructure | 1. Energy use and congestion | £3.6bn | £5bn |
| Industry 4.0 / IoT | 1. Manufacturing productivity | £7bn | £10bn |
| Health Care | 1. Cost savings | £0.7bn | £1.1bn |
| Environmental Impacts | C02 reductions | 1.5Mt CO2 | 2.3Mt CO2 |
|  | Value | £100mn | £160mn |

*Table 1: Regeneris Consulting (2018): headline impacts of full fibre over 15 years*

Whilst the report by regeneris is focussed on a large scale across towns and cities, it demonstrates a strong case fibre in terms of the opportunities it can bring and the need to ensure our area is maintaining its competitiveness as a local authority and as a region at a wider scale.

The following remainder of this report delves into some of these aspects in more detail including some use cases examples from around the world.

# Impacts

## Economic

There are a number of economic opportunities that arise from fibre connectivity I terms of the opportunities it brings for businesses through improved productivity and also for regions through its pull factor in attracting SME’s.

It has been shown through the super-fast broadband (SFB) roll out analysis (2012-2016) that faster connectivity speeds has been the crucial factor in job creation. The programme also showed that in areas of increased connectivity, firms relocated to those areas demonstrating a strong inward investment potential. Firms that did not change location saw increase of employment by 0.2%, an increase in turnover by 0.6% per annum and the turnover per worker rise by 0.4% (DCMS, 2018). When exploratory research examined the effects of faster fixed broadband discovered that the economic impacts increase substantially with faster speeds indicating that a move to gigabit technology will further deliver employment and productivity benefits.

## Health Care

Full fibre will enable the larger scale deployment of connected healthcare technologies. It will increase the network capacity and reliability of service, allowing better real-time access to patient monitoring data and stimulating new technology development.

The development of new applications in the field of healthcare has been facilitated by high speed connectivity. It is envisaged that video based monitoring applications will be used more for check-ups or initial screenings. Telecare has a significant opportunity to support independence in the home for the elderly too. These technologies will enable significant cost savings and a more agile health service that is better placed to cope with the pressures of an ageing population.

*Outputs and outcomes from fibre in health care*

Telehealth Case Study

The Nuffield Trust ran a whole-system telehealth demonstrator trial for 3,100 patients diagnosed with COPD, heart failure or diabetes. It found that telehealth services delivered a 45% reduction in mortality, reduced emergency admissions by 20%, led to 14% fewer elective admissions and 14% fewer bed days. The trial found that overall costs of hospital care were £1,888 lower among telehealth users with COPD, heart disease or diabetes, than for control patients.

Nuffield Trust (2012). ‘’The Impact of Telehealth on the use of Hospital Care and Mortality’

|  |  |  |
| --- | --- | --- |
| Frontier economics cost savings estimates in health and social care | | |
| Area | **Cost** | **Justification** |
| Primary care | 10% reduction | Main sources of cost saving are accommodation costs and reduced number of cancelled appointments. |
| Outpatient care | 10% reduction | Main cost savings to come from reduced accommodations costs and reduced number of missed hospital appointments |
| Inpatient | 5% reduction | Applying telehealth to inpatient appointments is likely to reduce the number of bed days for patients, whom are instead monitored remotely via new technology. More frequent patient monitoring is also likely to reduce emergency A&E admissions. They estimate the net cost saving to be positive and leading to a 5% overall cost reduction. |
|  | | |
| Social care | 8% reduction | With telecare the expectation is that more people will be able to live autonomously for longer, alleviating congestion problems for social homes and reducing day-care costs. |
| Frontier Economics (2017) | | |

The financial impact of improved speeds in health care was noted in the super-fast broadband programme, where a 3.7% increase of productivity was noted in areas with access to faster speeds. (DCMS, 2018). Frontier economics estimate the cost savings full fibre can bring in health and social care. The figures demonstrate quite substantial savings in primary and outpatient care (10% reduction) and in social care (8% reduction). With increasing pressures on the health care service, the need to invest in fibre to aid the use of such technologies is essential.

## Education

Fibre can be used in a number of ways to enhance the educational experience. The report into the benefits of the super-fast broadband programme highlighted a 4.7% increase in productivity in the education sector as a result of faster speeds (DCMS, 2018). The indicative research suggests that this will be even greater with full fibre. Some of the features of how fibre can enhance education are:

Example of fibre use in education.

Japan has benefited from very strong FTTP penetration and optimised the learning experience of students. Japan is increasingly adopting a hybrid teaching model that utilises traditional (paper and pen) writing and reading exercises as well as electronic tools and devices to enhance the learning experience. Artificial intelligence is used for online examinations, tailoring questions to the students and adapting the questions to keep motivation high. Japan has recently been trialling fully remote classrooms, which enable students who live in remote places to attend school.

Little (2016) Vodafone group call for the Gigabit Society

## Environmental benefits

The environmental benefits from fibre are two fold. Firstly, the impact which smart cities create through energy-efficient buildings, air quality sensors, and renewable energy sources are providing cities opportunities to reduce their ecological footprint (see section XXX).

In addition, processes in changes to working habits derived from fibre technology can have a positive impact on the environment. Home working has become an increasing part of working life. In 2014 a record number of people in employment were home workers (defined as those who usually spend at least half their working time at home), with 5% (over 1.5 million)78 of the workforce working within their home, and 8.9% using their home as a base whilst also working from other locations such as offices, or client premises

By 2020 forecasts predict that over 70% of the workforce will have adopted some form of mobile working as the norm, and we can therefore expect a large proportion of worker be using their homes as offices in the future, at least some of the time. (Lancaster University, 2016)

*Environmental impact of fibre through flexible working*

BT Workstyle Project

Flexible working is available to almost everyone in BT, and BT now has over 70,000 flexible workers, from senior managers to contact centre staff. Seven out of 10 employees work flexibly with 10% of those home based. BT report savings of millions in terms of increased productivity and cut costs.

Through flexible working, BT also avoids the purchase of 12 million litres of fuel per annum resulting in 54,000 tonnes less CO2 being generated in the UK. Since 1996, BT has reduced its global CO2 emissions by 60%.

# 5G

5G is the future of mobile technology, considered a significant increase from the technologies of 4G. The key features of 5G are:

* Reliable networks
* No loss of connectivity
* Low latency – real time responses with no ‘lag’
* Ability to connect millions of devices – lots of things

Some of the use cases for 5G are demonstrated in the following diagram:

The collection and availability of data for use of both public services and citizens adds value through its ability to adapt to changing circumstances or patterns of behavior and making better decisions about services. Businesses are also considered to benefit from open data, as providing an open data platform with access to information about the city, better decisions can be made using data analytics from these ‘smart’ technologies. Some areas are already adopting open data practices.

Bristol: <https://opendata.bristol.gov.uk/pages/homepage/>

Open Data Bristol is a site for exploring, analysing and sharing open data for and with the city. Much of the data has been published by Bristol City Council, but other organisations are free to upload relevant information too.

# Smart Cities

Smart cities provide a significant opportunity for public sectors to use information and communication systems to manage assets. The collection and analysing of data of persons, utilities, traffic and transport can lead to vast efficiency savings.

A recent report (ABI Research, 2018) has indicated that public investment in smart city technology creates a multiplier effect 10 times greater. Public and private sector partnerships are also developing to design and develop these technologies. These investments have been considered a significant part of cities abilities to attract new residents and businesses and thus increasing competitiveness on a regional and international scale.

Some of the features of smart cities are listed:

## Smart meters

* Sensors that authorities can access via the internet to monitor/ measure water levels, pressure, flow rate and chemical compositions

Thames Water rolled out smart meters in January 2016. Since then they have installed over 240,000 smart meters, which give over 5.8 million hourly meter readings per day (more meter reads in one day than they used to get in a year from our historical meter base of over 2 million meters).

They use the data to analyse hourly meter readings, enabling them to identify where there may be excessive water usage (for example a leak in the supply pipe or with an appliance or fixture in the home. They then engage with the customer about the issue and seek to resolve it.

This project has already saved almost 11 million litres of water per day – the equivalent supply for 77,000 people.

## GPS sensors/ traffic cameras

* Help manage traffic flow at major roads, intersections and roundabouts
* Use sensors in cars to monitor movement and identify congestion points

In the Netherlands, low latency (milliseconds) is used to transfer data through messages and services which ensure road users are always kept up to date with information regarding their journey such as traffic signals, speed limits, lane closures, events, incidents and parking information.

The combination of the quick data transfer and development of traffic signals that communicate with vehicles and cyclists optimise the flow of traffic across the urban network. It also enables certain vehicle journeys to be prioritised such as cyclists or emergency services.

## Smart meters

* monitor deteriorating equipment, such as traffic lights and pedestrian signals
* detect the effect of traffic on environmental conditions.

In Glasgow, a mobile network has been established to monitor the air quality using a sensor node, sensor hub and a cloud-based user interface.

The sensor nodes monitor aspect of the air such as levels of carbon dioxide, particle matter, temperature, humidity and pressure. This is then relayed back to a sensor hub and alongside the GPS data is transferred to the cloud where it can be analysed. The combined elements were driven around the city attached to vehicles.

Current static air quality monitoring stations are costly, so the mobile sensor and GPS data approach provides a low cost flexible solution which complements the static stations.

## Public transport

* real time location of buses which can be checked through phone apps
* integration of travel options tailored to the user

Milton Keynes – integrated multi-modal solution to allow people to travel easily across the city

A travel integration system for across Milton Keynes, the citywide service is intended to use real-time information about transport options and conditions to provide smart guidance travellers. It is an app solution which tells the user the options available for walking, getting the bus, taking a bike etc.

More information is available at: <http://www.mksmart.org/transport/>

## Security

* newer CCTV cameras can do a range of other tasks such as monitor motion, have fire and smoke alarm capabilities, measure air quality or lock and unlock doors depending on perceived situations
* other options could be hotlines or panic buttons that could allow police to respond to emergency scenarios and then using smart technology emergency services could get to the location quicker by knowing where to go and having traffic patterns across the city manipulated to get them there quicker.

Greenwich O2, London

CCTV solutions in The O2 Greenwich have the ability to also crowd count, detect smoke, and predict capacity issues. This allows them to change crowd flows, manage health and safety issues more accurately and respond to the demands of the situation in a more effective way.

# Conclusion

The report demonstrates the vast and diverse roles in which fibre can benefit the future of our places. The economic development opportunities are vast for both private and public sectors. Consideration should be given to how the installation of fibre could benefit the Vale of Glamorgan and how it could enhance the services we deliver and our offer to residents and businesses.

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