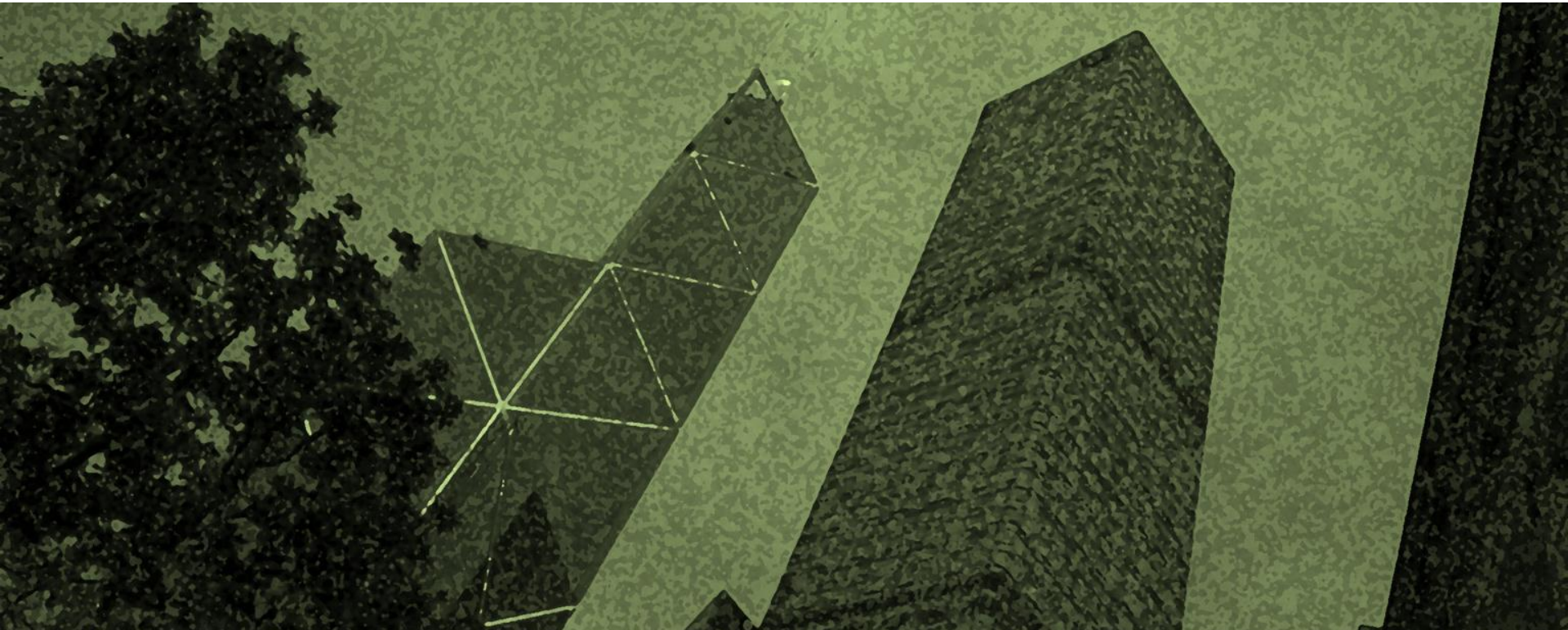
Exeter City Council

Exeter – Knowledge Economy Strategy and Action Plan

October 2013



Mickledore
Solutions in regional development

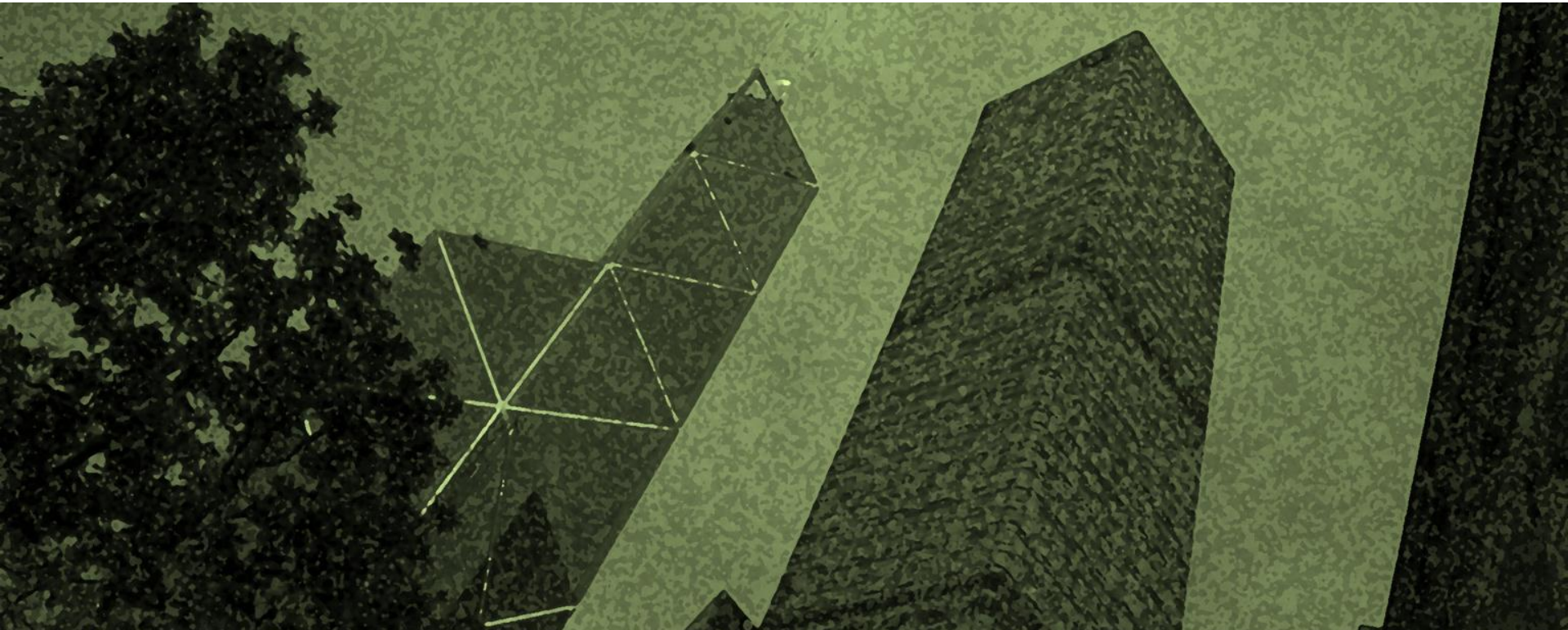
Mickledore Ltd.
Unit 2
Chapel House Barn
Pillmoss Lane
Lower Whitley
Cheshire
WA4 4DW
Tel: 01925 837679
Tel: 07747 085400

Glasgow Office:
63 Hillside Road
Paisley
PA2 6UD
Tel: 0141 628 2000

Email: contact@regionaldevelopment.co.uk
Web: www.regionaldevelopment.co.uk

Contents

1. Executive Summary



Executive Summary

the Exeter City economy is a strongly performing economic area with some strong knowledge assets but where the knowledge economy is not yet fully developed

The approach

This document sets out the knowledge economy strategy for the City of Exeter but in many ways the document may be viewed as the economic strategy for the City. This is because the sectors considered within the document are wide ranging and the recommendations represent a substantial amount of work.

It is correct that the economic strategy for the City should be largely focused on the knowledge economy. It is the knowledge economy in which the UK can differentiate itself from large parts of a globalised economy and it is an area in which Exeter holds a number of special assets – the University, the Met Office and some of the companies all have elements within them that may be considered world class.

Current Position

Knowledge based industries are likely to generate the economic growth of the future, but an important finding which prefaces this entire study is that Exeter should not be considered a heavily knowledge based economy at present. This strategy represents the start of a shift in emphasis which could allow the economy to shift towards a prevalence of knowledge based activity.

Any statements made concerning the knowledge based economy logically result in a question of definition of the knowledge economy. The approach that has been taken by this study, however, has been to define the sectors that are not examined within this study – public, personal and professional services and to take a pragmatic approach to defining the remainder almost case-by-case. This is because even the most prosaic of goods and services are increasingly produced using knowledge in the process.

The evidence to suggest that Exeter is not yet a heavily knowledge based economy is drawn from the employment and company structure of the area. Exeter has a strongly performing labour market with relatively low unemployment; it has higher than average proportions of people employed in public services, business services, retail and wholesale activity. All of this suggests a City providing a vibrant mixture of services for its wide catchment area. The City does not employ a higher than average number of people in many of the more obviously knowledge based industries however and the numbers of large or even medium sized companies with a clear differentiation based on knowledge, research or science are relatively few. In addition the skills profile and occupation profile of Exeter – whilst generally performing better than the national average – does not match the comparator knowledge based economies of locations such as Cambridge, Warwick, York or Norwich.

The summary conclusion of the Exeter City economy and economic geography is therefore of a strongly performing economic area with some strong knowledge assets but where the knowledge economy is not yet fully developed.

Executive Summary *cont*

Setting out an 'applied solution' within sectors and the 'business opportunity' is important in ensuring that work is relevant to everyone supporting he sector – not a tight definition

Knowledge Assets & Sectors

It is difficult to single out knowledge based organisations and claim that a comprehensive assessment has been undertaken. Whilst some facets of the economy may not be represented in a summary, the key knowledge assets of the City that have been reviewed are the Met Office; SW Water (Pennon Group plc); The University of Exeter; Medical School; and the RD&E Hospital.

In addition to these assets the work also highlights a number of other key employers such as the Environment Agency and Quintiles.

Working through each of these organisations, other employers, relative strengths of the economy and the links that these organisations have formed resulted in recommendations of the sectors that should be a focus of work for the City. These sectors were defined as:

- Big Data
- Climate Change (business opportunity around business adaptation)
- Health
- Water
- Agri-tech

In each case it is possible the report tracks the trends, existing assets and linkages, opportunities and suggested actions. These actions are detailed but are set out against the four ways in which the growth of the knowledge economy could be influenced:

- How the institutions and assets could be strengthened
- How more business start-ups and spin outs could be generated
- How local businesses can better benefit from the knowledge assets present; and
- How more investment can be attracted in these areas.

It can be seen from the sectors that there is a large amount of inter-linkage. Issues relating to climate change may impact on crop yield and water supply – requiring complex modelling to make appropriate predictions as one example. As a result across these fields, Exeter is a location that can best offer an applied solution – and as such a solution that is potentially most commercially relevant.

This 'applied solution' and 'business opportunity' approach is also important in ensuring that the suggested sectors are broad vertical strands of related activity – not a tight definition of the types of companies with whom activity should be limited. Exeter has a potential value to add to any company considering the ways in which the economy adapts to climate change – this is the business opportunity and the topic for discussion more than a 'sector'.

Executive Summary *cont*

In almost all cases it took many years to become successful and indeed some experienced slow growth at the beginning.

Lessons from Elsewhere

The report examines a number of locations which have established a knowledge economy – in the UK and some exemplars from overseas which have developed a strong science based economy. These are set out in full in section 7 but the lessons learned are that:

- In almost all cases it took many years to become successful and indeed some experienced slow growth at the beginning.
- None of the examples identified had a key cluster strategy in place at the start of their journey.
- All of the successful locations had strong leadership and vision – both private and public sector.
- All achieved effective engagement of their key players: – local/regional/national government, other public sector organisations, the academic sector and the business community.
- All established strong relationships and geographic proximity of business location to university departments/research units
- On the whole, other important research or training institutions of regional/national importance were being present in their area of spatial focus.
- In every case effective and formal networking systems were established resulting in effective communities who shared ideas and research collaborations – once the critical mass of companies was established.

Interestingly, and unusual for most corporate investment stories, the locations offered a high quality of life

Recommendations

- All of the evidence is synthesized into a series of recommendations which sit alongside the detailed individual tactical actions. The overall recommendations can be summarised into:

- The creation of a vision (Exeter to be recognised as the best known City in the SW of England for innovation) and a SMART objective below this (within 5 years the work results in the establishment of 75 new companies and 2000 new jobs linked to the sectors identified).
- The need for an over-arching governance organisation but which doesn't create another layer of committees or meetings. This is suggested as a role that could be undertaken by EXiST.
- Recognition that delivery of the strategy is likely to require additional resource and some reallocation of activity. This is a strategy that is not expensive to deliver in direct expenditure but will require people resource. This is most closely linked business engagement; business / innovation brokerage; and individual actions relating to each sector.

Executive Summary *cont*

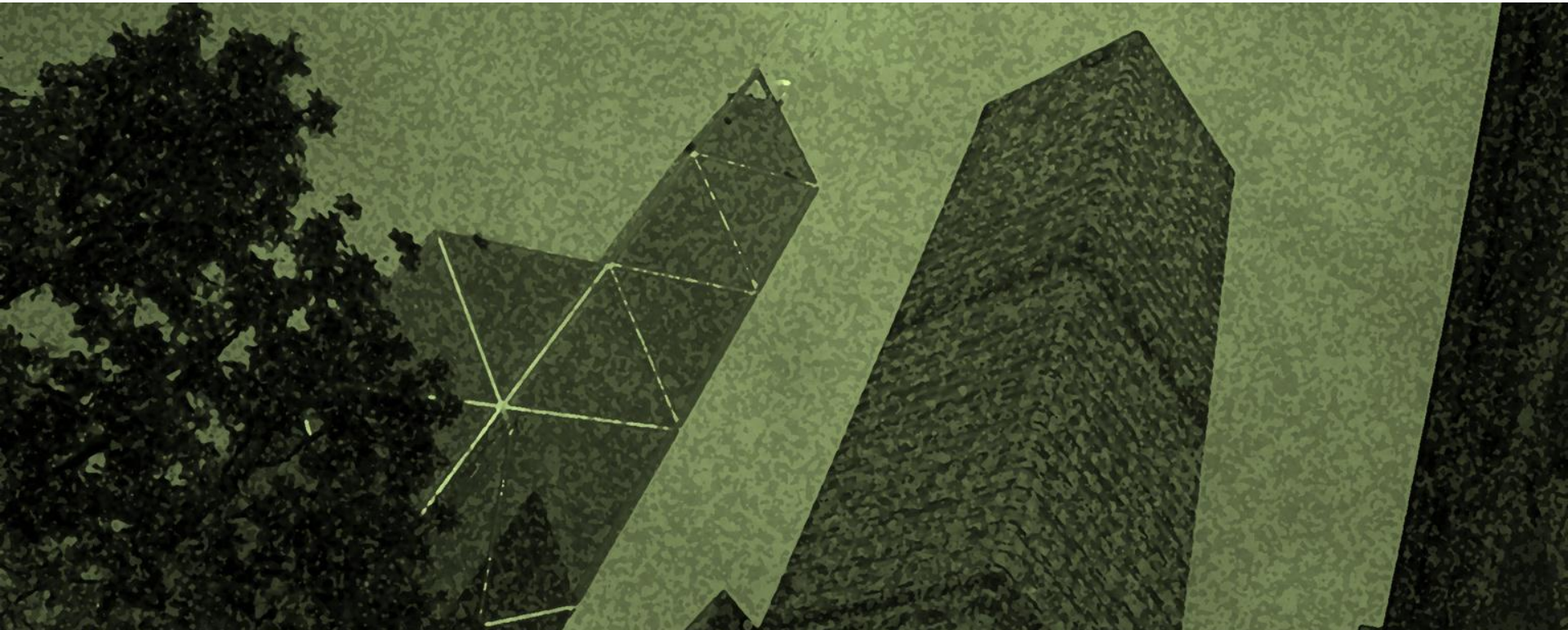
In total there are 36 recommendations set out in Section 8 in addition to the individual potential actions throughout the sector chapter.

- Links to UKTI and TSB and the key knowledge that they require to help influence the position of Exeter in the day-to-day activity of both organisations.
- Securing all of the benefits of the super-computer.
- National Catapult recognition from BIS for the super-computer investment.
- Building a centre of business excellence for knowledge based funding structures for business – public and private.
- Focus on delivering better Broadband using public funds (ERDF); different delivery solutions; and maintaining pressure on BT through Connecting Devon and Somerset.
- The opportunity to supplement the work of the University at the Innovation Centre by creating other business start-up centres in the City making use of redundant public assets.

In total there are 36 recommendations set out in Section 8 in addition to the individual potential actions throughout the sector chapter.

These recommendations are then set out in an Action Plan in Section 9 but these are not the Action Plan for the City Council – and in fact the strategy is intended as a strategy for the City as a whole, not the City Council. To this extent the success of the overall approach will require close working between all of the key partners, commitment and some leadership.

2. Introduction



Introduction

The purpose of the report is to set out the strategy and action plan in order to grow Exeter's knowledge economy

Introduction

- This report sets out the strategy and action plan for how Exeter could develop its knowledge economy, based on attracting and growing science and technology organisations, research and development and creating high quality employment opportunities in the city.

Approach

- Our approach to this study was to undertake the programme of work in a number of interlinked stages. This was mainly focused on understanding the current position of Exeter's knowledge economy in terms of its capability and other key assets and from a wider perspective, identifying the opportunities to further grow the knowledge economy as well as potential barriers.
- This work then led to the development of the action plan and the resources required to achieve it.
- The first stage of identifying Exeter's capacity and capability was developed by undertaking a full analysis of employment by sector, researching Companies House Records and consultation.
- This process informed and provided a framework for discussion with the Exeter Knowledge Economy Steering Group in terms of agreeing which sectors should be identified as key knowledge industry strengths for the area.
- These were agreed as being:
  - Big Data
  - Climate Change
  - Health
  - Water
  - Agri-tech and Food Security
- For each of these sectors, consideration was given to Exeter's existing assets; identification of key sector trends and how these could provide opportunities for Exeter.
- An important aspect of the consideration of potential opportunities for Exeter, was to set out national and international case studies of how other locations have developed a knowledge economy in their locality. The international case studies provide useful insight on how very effective knowledge economy locations have been generated.

Consultation

- An important aspect of the approach to the Exeter Knowledge Economy Strategy was consultation with key stakeholders. Over 20 individuals were consulted on a one-to-one basis, with organisations ranging from the University of Exeter, The Met Office, ExIST, the Royal & Devon Hospital and businesses including South West Water, ATASS and Blur Group.

Introduction

The study provides practical outcomes and an action plan as opposed to a study that will go dusty on a shelf

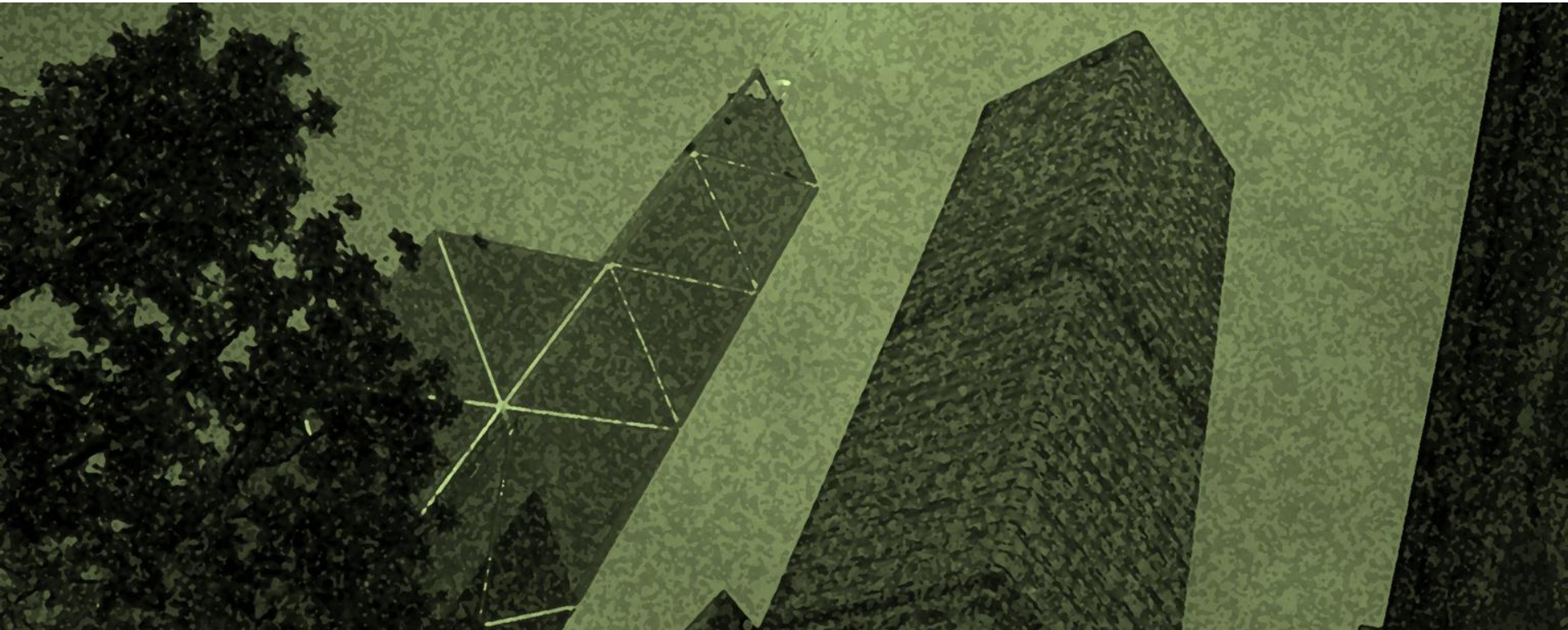
Consultation *(cont.)*

- Exeter City Council's emphasis on partnership and stakeholder engagement led to the establishment of the Exeter Knowledge Economy Steering Group. The Steering Group is also an important part of the process in ensuring the buy-in of all the interested stakeholders.
- This group also helped to determine the direction of the study and provided the opportunity for further consultation.

Anticipated Use

- The purpose of this study is to collate and utilise the detailed analysis that has been undertaken to provide a practical report with core recommendations and an action plan providing clear tasks, outputs and resources required for each one.
- An important output is the availability of an action plan which brings together the interested stakeholders to develop and drive the strategy forward. A strategy will help to encourage a common cause and a shared vision.
- The feedback from the consultation indicated that Exeter is at an embryonic stage of developing its knowledge economy. As a result, this study is anticipated to provide guidance as to what the city should be doing to develop its knowledge economy, and given the limited resources, available, ascertain which areas the effort should be concentrated.
- The identification of the Government's area of focus within each of Exeter's most important knowledge economy sectors is also anticipated to provide awareness of current and future openings.

3. Analysis of Current Position



Current Position

Exeter has sector strengths in Legal & Accounting, Telecommunications and Professional, Scientific and Technical Activities.

Before any work can be undertaken on setting out suggested future activity, a good understanding must be gained of the structure of the current economy and the strengths of the knowledge economy assets. This is set out in the pages which follow.

Sectors by Employment

The employment contribution of individual sectors in an area gives a good indication of the make-up of its economy. This data is based on the Business Register and Employment Survey (BRES) which captures numbers employed by industry. It should be noted that any survey-based approach is subject to limitations, given its reliance on the accuracy with which forms are completed by businesses as well as the sample sizes generated for smaller areas such as local authorities. Despite such caveats, it provides the most up-to-date perspective of the distribution of employment for Exeter. Figure 1 below provides an overview of all sectors employing 500 or more by 2-digit SIC code. Data is shown for Exeter, as well as for comparator locations.

Industry	Exeter	Exeter %	England %	Warwick %	Cambridge %	Norwich %	York %
86 : Human health activities	9,500	11.1	7.0	6.3	10.2	3.3	8.2
47 : Retail trade, except of motor vehicles and motorcycles	8,500	10.0	10.2	7.4	10.1	13.4	12.4
85 : Education	8,000	9.3	9.5	10.1	25.2	11.4	11.3
84 : Public administration and defence; compulsory social security	7,900	9.2	5.0	6.5	3.2	7.5	4.9
69 : Legal and accounting activities	4,000	4.7	2.1	1.8	2.5	2.2	2.1
56 : Food and beverage service activities	4,000	4.7	5.4	5.6	5.7	5.6	6.6
81 : Services to buildings and landscape activities	2,900	3.3	2.2	2.2	1.9	6.0	2.4
88 : Social work activities without accommodation	2,700	3.2	3.1	2.8	2.9	3.6	3.0
46 : Wholesale trade, except of motor vehicles and motorcycles	2,600	3.0	4.2	5.8	2.5	3.7	2.1
45 : Wholesale and retail trade and repair of motor vehicles and motorcycles	2,400	2.8	1.8	2.5	0.9	2.4	1.5
78 : Employment activities	2,200	2.6	3.1	1.8	3.6	4.2	1.5

Data are based on relevant local authority boundaries; Data rounded to the nearest 100

Current Position

Exeter has sector strengths in Legal & Accounting, Telecommunications and Professional, Scientific and Technical Activities.

Sectors by Employment (*cont.*)

Industry	Exeter	Exeter %	England %	Warwick %	Cambridge %	Norwich %	York %
61 : Telecommunications	1,900	2.3	0.8	0.7	0.8	0.7	0.6
87 : Residential care activities	1,900	2.2	2.6	1.9	0.9	1.4	2.7
74 : Other professional, scientific and technical activities	1,700	2.0	0.5	0.6	1.0	0.3	0.3
43 : Specialised construction activities	1,500	1.8	2.5	1.1	0.8	1.7	2.1
68 : Real estate activities	1,500	1.7	1.6	1.2	1.2	1.5	0.9
35 : Electricity, gas, steam and air conditioning supply	*	*	0.4	1.1	0.1	0.1	0.1
64 : Financial service activities, except insurance and pension funding	1,400	1.6	2.0	0.7	1.0	1.8	0.6
49 : Land transport and transport via pipelines	1,400	1.6	1.8	0.7	0.7	1.5	5.5
53 : Postal and courier activities	1,300	1.5	0.9	2.7	0.6	0.8	0.9
71 : Architectural and engineering activities; technical testing and analysis	1,100	1.3	1.5	2.3	2.5	1.1	1.7
41 : Construction of buildings	1,100	1.3	1.3	0.9	0.8	0.8	0.8
94 : Activities of membership organisations	1,000	1.2	0.9	0.9	0.9	0.6	1.2

Data are based on relevant local authority boundaries

* Data unable to be disclosed

Data rounded to the nearest 100

Current Position

Exeter has sector strengths in Legal & Accounting, Telecommunications and Professional, Scientific and Technical Activities

Sectors by Employment (*cont.*)

Industry	Exeter	Exeter %	England %	Warwick %	Cambridge %	Norwich %	York %
93 : Sports activities and amusement and recreation activities	900	1.0	1.4	1.4	0.9	2.2	0.8
70 : Activities of head offices; management consultancy activities	800	1.0	2.1	2.8	1.1	1.0	1.2
62 : Computer programming, consultancy and related activities	800	1.0	2.2	4.2	4.1	0.8	1.2
55 : Accommodation	700	0.8	1.4	1.0	0.8	1.0	2.3
66 : Activities auxiliary to financial services and insurance activities	700	0.8	1.6	0.7	0.4	2.9	4.5
80 : Security and investigation activities	700	0.8	0.8	1.8	0.2	1.4	0.3
36 : Water collection, treatment and supply	600	0.7	0.1	0.1	0.1	0.1	0.0
28 : Manufacture of machinery and equipment n.e.c.	*	*	0.7	1.1	0.0	0.2	0.1
96 : Other personal service activities	600	0.7	1.0	2.3	0.8	1.0	0.9
58 : Publishing activities	600	0.7	0.5	0.3	1.2	0.9	0.2
77 : Rental and leasing activities	600	0.7	0.5	0.6	0.4	0.4	0.3
42 : Civil engineering	500	0.6	0.7	0.4	0.2	0.2	0.8

Data are based on relevant local authority boundaries

Data rounded to the nearest 100

* Data unable to be disclosed

Current Position

Around 4,000 people are estimated to be employed in the Legal & Accounting Sector in Exeter.

Sectors by Employment (*cont.*)

- The largest employers (with over 1,000 employees) in Exeter are the Police, Devon County Council, Royal Devon & Exeter NHS Foundation Trust, the University of Exeter, the Met Office, Flybe and EDF Energy (which has a call centre based in the city). The Environment Agency has a base in Exeter where 450 are employed.
- Beyond the typically labour intensive sectors of retail, wholesale trade and public services (i.e. health, education, social services), the largest industries in Exeter in terms of total employment are:
  - Legal and accounting activities (c4,000 employed)
  - Services to buildings and landscape activities (2,900)
  - Telecommunications (1,900)
  - Other professional ,scientific and technical activities (1,700)
  - Specialised construction activities (1,500)
  - Electricity, gas, steam and air conditioning supply (data withheld)
  - Financial service activities, except insurance and pension funding (1,400)
- Within Legal & Accounting, the vast majority (3,300) are employed in Legal Activities (SIC 691); with the remainder (700) employed in Accounting, Book keeping & auditing activities and tax consultancy.
- All 1,900 employed in the Telecommunications Sector are classified in the 3 digit SIC code of “Other Telecommunications activities”.

- Within Legal & Accounting, the vast majority (3,300) are employed in Legal Activities (sic 691); with the remainder (700) employed in Accounting, Book keeping & auditing activities and tax consultancy.
- All 1,900 employed in the Telecommunications Sector are classified in the 3 digit SIC code of “Other Telecommunications activities”.

Location Quotients

- Absolute figures for employment and even corresponding percentages, do not fully illustrate the relative performance of industries in Exeter. In order to better understand where Exeter has a comparative advantage compared to other areas and nationally, Location Quotients (LQs) are used.
- LQs present the proportion of employment in each sector within Exeter compared to the equivalent percentage at the national level. Thus, scores over 1.00 indicate a relatively strong representation locally while scores of over 2.0 indicate that double the proportion of employees in Exeter work in the sector compared to the position in England. The table on the following pages highlights all those sectors with a score of greater than 1.5.

Current Position

Compared to the national picture, the Exeter economy demonstrates a comparative strength in Water Treatment and Supply

- Water Collection, treatment and supply is the sector with the highest Location Quotient . This highlights the dominance of the Water Treatment Plant run by South West Water (part of the Pennon Group plc); where the 2013 Annual Report states that c1,100 are employed (query fig quoted in table). This sector has seven times the proportion of employment compared to England.
- Other sectors with comparatively high Location Quotients are:
  - Electricity supply
  - Other professional, scientific and technical activities
  - Telecommunications
  - Legal and Accounting

- However, in terms of these sectors being of significance to the growth of the Knowledge Economy, a couple of points need to be considered. Firstly, in electricity supply the numbers employed in Exeter may be inflated by the presence of EDF Energy's call centre which may have categorised itself into the SIC code of Electricity Supply.
- This may also partly account for the telecommunications sector's high location quotient, although of course there are key companies in this sector such as South West Communications.

Current Position

- 'Other' Professional, Scientific and Technical Activities, Legal & Accounting and Telecommunications are the sectors which demonstrate the highest location quotients

Location Quotients (LQ) – all Sectors (2 dig SIC code) with a LQ of 1.5 or more

Industry	Exeter	Warwick	Cambridge	Norwich	York
36 : Water collection, treatment and supply	7.52	1.42	1.42	1.14	0.34
35 : Electricity, gas, steam and air conditioning supply	4.40	2.89	0.22	0.35	0.25
74 : Other professional, scientific and technical activities	3.70	1.20	1.95	0.60	0.57
61 : Telecommunications	2.87	0.84	1.06	0.88	0.78
69 : Legal and accounting activities	2.23	0.88	1.20	1.06	1.01
84 : Public administration and defence; compulsory social security	1.84	1.31	0.63	1.49	0.99
53 : Postal and courier activities	1.64	2.99	0.71	0.88	1.00
86 : Human health activities	1.58	0.90	1.46	0.47	1.17
45 : Wholesale and retail trade and repair of motor vehicles and motorcycles	1.58	1.39	0.53	1.33	0.84
81 : Services to buildings and landscape activities	1.50	0.97	0.84	2.68	1.08

- When comparing some of these key sectors against comparative location quotients in the competitor locations, Exeter performs well. For instance, 'Other Professional, Scientific and Technical Activities' has a location quotient of 3.70 compared to between 0.57 and 1.95 for key comparator locations.
- Similarly, for 'Legal and Accounting Activities', Exeter has a location quotient of 2.23 – that is, there are more than twice the proportion of people working in this sector than at a national level – compared to between 0.88 and 1.20 in comparator locations.

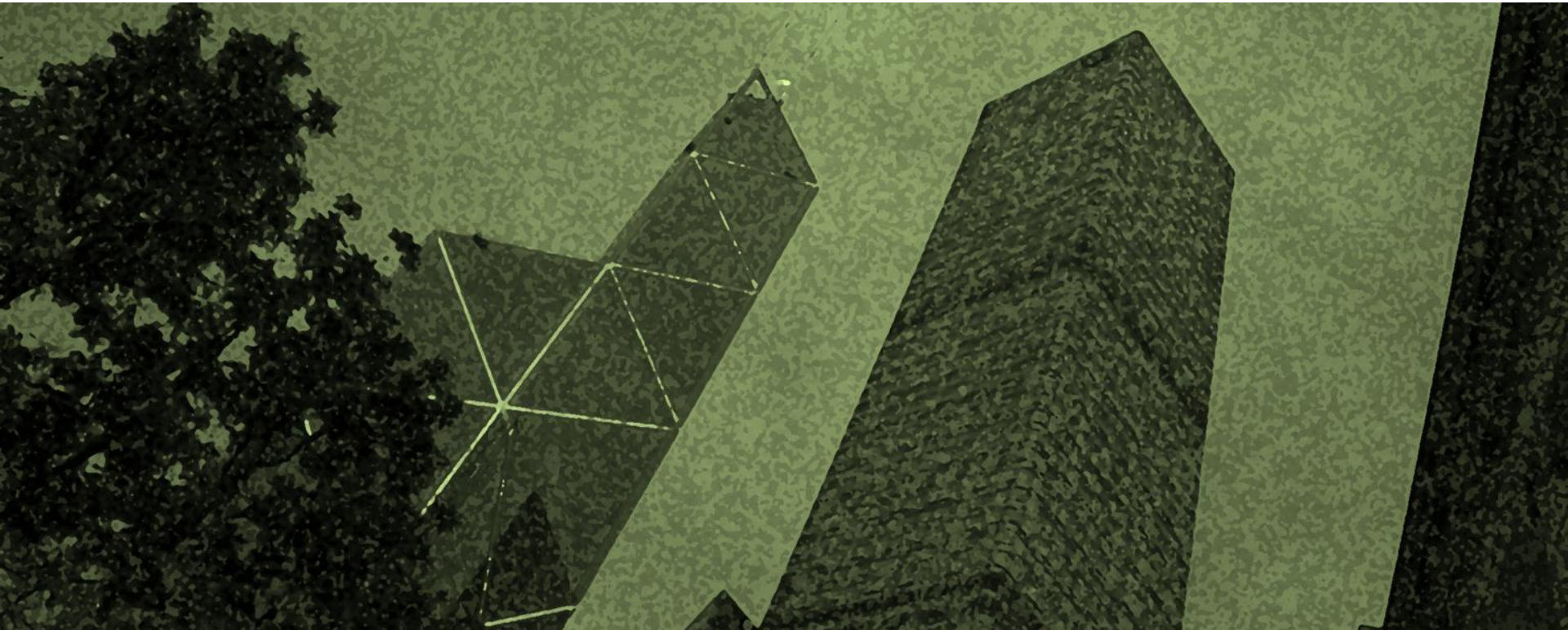
Current Position

The key Knowledge Economy players in Exeter are the University of Exeter and the Met Office

Key Businesses in the Knowledge Economy

- The largest employers (with over 1,000 employees) in Exeter are the Police, Devon County Council, Royal Devon & Exeter NHS Foundation Trust, the University of Exeter, the Met Office, Flybe and EDF Energy (which has a call centre based in the city). The Environment Agency has a base in Exeter where 450 are employed.
- As part of this phase of capability and capacity exploration, we researched the business base in Exeter (using Companies House data, sourced by One Source) as well as identifying key companies during our stakeholder consultations. This exercise revealed that within the boundaries of Exeter, there is not yet a critical mass in key knowledge economy sectors, although there are one or two important players. Once the wider region is taken into account, several more relevant companies exist. To follow, we have highlighted some of the key companies which operate in the Knowledge Economy Sector in Exeter. The list is not exhaustive.
- Along with the Met Office, companies that are involved in Big Data/computing and modelling/forecasting include the ATASS Group (including ATASS Sports), Select Statistics and Tangerine Bee. Blur Group is a fast growing global services exchange company currently head-quartered in London who have recently located their R&D function in Exeter. The Merret Survey Partnership, based near the Airport are involved in land surveying using high tech aerial and land laser scanning. Q3 Technologies based at the Innovation Centre is involved in GPS software systems. Proto Imaging is a 3D Graphics consultancy based in Exeter.
- Alcoa Howmet and Goodridge are the leading players in the field of advanced manufacturing/engineering. A little further afield, in East Devon are Supacat who manufacture high mobility vehicles for the defence, oil and gas, marine and renewable energy sectors. Simpleware Ltd are a software services company operating in the Engineering sector, and Scimar Engineering Ltd based at Marsh Barton Industrial Estate. They are a small R&D focused company who work in the marine, green energy and industrial electronics sector.
- Key players in the Legal & Accounting sector include Michelmores Solicitors and Ashfords Solicitors and in Telecommunications the major company is South West Communications. South West Communications (who employ 120 people in Exeter) is a telephone systems supplier, as well providing other services such as data centre services, including data backup and server hosting, cloud and endpoint security, onsite IT solutions, data networks, and lines and calls connectivity.
- Science company LGC have a BSE testing laboratory based at the Innovation Centre. Greenpeace Research Laboratories is also based at the Innovation Centre, as is Enzo Life Sciences (UK) Ltd.
- More detail is given in the following pages on the identified strengths of some of the key knowledge organisations and institutions in the city.

4. Key Knowledge Economy Players



Knowledge Economy Organisations - The Met Office

The Met Office has a considerable number of commercial and research collaborations in the UK and globally which could potentially be leveraged for the benefit of the Exeter knowledge economy

- The Met Office is the main differentiator within Exeter's knowledge economy. As well as being an international research centre on Climate Change it can also provide opportunities to position Exeter at the centre of activity around big data, risk management/resource planning and data analytics. This has commercial applications across a wide range of sectors including energy/the environment; financial services; aviation; utilities, health, retail and food management.
- The wide range of collaborative and commercial relationships within the Met Office also provide a potential to leverage those alliances for the future development and growth of the Exeter knowledge economy.

Introduction

- The Met Offices is an Executive Agency of the Department for Business, Innovation and Skills. Prior to the transfer to BIS, the Met Office was part of the Ministry of Defence.
- In 2003 the Met Office relocated its headquarters to Exeter from Bracknell. The Met Office has 2,000 employees of which 500 are based in scientific and research activity. A further 200 are employed in R&D, engineering and observation. The Met Office employs a very high proportion of graduates; attracting graduates from overseas universities and UK universities including Oxford and Cambridge.
- The Met Office has considerable international linkages and collaborations including with WHO, the American National Weather Service and the US Space Weather Prediction Center of the National Oceanic and Atmospheric Administration

Met Office Services

- The Met Office provides services across the main areas of: defence and government; Public Weather Service; climate change; health; transport and business. In 2012/13 total Met Office revenues were £204.9 million, with government revenues totalling £171.7 million. Approximately 80% of the Met Office's revenue is from military and defence contracts.
- Commercial services represent approximately 10% of the Met Office's activity. This includes services across a wide range of sectors such as media, transport, financial services, engineering, construction, health and utility companies.
- Commercial revenue grew by 6.9% in 2012/13, representing an income of £32.5m, with particular growth in commercial aviation, utilities, road and rail and secondary markets. There has also been an increase in advice for areas such as marine and renewables. Renewable applications provide forecasts about likely wind speeds at potential locations of offshore wind farms.
- The Met Office works closely with the water industry in providing services to help in areas such as innovation, resource and asset management. Exeter is also the base of The Flood Forecasting Centre which is jointly staffed by Met Office meteorologists and Environment Agency hydrologists.
- Longer-range forecasting techniques have an increasingly important role to play in the re/insurance market. Lloyd's work closely with the Met Office and Willis Re, the global reinsurance broker through the Willis Research Network support has a research post at the UK Met Office (and at the University of Exeter)focussed on research employing Met Office climate models.
- Another area of recent growth for the Met Office is in space weather. Space weather can impact the performance of the electricity grid, satellites, GPS systems and aviation; even perhaps mobile communication. The Met Office is working in collaboration with the US Space Weather Prediction Center of the National Oceanic and Atmospheric Administration. This involves developing improved space weather models and prediction systems to support a real-time space weather warning service.

Knowledge Economy Organisations - The Met Office

The potential location of part of the supercomputer to Exeter Science Park could potentially significant increase commercial collaborations

International and national collaborations

- As well as the US Space Weather Prediction Center of the National Oceanic and Atmospheric Administration, the Met Office works in collaboration with the American National Weather Service. With the latter, the Met Office is one of only two World Area Forecast Centres, each providing a backup for the other. These Centres provide global forecasts of upper winds and temperatures for global flights, helping to optimise safety and fuel consumption.
- The Met Office is working with the World Health Organisation, national governments, businesses and academic centres in the area of understanding how weather and climate affect people's health; ranging from short term, medium and longer term. As well as playing a key international role in the area of health, the Met Office has been undertaking research with the NHS, to provide forecasts tailored for those with health conditions that are affected by weather condition
- The Met Office is part of the Joint Weather and Climate Research Programme with the Natural Environment Research Council which uses shared supercomputing resources to analyse climate data and develop models.

Academic collaborations

- The Met Office provides a strong link to the 'supply side' of the knowledge economy within the knowledge based institutions. The Met Office's Academic Partnership includes research collaborations with the universities of Exeter, Reading, Leeds and more recently Oxford.
- The Met Office funds 5 joint chairs at the University of Exeter. The majority of the collaborations lay within the College of Engineering, Mathematics and Physical Science, particularly within Mathematics and Computer Science. However, the area of health is growing in importance and since 2010 there been joint working with the Met Office Heath team, building a number of projects to develop research in health, climate and the weather.

The Supercomputer

- The Met Office replaces its supercomputer every 5 years, with the next one due to be replaced in 2015. At present, the supercomputer is located within the Met Office which given high security requirements means that it is not available for use by businesses. However, with the advent of the Exeter Science Park, consideration is being given to locating part of the supercomputer onto the Science Park in order to enable collaboration with private businesses. This could potentially provide the Exeter Science Park with a significant asset for developing its knowledge economy.

Supply chains

- The Met Office has a supply chain of 1,598 companies, 225 of which are classed as SMEs. The Met Office has a strong supply chain in Devon but less concentrated in Exeter itself. In 2012/13, out of a total capital expenditure of £22.9m, £13.1m was spent on satellites and £5.4m on Technology & Information Services, including supercomputer expenditure.
- In some areas of the supply chain, there have been difficulties in sourcing equipment locally. This includes obtaining parts for radars in the required timescale due to the location of these suppliers being in Germany and the US as opposed to locally.

Knowledge Economy Organisations - South West Water

The water industry is going through considerable change, potentially presenting future opportunities for Exeter

- As well as the Met Office, South West Water is another important organisation in the local knowledge economy and particularly within the environmental sector.
- South West Water is a headquartered in Exeter and provides water and sewerage services to Devon, Cornwall and parts of Somerset and Dorset. South West Water is a wholly owned subsidiary of Pennon Group PLC. The latter has assets of approximately £4.3bn and employs over 4,500 people.
- As well as South West Water, the group incorporates Viridor, a renewable and waste management business. In 2012 South West Water was the most profitable part of the group; with revenues of £474m and profits before tax of £141.5m compared to Viridor's £57.6m profits before tax on revenues of £761m.
- In total South West Water employs 1,250 people with approximately 500 people based in Exeter. Staff work in diverse environmental areas including geotechnical, waste, water and infrastructure. The company employs engineers who provide support on engineering/electrical services to telemetry, automation and IT. South West Water has its laboratories in Exeter, which provide analysis services including mass spectrometry scans. About 50 staff are employed in the laboratory services, with the majority undertaking testing and analysis services and with about 8 staff undertaking research. The laboratory also provides radioactive analysis in areas such as radon.
- South West Water is currently well connected with Exeter's knowledge assets of the Met Office and the University. South West Water commissions work from the Met office focussed on extreme weather for areas such as coastal defence work which is a growing area to the business.
- The company also has strong linkages with the University which include the Environmental & Sustainability Institute and the Centre for Water Systems. South West Water also collaborates with the University of Exeter Business School, particularly in the leadership and the One Planet MBA.
- The importance of risk management and data analytics is growing considerably within the company. There is now a change in the staff profile, with a stronger focus on data analytics and the use of technology to recognises risks. This has instigated significant change management which is where the collaboration with the Business School has been of particular benefit.
- South West Water spends approximately £250m a year its supply chain with a strategic alliance with 60 key suppliers who account for the majority of expenditure. The company's policy is to have a strong focus on spend in the regional economy (Devon and Cornwall). In terms of higher value added services (i.e. outside of utilities installation contractors) the supply chain in Exeter is predominantly based on the services of consulting engineering firms. This includes Hyder Consulting, AECOM and Pell Frischmann.
- South West Water has a sporadic number of spin-outs. This includes Aquatic Services who provide analytical services and surveys. The company is located in Devon.
- The UK water industry is going through considerable change, particularly as a result of the Water Bill which is currently progressing through Parliament. This will drive market reform and aim to create a more resilient and sustainable water sector. These reforms are likely to considerably increase competition within the sector, pushing the drive for further innovation in order to remain competitive.

Knowledge Institutions - University of Exeter

The University of Exeter has recently invested £230m in its science base, placing it in a pivotal role in underpinning the Knowledge Economy

Introduction

- The University of Exeter is a key asset in the development of Exeter's Knowledge Economy. As such, it is useful to consider the knowledge resources that knowledge and scientific based businesses in Exeter and the locality may draw upon.
- Over the last six years, the University of Exeter has invested £230m in its science base. As the last Research Assessment Exercise (RAE) was in 2008, this does not provide a very useful indication of research strengths of other universities. The areas of strength that have been cited by the University include: functional materials; water systems engineering; climate change science; big data/data analytics; and plant science. Within the Medical School, key areas include diabetes and cardiovascular risk and ageing. The overall average ranking puts the University 27th in the UK.
- The University of Exeter has a total of 18,720 students of which 4,515 are postgraduate (HESA 2011/12). For the same period, graduates had an employment rate of 76.8%, of which 12% stayed in the region, with the majority remaining in Exeter and those being mainly in accounting related positions.
- In 2012, the University of Exeter joined the Russell Group of Universities and is one of the fastest growing research institutes within this Group. Within the Russell Group, The Complete University Guide (2014) ranks Exeter 10th
- Overall, The Complete University Guide ranks the University of Exeter 8th, with a total score of 848 (Cambridge ranks 1st with a score of 1000). The Sunday Times rates Exeter in 7th place and in 2012 named Exeter 'Sunday Times University of the Year 2012/13'.

Research Assessment Exercise 2008, World Leading and Internationally Excellent Research

Selected Units of Assessment, Science & Finance only	% of research classified as 4* and 3*
Other Hospital Based Clinical Subjects (joint submission with University of Plymouth)	65
Health Services Research (joint submission with University of Plymouth)	50
Biological Sciences	50
Physics	60
Pure Mathematics	55
Applied Mathematics	60
Computer Science & Informatics	65
General Engineering	55
Accounting & Finance	65

Knowledge Institutions - University of Exeter

The College of Engineering, Mathematics and Physical Sciences brings together complementary specialisms to solve scientific problems within a wide range of applications including climate change and medicine

- QS World University Rankings are focused on data covering four key areas covering: research, employability, teaching and internationalization. The rankings identify the top 50 universities in order and then group universities into rank bands.

University of Exeter, QS World University Rankings by STEM Subjects, 2013	Rank band
Agriculture & Forestry	101-150
Biological Sciences	151-200
Civil and Structural Engineering	151-200
Earth & Marine Sciences	101-150
Environmental Science	101-150
Psychology	51-100

Research strengths relating to the knowledge economy

- In 2012 the University achieved a total research income of £75m and anticipates that in 2013 this will total £90m. The University's science strategy is an interdisciplinary approach bringing together research teams from different disciplines to problem solve. This enables a more holistic approach in addressing commercial related problems.
- Key research themes are: Climate Change & Sustainable Futures; Systems Biology; Translational Medicine and Functional Materials and Extrasolar Planets.
- There are five academic colleges. These are: College of Engineering , Mathematics and Physical Science; College of Life & Environment Science; College of Social Sciences & International Studies; College of Humanities and the Medical School and the Business School. The Colleges and a number of their research strengths that have been cited as being of particular importance by the University are included in the following pages.

College of Engineering , Mathematics and Physical Science

- **Engineering** – key research in areas of advanced materials including graphene and additive manufacturing. This includes aerospace applications where the University is working with Airbus and AugustusWestland.
- The School has a number of specialised research centres including **The Centre for Additive Layer Manufacturing** (CALM). It is particularly different to other centres as it offers metal additive manufacturing as well as plastics. This centre in particular is one where there are the strongest interactions with local SMEs. Another important research centre is **The Centre for Water Systems** which specialises in waters systems engineering where there are important linkages with companies including consulting engineering consultants AECOM who have a base in Exeter
- **Computer Science** – a key area of research is artificial intelligence and big data as well as research activity on the next generation of computers. This department has strong links with Met Office and has three joint professorships researching weather and climate system modelling.
- The Computer Science department uses methods such as statistical data analysis, modelling, search and optimisation for applications such as search for genetic causes of type 2 diabetes to developing air traffic control collision alert systems.

Knowledge Institutions - University of Exeter

The Medical School has a particular strength in diabetes and on the genetic aspects of diabetes as well as improved treatments for patients

- **Mathematics** – This department out of all others has the strongest linkages with the Met Office. Research includes areas of short-term (weather predictions) and long-term predictions (climate change). Research is also undertaken to look at linkages between human health, weather and climate. Pure mathematics research includes cryptography, an important area as encryption algorithms have huge commercial value.
- **Medical Imaging** – this brings together physics and engineering. The work of the Biomedical Physics research group looks at how to understand processes that may be involved in diseases from which to develop novel therapeutic approaches. The University of Exeter is one of the partners working with GlaxoSmithKline to develop new drug –delivery techniques for brain diseases.
- **Physics & Astronomy** – there are research programmes within a number of areas including: Biomedical Physics, Electromagnetic Materials and Quantum Systems and Nanomaterials. The research within this department have a number of applications and so are more open to collaboration with companies. Existing collaborative work with companies includes BAE Systems, QinetoQ and Sonardyne.
- **Renewable energy** – this focus on marine and solar and is mainly based in Falmouth.
- **Natural Sciences** – the University's strong links to the Met Office and expertise in areas such as mathematical climate modelling and ecosystem response puts the University in a unique position within climate change research.

The College of Life and Environmental Sciences

- **Plant Science** is an important area within this College. The research of the Plant Biology Group includes many cross-disciplinary collaborations involving Mathematics, Physics, Geography and Social Science.
- **The Centre for Mood Disorders** – the purpose of the Centre's research is to develop an understanding of the impact of mood disorders to improve and maximize the effectiveness of interventions, treatments and services.

The Medical School

- The academic year of 2013/14 will be the first year of the University of Exeter Medical School after its separation from Plymouth University. The School has particular strengths in: diabetes, cardiovascular risk & ageing; neuroscience; Health Services Research; and Environment & human health which is based in Truro.
- The Medical School is a key partner in the Quintiles Peninsula Prime site. The Prime Site also comprises of clinical research facilities and academics at the Royal Devon & Exeter NHS Foundation Trust and four other NHS Trusts in Devon and Cornwall.
- The Medical School has linkages with large companies, mainly in the pharmaceutical industries (e.g. GlaxoSmithKline) and through international consortiums where the Medical School provides an academic role.
- Collaborations with SMEs have been around working in areas for joint grants to test products, diagnostic tests and design processes. Linkages have been predominantly with SMEs located in Devon as opposed to Exeter in particular.

Knowledge Institutions - University of Exeter

The University of Exeter has a focus on inter-disciplinarity bringing together different research strengths; which potentially provides holistic solutions to businesses

- **The Business School** has a number of research centres, including the Centre for Leadership Studies and the Centre for Finance and Investment. The latter has significant research strengths in financial econometrics and risk management. Research areas include modelling currency and commodity prices and weather derivatives. The School also offers the One Planet MBA. The programme is in partnership with WWF International and has a strong focus on developing more sustainable business processes.
- The Business School has two business networks, The Exeter Leadership Partners (ELP) and the Business Leaders Forum. Members of these networks include Honda , M&G, QinetiQ, Thomson Reuters, AstraZeneca and The Met Office.

Collaborative Research

- Between 2009/10 and 2010/11, the University of Exeter has considerably increased the level of collaborative research compared to the national average. Unlike the average for the UK which has seen a reduction of 5% in contract research with larger commercial businesses, the University of Exeter's activity in this area has gone up by 16% during the same period.

- The University of Exeter is making a significant investment in new assets which will have an impact of the knowledge economy and the opportunity to develop potential commercial linkages. The University's focus on interdisciplinary activity is embodied in two new major development projects:
- **The Living Systems Building** – this £50m development will open in 2016. It will bring together mathematicians, physicists, systems engineers, biochemists, cell and molecular biologists and clinical scientists. Major research themes will include systems biology and translational medicine. It is anticipated that this might potentially generate commercial interest from companies in the areas of medical instrumentation, pharmaceuticals and diagnostics.
- **The Wellcome Wolfson Medical Research Centre** will be a Centre for Translational Medicine. This will bring together clinical and biomedical scientists working in human genetics, cell biology, human physiology and interventional studies (eg: treatments, therapies, behaviour change) of diabetes. The Centre will focus on 'translating 'work from the laboratories into treatments and therapies for patients.

Research Related Activities, Percentage Change Between 2009/10 to 2010/11

	University of Exeter	Total UK HEIs
Collaborative research involving public funding	36%	16%
Contract research (excluding above and research councils) of which:	21%	7%
▪ Number with SMEs	23%	3%
▪ Number with other non SME commercial businesses	16%	-5%

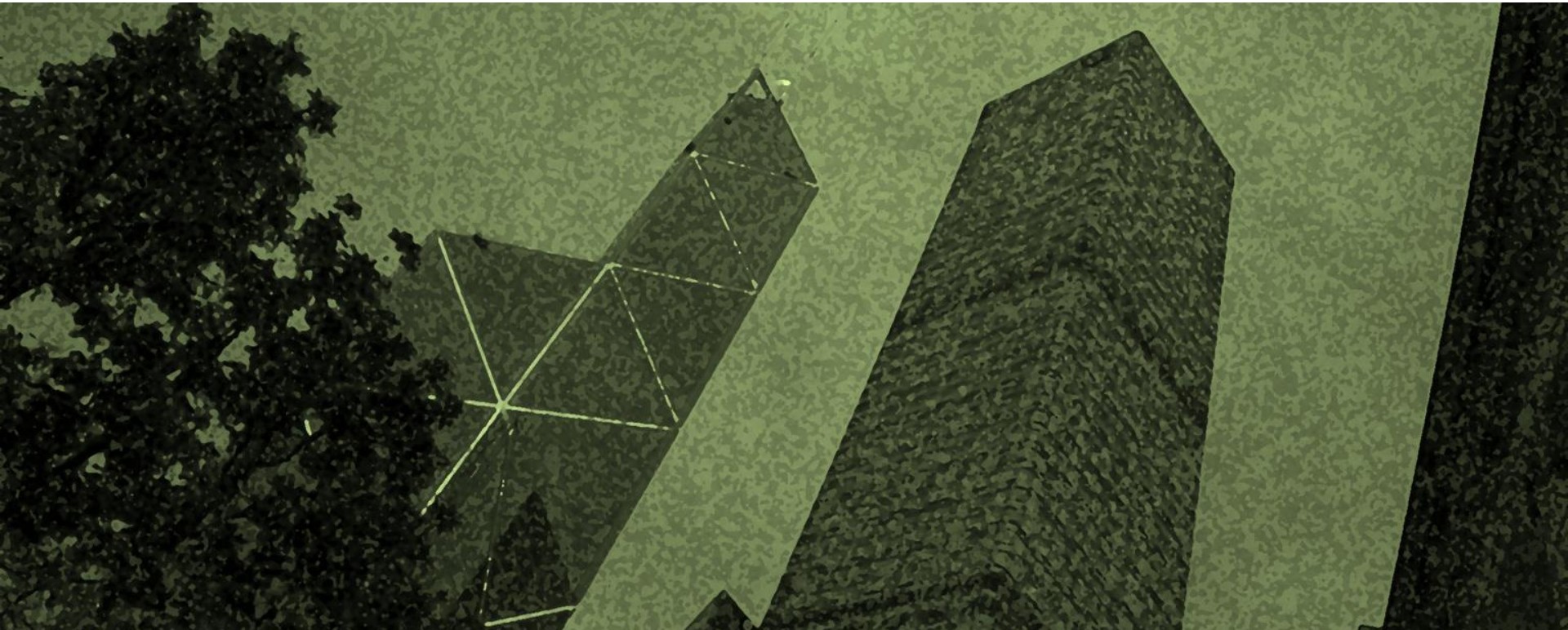
Source HEFCE Business & Community Interaction Survey 2010-11

Knowledge Institutions – RD&E Hospital

The RD&E Hospital is a regional centre for diabetes, medicines for children and stroke clinical trials

- The Royal Devon & Exeter Hospital (RD&E) employs 6,700 staff and in 2011/12 delivered over 300,000 outpatient attendances and over 115,000 day cases.
- The RD&E is a knowledge institution in its own right attracting £10m of annual funding from the National Institute of Health Research (NIHR). The RD&E pilots new ways of working and patient care for the Department of Health and the National Institute for Innovation before it is rolled out across the NHS. Along with the School of Medicine, the RD&E is one of the partners in the Quintiles Peninsula Prime site.
- The RD&E hosts four of the eight Local Research Networks in the South West. (Local Research Networks are part of National Institute of Health Research). These are: Diabetes Research Network; Medicines for Children Research Networks; Stroke Research Networks and the Peninsula Comprehensive Local Research Networks.
- The RD&E is a regional specialist centre for recruitment in diabetes, medicines for children and stroke clinical trials/studies. The Trust was involved in conducting 577 clinical research studies during 2012/13 and in the last quarter of that period, 77 commercial trials were reported of which 46 were closed.
- The Exeter Clinical Research Facility at the RD&E provides services for clinical research that can be used by commercial companies, for undertaking experimental medicine research and those requiring research and tissue banks. The CRF manages the Peninsula Research Bank and the RD&E Tissue Bank which collects tissue for forthcoming studies examining biomarkers.
- Other areas of research include surgical research examining the benefits of robotic surgery in the training of surgeons and monitoring performance under pressure.
- Although the population of Exeter is not large enough to provide enough scale within the area of clinical trials, the fact that the RD&E and the Medical School are key partners of the South West Quintiles Prime Site and the South West Health Innovation Network is of significant importance in terms of providing greater scale through a South West health network and access to a larger and stable population.
- The RD&E's level of translating research into commercial opportunities has not been as large as expected and there has also been a limited number of spin outs. However, this is an overall issue within the NHS, where potential barriers are perceived in areas such as Intellectual Property ownership and potential patenting.

5. Labour market, skills and employment



Labour Market, Skills and Employment

A knowledge economy strategy is only a suitable approach if there is a strong skilled labour force to build from.

Scale

As a relatively small City by international standards, it is useful to examine the scale of Exeter as a centre for employment. Such an analysis can provide some context for the scale of ambition and also whether other similar sized locations have been able to develop a strong and high profile knowledge economy.

The resident population of the City of Exeter was recorded at 117,800 in the 2011 census. The Office of National Statistics estimates (Annual Population Survey) that in 2011 net in-commuting adds a further 33,600. The economically active population in Exeter is 63,000 and as a result the workforce could be estimated at about 96,000. This is illustrated relative to other comparator locations in the table below.

The table demonstrates that Exeter has a similar size of economically active population to Cambridge, Norwich and Warwick – with a surprisingly high percentage of the population who are economically active compared to these locations.

Where the scale of Exeter is somewhat lower than Cambridge and Norwich is in attracting in-bound commuters. In the case of both Cambridge and Norwich the inbound commuters add more than 75% again to the economically active population. Exeter adds a smaller proportion although still draws in more than 50% again. The result therefore, is that Exeter has a similar workforce to York (despite York being a larger City), has a significantly higher population than Warwick – but is smaller in workforce terms than Cambridge and Norwich.

In terms of the origin of in-commuters, Exeter mostly attracts commuters from East Devon, Mid Devon and then Teignbridge.

Once conclusion that may be drawn from the data is that there may be the opportunity to grow the workforce of Exeter as the City gains more economic critical mass and commuters are attracted in greater numbers. Cambridge and Norwich gain commuters in greater concentrations from neighbouring Authorities and from a greater distance away.

2011	Cambridge	Norwich	Exeter	York	Warwick
Economically Active	69,000	77,100	63,900	106,300	70,300
%	77	77	82	77	75
Net commute	+52,800	+64,958	+33,600	+2,078	-5,902
Implied workforce	121,800	142,058	96,000	108,378	64,398

Source: ONS Annual Population Survey 2011 Mickledore interpretation

Labour Market, Skills and Employment

With a high economically active population and a very low proportion of people with no qualifications, Exeter could be argued to have an exceptionally well performing labour market.

Skills

The skills of the workforce are examined from a qualification perspective by the Annual Population Survey on an annual basis. The table below sets out the skills of Exeter from the perspective of both the City and the commuter area (Exeter, East Devon, North Devon, Teignbridge). This is compared with the Local Authority areas of the competitor locations.

It can be seen from the table that the proportion of the working age population achieving NVQ4+ (degree or higher) is marginally lower than the reference group with the exception of Cambridge which has an exceptionally high proportion of graduates (or above) in the working age population.

The City of Exeter has a higher proportion of NVQ4+ residents of working age than the national average (34.2%) and as a result can be judged as moderately strong – but unremarkable. Of course some of the graduates may live outside of Exeter and in-commute, but when the total commuter area (including Exeter) is considered the proportion of graduates in the working age population drops. It should also be noted that each of the other locations are likely to employ a significant number of in-commuting graduates as well.

Conversely, Exeter residents are very unlikely to have no qualifications and this may bely the data on the high proportion of economically active residents. The table shows that 96.9% of the population has some type of qualification and this is high compared to the national figure (UK 90.1%) and relatively high when compared to the knowledge economy comparators. This could be argued to demonstrate a very well performing labour market.

2012	Cambridge	Norwich	Exeter	Exeter Commute	York	Warwick
% with NVQ4+ - aged 16-64	65.8	40.6	38.8	33.3	41.3	43.5
% with NVQ3+ - aged 16-64	74.8	60.8	60.4	57.0	65.6	62.9
% with NVQ2+ - aged 16-64	80.9	74.0	79.1	77.5	79.8	75.6
% with NVQ1+ - aged 16-64	89.0	85.1	92.4	89.8	90.6	82.9
% with other qualifications - aged 16-64	5.6	5.8	4.5	N/a	2.9	9.2
% with no qualifications - aged 16-64	5.4	9.1	3.1	6.3	6.4	7.8

Source: ONS Annual Population Survey 2012

Labour Market, Skills and Employment

Occupation data tends to reinforce a view that the depth of large employers in the Exeter knowledge economy at present is not high.

Occupation

The occupation of the workforce is examined from an occupation perspective by the Annual Population Survey on an annual basis. The table below sets out the occupation of residents from the perspective of both the City and the commuter area (Exeter, East Devon, North Devon, Teignbridge). This is compared with the Local Authority areas of the competitor locations.

The data is perhaps consistent with Exeter operating as a regional city economy – with key regional companies managed from the City and many of those managers living outside the City boundary, but at the same time the service sector function of the regional city economy involving a large number of 'elementary occupations'. The data does not suggest any barrier to Exeter's aspirations to further its knowledge economy activities but the relative paucity of Associate Professional and Technical Occupations is at least consistent with the findings in the earlier section that the depth of large employers in the knowledge economy at present is not high.

2012	Cambridge	Norwich	Exeter	Exeter Commute	York	Warwick
Managers, directors and senior officials	5.3	4.9	9.7	11.3	9.2	12.0
Professional occupations	44.8	22.3	20.9	20.0	23.2	30.4
Associate prof & tech occupations	13.9	19.9	8.0	11.9	12.4	15.3
Administrative and secretarial occupations	7.5	9.4	10.6	11.0	11.3	9.0
Skilled trades occupations	4.5	7.2	4.7	11.8	10.2	5.1
Caring, leisure and other service occupations	5.9	8.4	14.0	9.4	8.3	4.5
Sales and customer service occupations	3.9	12.3	6.5	6.5	9.9	11.5
Process, plant and machine operatives	1.8	2.3	7.7	5.8	4.3	2.7
Elementary occupations	12.4	11.8	18.0	12.6	11.2	9.0

Source: ONS Annual Population Survey 2012

Labour Market, Skills and Employment

In the state sector, education attainment in Exeter is in line with the average for England.

Educational Attainment

The educational provision in the age group 16-18 is shown in the table below. This shows the performance of these institutions compared to the national average. The table shows that on most measures the provision in the Exeter state sector is close to the National average for A level results (and exceeds the national average for the percentage of students at KS5 going on to sit and then pass their A levels).

In the case of the independent sector, Exeter has two high performing schools with Exeter School and The Maynard School. Both of these schools significantly exceeded the national average for their A level attainment.

Whilst education provision appears to be reasonable in Exeter, the number of young people entering the labour market is likely to be relatively low compared to the average for England. The population of Exeter has relatively fewer young people as a total of the population compared to the National average. In Exeter 18% of the population are 17 or below; the figure for England is 20%.

2012	% of KS5 students achieving 3 or more A levels at A*-E	% of KS5 students achieving 2 or more A levels at A*-E	% of KS5 students achieving at least 1 A level at A*-E	Average point score per A level student	Average point score per A level entry
England - all schools and colleges	55.5	63.7	68	754.5	214.8
England - state funded schools and colleges	52.3	60.7	65.3	736.2	210.2
Clyst Vale Community College	83	97	100	753.7	200
Exeter College	39	47	50	680.5	211.6
Exeter School	100	100	100	906.1	249
Exeter Tutorial College	57	100	100	645	205.2
The Maynard School	100	100	100	926	243.2
St Margaret's School	72	97	100	655.3	211.2

Source: Performance tables – Department for Education 2012

Labour Market, Skills and Employment

18.8% of students at the University of Exeter originated from the LEP area in 2011/12. only 16% of the total students graduating that year gained jobs in the LEP area.

University of Exeter

The largest educational establishment in Exeter is the University of Exeter. In the 2011/12 HESA returns the University reported a total number of 18,720 students (including part time) and these student numbers were broken down as follows:

	Origin	No.
Post Graduate	UK	2,715
	Other EU	330
	Non EU	1,475
	Total	4,515
Under Graduate	UK	11,000
	Other EU	615
	Non EU	2,585
	Total	14,200
Grand Total		18,720

Source: HESA

Of the UK students selecting the University of Exeter 18.8% were domiciled in the Heart of the SW LEP area; 20.3% were domiciled in the South West more generally; 34.3% originated from London and the SE; and the remaining 26.6% originated from elsewhere in the UK (figures HESA derived by Heart of SW LEP).

After completing their studies, of those students of the University of Exeter who were in work 6 months after completing their studies, 22% were working in the SW LEP area suggesting that more students stay in the area than were living in the area at the outset – although this can be misleading since the retention rates only consider those in work – if all students are considered the figure falls to 16%. A smaller proportion of students therefore got a job in the LEP area 6 months after graduation than were domiciled in the LEP area before their studies began.

The subject area of leavers is set out in the table overleaf. This shows all leavers in percentage terms and illustrates that the most popular subject area for leavers is in biological sciences. Overall it demonstrates that 36% of Exeter graduates are involved in STEM related subjects.

Labour Market, Skills and Employment

A 1 percentage point increase in the graduate retention rate could add 70 STEM related graduates into the local workforce each year.

Subject area of leavers

	%
Medicine & dentistry	3
Subjects allied to medicine	1
Biological sciences	19
Veterinary science	0
Agriculture & related subjects	0
Physical sciences	7
Mathematical sciences	3
Computer science	0
Engineering & technology	4
Architecture, building & planning	0
Social studies	13
Law	4
Business & administrative studies	5
Mass communications & documentation	0
Languages	13
Historical & philosophical studies	8
Creative arts & design	3
Education	16
Combined	2
Total	100

Source: HESA

The table shows the subject area of graduates rather than the area in which they subsequently find work.

Overall it can be seen that if 1% more students remained in the area and those staying reflected the average proportions of students graduating in STEM subjects, this would add a further 70 STEM graduates to the workforce.

A more positive, and clearly true message, is that there is a high number of STEM graduates produced in Exeter each year with the majority not finding employment in the area – and the belief that if more opportunities were available, a greater number of students could stay.

A study with recommendations on graduate retention has recently been produced by the Heart of the SW LEP and it was from this paper that many of the HESA statistics were drawn.

Conclusion

The conclusion that can be drawn from all of this evidence is that Exeter has a labour market which is comparable in size to other areas and with an increase in scale of economic activity could be reasonably expected to attract a workforce from a greater distance than is currently the case.

Employers have anecdotally made reference to a shortage of skills and in particular skills in mathematics and science – but these comments have not been particularly specific or widespread. Whilst there is no doubt that high quality staff with a mathematics or science background are in short supply, this is not a problem that is unique to Exeter – and indeed, in the attraction of STEM graduates, companies in Exeter may reasonably expect to have access to a greater number than elsewhere as a result of the University and its relatively low retention rates. In reality, however, employer references to skills are often referring to graduates who already have some Company

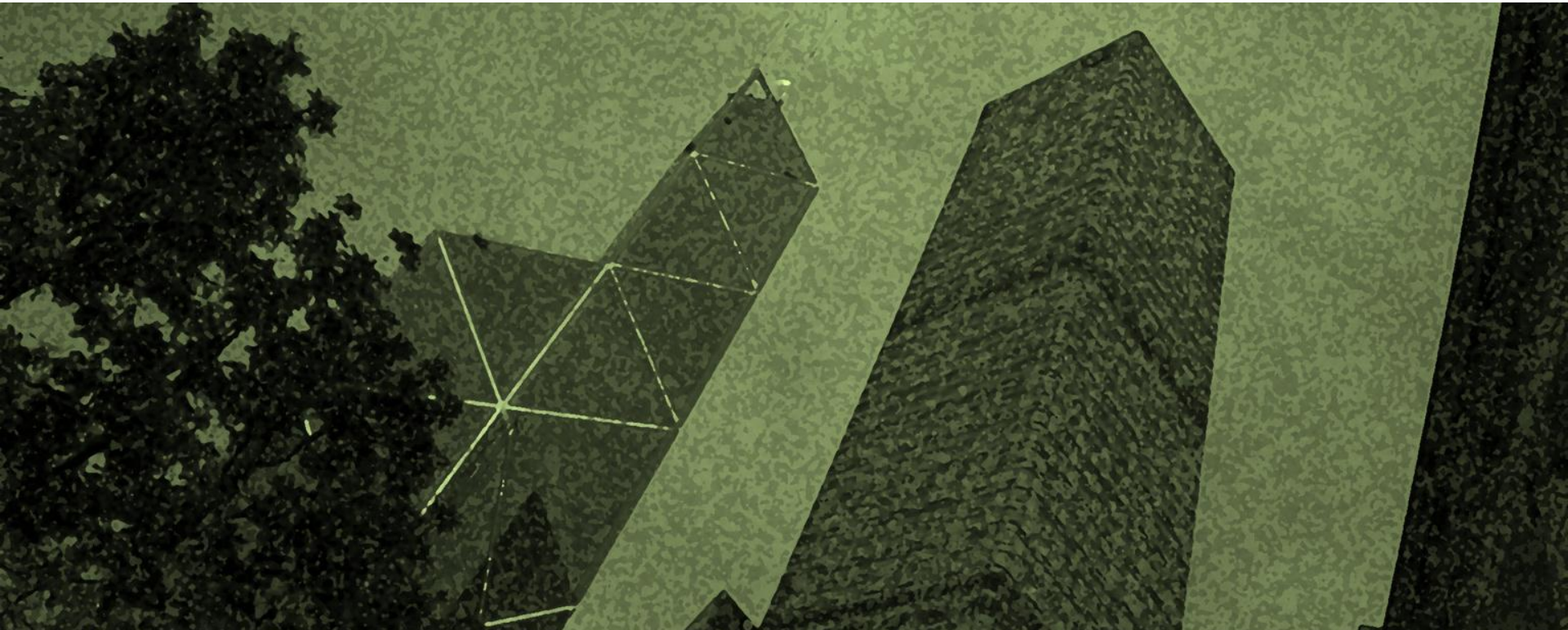
Labour Market, Skills and Employment

- **There is nothing in the skills profile that precludes a shift towards a greater proportion of knowledge economy activity - and indeed greater activity in the local economy may allow a greater retention of graduates.**

experience.

The mix of skills attainment, occupations and the output from schools in Exeter is in keeping with the national average with some stand out features. Overall the skills profile of the City of Exeter and its catchment area does not preclude a knowledge economy – but nor does it demonstrate an economy that is currently disproportionately involved in knowledge economy activities.

6. Sector Opportunities



Opportunity Framework - Sectors

Big Data - Trends

It is estimated that 'Big data' will become a $10bn industry for healthcare alone

- There is no official or industry definition of what constitutes 'big data'. However, big data could be considered as datasets whose size is beyond the ability of typical data software tools to capture, store, manage and analyse.
- Considerable amount of data is being created on a daily basis. It is estimated that 90% of the data in the world today has been created in the past two years; every minute 100,000 tweets are sent globally and Google receives 2 million search requests.
- Data is therefore continually gathered from a considerable variety of sources ranging from social media sites, electronic patient records, mobile signals, satellites, sensors and smart meters. Invariably, this also presents the challenge of integrating information from multiple data sources.
- The growth of big data has been facilitated by advancements in computer memory storage and processing, making it possible to store and analyse huge amounts of data.
- The potential benefits of utilising big data are significant both in scale and scope. Data analysis of huge data sets has become much easier. Big data is being seen as source of major competitive advantage with industry predictions that businesses who do not exploit it will not survive.
- The continued growth of mobile devices is driving big data investment. These devices with their location, communications and portability present a consumer platform ideally suited to big data innovation. For example, 'MapMy Fitness' was developed by a technology company as a tool by which joggers could map their routes/performance and was subsequently expanded to provide a wide variety of fitness activities as well as personal health monitoring.
- The growing use of big data will help open new commercial opportunities, such as businesses providing data aggregation and analytics services to a diversity of businesses in areas ranging from climate change to manufacturing.
- Many sectors have already embraced big data such as banking and retail, as well as less high profile sectors such as agriculture. The growth of the importance of big data and analytics is demonstrated by Monsanto's recent acquisition for over $1bn of a big data company that monitors weather conditions from which they provide customised crop information and crop insurance.
- A sector which has traditionally lagged behind in the use of big data is the health sector. However, given the cost challenges that the UK health sector is likely to continue to experience, combined with new practices such as the increased digitalisation of patient records, big data has the potential to make a considerable impact in this sector. McKinsey & Company's 'Big Data: the next frontier for innovation' report (2011) estimates for example, that medical clinical information providers which aggregate data and provide analytical services to improve health care efficiency has the potential to develop into a market of more than $10bn by 2020.
- A significant constraint on maximising the economic opportunities generated through big data will be related skills shortages, particularly relating to mathematics, statistics and computer science skills. The skills required to build systems that capture, store, analyse and create predictive analysis are in short supply, requiring a focused and sustained approach to ensure there is a pool of talent to serve this area.

Big Data – Existing Assets

Despite some University (and company linkages) in 'big data', The University of Exeter is not listed in Sir Andrew Witty's top 39 UK institutions for the area

- The University of Exeter has a number of faculties and departments with a research focus on big data. The Computer Science department has a strong emphasis on artificial intelligence and big data as well as research activity relating to machine learning and the next generation of computers.
- The Mathematics department addresses a range of topics in applied mathematics, pure mathematics and statistics that relates to big data, including data analysis for undertaking areas of short-term (weather predictions) and long-term predictions (climate change). Research is also undertaken to integrate different data sets to investigate linkages between human health, weather and climate.
- The University of Exeter Business School is also an important asset in research relating to the use of big data. Its Centre for Finance and Investment has significant research strengths in financial econometrics and risk management. Research areas include modelling commodity prices and weather derivatives.
- The University's interdisciplinary approach is reflected in the Exeter Climate Systems is an interdisciplinary research centre whose main research themes include the use of big data to develop the next generation of weather prediction models.
- Inter-disciplinary activity is also at the heart of the Exeter Initiative for Statistics and its Applications (ExISta) which is based at the University. It is a membership organisation which brings together statisticians within the University, the local public and private sector to foster and promote inter-disciplinary statistical activity through events and networking.
- Although the University has a number of big data related research activities, in relation to big data research being undertaken by other research institutes, the preliminary findings of Sir Andrew Witty's Review of Universities & Growth (June 2013) which lists the top 39 UK research institutes that have received grants from the UK Research Councils in relating to big data technologies, the University of Exeter is not included in this list.
- An asset that is a considerable differentiator in Exeter's position in the area of big data, is the presence of the Met Office which has a deep and concentrated pool of employees with specialist experience of managing and analysing big data.
- The Met Office was recently given responsibility by the Government for developing astronomical weather predictive capabilities. This involves managing huge data feeds from images and satellites that is presented to forecasters near to real-time. As part of this process, the Met Office is using a MongoDB-powered NoSQL database to predict these space weather events. NoSQL databases are finding significant and growing industry use in big data and real-time web applications.
- Exeter has a small existing base of statistical/analytics related companies. This includes ATASS Group, a statistical modelling and research services company founded in 1998. More recently, another statistical services company, Select Statistical Services was established by a former employee of ATASS. Foreign owned companies in the area of data analysis includes First Databank, a US owned company that uses drug data to provide drug 'knowledge' to inform medication decision support.
- The growth of big data is anticipated to see an increase in the demand for specialist skills such as mathematics, modelling, statistics and software engineering. These are areas where there are UK skills shortages and where the University of Exeter with strengths in mathematics and in the longer term, the specialist maths Free School in Exeter, which is anticipated to make an impact in increasing the take up of STEM related degrees; thus helping to provide a source of new local talent.

Big Data – Opportunities

The Met office supercomputer and the external access it will allow is a game changer. We believe that this should propel Exeter into a TSB Catapult Centre for 'big data'

- Big data is already creating considerable growth opportunities and creating new industries. Within the context of Exeter's assets, big data could be a significant opportunity to grow Exeter's knowledge economy, particularly in risk management/resource planning and data analytics. This has commercial applications across a wide range of sectors but could be focussed in sectors which are already important in Exeter, including climate change, the environment, health, medicine and agri-tech.
- Within the field of big data, areas that are anticipated to grow and are computer, electronic products and information sectors. The advances in data storage is likely to increases the level of instrumentation used (e.g. radars, sensors, autonomous systems), with innovation in the area of devices to collect, analyse and monitor data, such as medical devices for use in early detection of health complications. The use of sensors and monitoring devices by the Met Office and South West Water for example, may potentially create supply chain opportunities for new and/or existing companies in this area.
- The growing number of research institutions in the area of big data would indicate that it could be an idea to position Exeter around the areas of research expertise of the University of Exeter, notably in the areas of health, climate and plant science.
- The Government's Autumn 2012 Statement which announced the 'eight great technologies that will propel the UK to future growth' included the announcement of £189million of funding for big data and energy efficient computing in areas such as earth observations and medical science. Government funding in the area of big data and health has resulted in the launch in 2013 of two new university centres. The importance of the benefits of big data in the agricultural sector has also been recognised, with a recent announcement for funding of £10m announced for a Centre for Agricultural Information and Metrics of Sustainability.
- In addition, the Technology Strategy Board (TSB) is due to launch a major call in big data and data exploration in 2014. The growing availability of government funding for areas of research relating to big data could give Exeter the opportunity for increase its research standing in the area of big data, especially in the areas of its niche expertise.
- The Met Office's supercomputer is due to be to be replaced in 2015. This supercomputer will be located within the Exeter Science Park with external access permitted in order to enable collaboration with private businesses. This could potentially provide the Exeter Science Park with a significant asset for developing its knowledge economy.
- Exeter already has in place a number of groups which could be maximised to increase collaboration in the area of big data to raise the expertise of the locality in this area at a regional, national and international level.
- This includes ExISta, mentioned on the previous page which recently hosted in Exeter 'Talking Data South West', the region's first conference aimed at showcasing data related activities in the South West. The Exeter Strategic Corporate Partners initiative, with IBM as ones of its first partners also presents openings for collaborative activity.
- A potential constraint on maximising the economic opportunities from big data is likely to be around skills shortages, notably in areas of statistics, mathematics and machine learning. Exeter has the opportunity for Exeter to maximise the potential from the new maths school (particularly as it is only one of two such schools in the UK) and support other similar STEM skills/learning initiatives.

Big Data – Actions

Explore opportunities for accessing finance from the TSB funding call on 'big data' which is expected to be launched in early 2014

Impact of knowledge economy on existing businesses

- Identify existing information services/IT businesses in the areas of data aggregation and data analytics to ascertain whether a cluster group could be established to share best practice and knowledge exchange with relevant institutions.
- Identify existing businesses in the area of electronic products and monitoring devices and ascertain opportunities for cross working with information services related companies and cross linkages across different sectors such as medical devices and climate change.
- Work with the University of Exeter to encourage take up by local businesses of expertise and facilities within the University. For example, maximising opportunities through any Knowledge Transfer Partnership (KTP) calls in the area of 'big data'.
- Explore potential openings through the University of Exeter's recently launched 'Strategic Corporate Partners' as it develops to ensure that local businesses benefit from collaboration in the area of big data.
- The longer-term availability of the Met Office's new supercomputer for businesses, could make a notable impact on existing businesses. As this is put in place, at the time, ensure local businesses are aware of this service and how to maximise its potential. This has regional and national significance.

Spin-outs from existing organisations

- The creation of new industries as a result of big data may encourage spin-outs from institutions and companies. Ensure 'soft landing' provisions in place to support such spin-outs as well as network of professional services organisations to support spin-outs.

Attraction of new investment

- Develop marketing strategy to position Exeter at the centre of activity around big data, risk management/resource planning and data analytics. This could also be aligned within areas that have commercial applications in Exeter's sector strengths of climate change, water, agri-tech and health.
- Maximise the PR benefits of Exeter's USP of being the base of the Met Office and of one of the world's largest supercomputers.
- Leverage the collaborative and commercial relationships within the Met Office that are aligned to Exeter's key sectors. Identify international linkages such as with NASA and the US National Oceanic and Atmospheric Administration that could be used to raise the profile of Exeter in target overseas markets.
- Identify big data related local, regional and national networking groups such as ExISta, South West Big Data and Big Data Insight Group so as to develop networking opportunities and for identifying key trends to attract new investment into Exeter.
- Establish a network of high profile big data 'ambassadors' such as Dr Dennis Gillings, Quintiles and appropriate contacts within the Met Office who could potentially promote Exeter as a centre of big data expertise.

Supporting the existing base to grow institutions

- Work with the University to explore the opportunity to gain Government and private sector investment into big data research centres, particularly in climate change, health and agri-tech.
- Work with the University of Exeter to explore opportunities for the TSB call in early 2014 on big data in areas such as the exploration of various types of data across application areas or sectors, which reflect Exeter's sectoral strengths.
- Push for Catapult Centre recognition in the area of 'big data' on the back of the super computer investment.

Climate Change - Trends

Adaptation to climate change is set to become a huge market. The global market for Adaptation & Resilience for Climate Change was estimated at £69bn in 2011/ 12

The impact and anticipated changes to the global climate as a result of climate change has led to the development of a new market for goods and services in this area. Given the broadness of climate change as sector, the latter should be considered within the context of the two main policy responses to climate change, that is mitigation and adaptation. Mitigation addresses the root causes, by reducing greenhouse gas emissions, while adaptation seeks to lower the risks posed by the consequences of climatic changes. Up to now, there has been a strong focus on mitigation (e.g. switching to low carbon sources of energy) whereas current trends indicate that in the years ahead, greater emphasis will need to be placed on adaptation.

- Given Exeter's assets in climate change, the area is well placed to position itself as a centre of excellence in climate change, particularly with reference to adaptation.
- The UK Government's National Adaptation Programme (July 2013) highlights the significant commercial opportunity adaptation offers. The Department of Business Innovation & Skill's (BIS) 'Adaptation & Resilience Climate Change Report (2013) indicates that global A&RCC (Adaptation & Resilience for Climate Change) sales in 2011/ 12 were worth £68.7bn, compared with 2010/11 where the value was at £65.8bn.
- BIS uses the Defra definition of the A&RCC sub-sector which provides a focus when considering the opportunities for Exeter:
  - Construction & Retrofit
  - Finance, Investment & Insurance
  - Risk Management & Business Continuity
  - Urban Environment Redesign & Re-Engineering
  - Sustainable Drainage & Water Management
  - Energy Storage Infrastructure Resilience
  - Transport Infrastructure & Logistics Resilience
  - Water Irrigation & Water Footprinting
- Globally, the UK is positioned seventh overall, (by value of A&RCC sales), with 3.1% market share, behind the US, Germany and France. The UK is ranked fifth for Risk Management & Business Continuity; sixth for Architecture, Sustainable Drainage & Water Management; seventh for Construction & Retrofit, Environmental Finance, Transport Infrastructure, Finance Investment & Insurance; and eighth for Water Irrigation and Climate Change Management. UK A&RCC sales in 2011/12 were valued at £2.1bn.
- The UKTI and Economist Intelligence Unit report "Adapting to an Uncertain Climate: A World of Commercial Opportunities" (2011) considers the four key sectors that are likely to present significant commercial opportunities and so also provides a considered focus for how Exeter could position itself. The sub-sets of water management (Defra) and agriculture and life sciences (UKTI) are considered separately in this report.
- The four sub-sectors considered in the UKTI report are: financial services; infrastructure and construction; agriculture and life sciences; and professional services and consulting; Of these four, the latter represented the area which generated the most income, accounting for 24% of generated income as compared to 15% in financial services and 19% in infrastructure.
- The area of professional and consulting services relating to climate change is likely to increase further. This includes consulting engineering; legal and management consulting and particularly in areas of risk assessment/management and enhancing business resilience. A number of global consulting firms such as Atkins and URS as well as smaller niche consultancies are providing services in climate change risk assessment.

Climate Change – Trends & Existing Assets

The Met Office has a climate adaption team providing services in this area – this is a natural differentiator for Exeter within the UK in this emerging sector

- The range of more specialised knowledge driven consultancy and services is expanding. Emerging climate services include firms providing specialist climate modelling services, especially for insurers and reinsurance firms; requiring expertise in big data management. Software development is also key to climate adaptation, with companies developing software to help analyse the impact of natural disasters and other specialised climate services.
- Adaptation will also require support in areas such as designing flood defences, re-engineering gas pipelines.

Existing Assets

- Exeter has considerable knowledge assets in the area of climate change and is distinct in being the location of the Met Office's headquarters. The Hadley Centre is an international research centre in climate change, modelling and prediction with capabilities to deliver climate predictions over a timescale of 10-20 years as well as the capabilities for assessing long-term global climate changes. With a total of 2,000 employees, the majority being in scientific, research and forecasting activity, this presents a concentrated pool of knowledge employees.
- The Met Office's research on impacts, risk and opportunities of climate change is growing in importance. The Climate Adaptation team provides services such as assessments of organisations' vulnerability to current weather and climate, and how different adaptation options may reduce future risks.
- Although only 10% of the Met Office's services are in commercial services, this is an area that it is looking to grow further and so will increase its reach into a wide range of industries ranging from finance to energy.
- The fact that the Environment Agency also has its regional office in Exeter, with 450 staff also adds considerably to the locally based expertise; with activities including policy, environmental management . Climate SouthWest, based within the Environment Agency in Exeter has a remit to ascertain the effects and impacts of climate change in the region and develop adaptation responses across a number of prioritised sectors including business & utilities; transport; agriculture and health.

Research & Development

- The University of Exeter has Climate Change & Sustainable Futures as one of its 5 interdisciplinary themes. Research expertise includes climate modelling, risk management for business; mitigation and adaptation. Exeter Climate Systems is an interdisciplinary research centre whose main research themes include developing the next generation of weather prediction models and storm risks.
- The Computer Science department has strong links with Met Office and has three joint professorships researching weather and climate system modelling.
- Addressing the issues of adaptation is a key plank of the Exeter's Business School One Planet MBA (in partnership with WWF). The Business School's Centre for Risk & Ambiguity focusses on research areas in risk and uncertainty, particularly long term risk.
- The interdisciplinary approach to climate change combined with the University of Exeter's strong linkages to the Met Office, The Environment Agency and companies such as Willis, and Lloyd's puts the University in a significant position within climate change research.

Climate Change – Opportunities

The main area of opportunity for the locality in A&RCC is likely to be within risk modelling and consulting services

- The growing importance of the A&RCC sector and the UK's global position of 5th (by sales) in Risk Management and Business Continuity provides Exeter the opportunity to position itself strongly within the area of risk management/resource planning and data analytics.
- Exeter has a small but established professional services and engineering consulting base of businesses, an area which could have the opportunity to grow; through the creation of start-ups, organic growth of existing companies and the attraction of niche companies to the locality.
- Although the University of Exeter has strengths in finance, investment and insurance (e.g. weather derivatives), given the pull of London, it is unlikely that financial and insurance related operations could develop to a critical strength locally.
- It is also less likely that Exeter can position itself as a centre of manufacturing related to the A&RCC sector and that the main area of opportunity for the locality is within risk modelling and consulting services, However, an area where there might be some potential in relation to manufacturing relates to the Met Office supply chain.
- Expenditure on satellites represented over half of capital expenditure in 2012/13. Components for radars need to be sourced within a tight timescale and so proximity to the Met Office is important. At present some of these suppliers are in Germany and the US as these are not available locally.
- There are a number of local companies, who with support may have the potential to increase their capabilities in this area. Consideration should be given to weaknesses in the local supply chain where support from the University of Exeter and business support organisations such as the Manufacturing Advisory Service could enable these businesses to supply the Met Office.
- The presence of the Climate Change SouthWest in Exeter which has as its remit to increase the level of adaptation within their priority sectors, also provides an opening for positioning Exeter as an area where there is a high proportion of businesses putting in place measures for adaptation as well as energy efficiencies. This could help to increase the profile of Exeter and the locality as excelling in climate adaptation.
- The growth of the A&RCC sector is likely to see an increase in the demand for specialist skills such as risk management, modelling, software and engineering. These are areas where there are UK skills shortages and where the University of Exeter with strengths in mathematics and a growing School of Engineering has particular strengths. In the longer term, the specialist maths Free School (16-19) which will be run by the University of Exeter and Exeter College is anticipated to make an impact in increasing the take up of STEM related degrees; thus helping to provide a source of new local talent.
- The wide range of collaborative and commercial relationships within the Met Office also provide a potential to leverage those alliances for the future development and growth of the Exeter knowledge economy. The Met Office has considerable international linkages and collaborations including with WHO, the American National Weather Service as well as with companies ranging from EDF Energy to Willis.

Climate Change – Opportunities & Actions

There is an opportunity for Exeter to gain a greater profile in the area of 'Adaptability' and this is a subject which is about to gain lift off from an industry perspective

- The presence of the Met Office, the Environment Agency, the related R&D expertise of the University of Exeter all provide opportunities for creating stronger linkages between locally based companies as well as attracting new companies to area. The latter will be made more achievable if the profile of Exeter within the arena of climate change is raised through marketing and PR activity, but also importantly through leveraging existing commercial relationships.
- Given the broad reach of climate change, it is suggested that Exeter focuses on its areas of strength and that these are matched with areas of greatest opportunity. As a result, the recommendation would be to focus on the area of climate change adaptation. In particular this would be set within the context of professional services and engineering consulting; including risk management/resource planning and data analytics.
- However, it is also important to consider opportune areas, such as building capacity/capabilities to enable a growing local supply chain for the Met Office, which could include advanced manufacturing related activity. As the A&RCC sector is still an emerging sector, it is important for Exeter to keep an open mind on other opportunities as they develop.

Actions

Impact of knowledge economy on existing businesses

- Establish stakeholders and ascertain additional assets in the area of climate adaptation.
- Explore opportunity to setting-up a local networking group in the area of climate change adaptability.
- Work closely with Climate SouthWest to identify as many companies as possible put in place adaptation measures within their businesses.
- Ensure business support mechanisms/business engagement is aligned to requirements of climate change related companies.
- Work with the Met Office to identify possible companies who with support from relevant partners (e.g. KTPs through the University of Exeter, the Manufacturing Advisory Service) have the potential to meet supplier requirements particularly in areas that have an advantage in being sourced locally (e.g. radar).

Attraction of new investment

- Map existing relevant commercial linkages within the University of Exeter, The Met Office and the Environment Agency.
- Identify potential 'ambassadors' from the University of Exeter's alumni base.
- Identify relevant national/international forums/networks for example the Continuity Forum (this Forum is for Risk and Continuity professionals within business).
- Assess opportunity for appropriate Exeter based contact to join relevant Linkedin Groups such as "AdaptAbility", an international group of practice for sustainability, risk and disaster professionals working on or interested specifically in adaptation and resilience to climate change.
- Establish a list of appropriate annual climate change conferences that could be hosted in Exeter subject to size/availability of large conference venues).

Climate Change – Opportunities & Actions

There is an opportunity to start a dialogue with the adaptability consultants and risk modelling firms that have no SW presence

- Analyse lists of potential companies not already based in Exeter (e.g. sustainability consultants, risk modelling and consulting services etc) from which to develop a target list of companies which could be pursued to present the case for a presence in Exeter.
- Future acquisitions of consultancy and engineering firms in the water sector/climate change who already have a presence in Exeter should be targeted as the re-organisation following the acquisition could be an opportunity to secure further growth in Exeter.

Supporting the existing base to grow institutions

- Work with the University of Exeter identify climate adaptation projects (for example investigating how to adapt homes to resist effects of climate change) that could be eligible for TSB funding and that might be aligned with the University's research priorities in this area.

Health - Trends

An ageing population, an increased ability to live with diseases for greater periods of time and the overall demands on the healthcare system are driving huge change – particularly in the areas of primary care

- The health sector is currently experiencing a period of huge change and challenges which is anticipated to continue into the future. The significant increase in the UK's ageing population, with an estimated number of 19 million people aged over 65 by 2050, being is one of the key factors impacting the sector, together with further pressure from the predicted rise in the number of people living with disease and disabilities.
- Over the last century, there has been a shift in key health issues from communicable diseases (e.g. tuberculosis) to non-communicable diseases such as cancer. This combined with the increase in life expectancy means that diseases will be something that people will increasingly live with rather than die from. This shift is also complicated by the fact that increasing numbers of people are living with more than one disease or health issue.
- Another significant impact on the sector is the increasing levels of obesity, with the UK having the highest rate of obesity in Europe. This is leading to a number of poor health outcomes, including a rise in diabetes. The considerable increase in diabetes (the majority being Type 2), with by 2025 estimated 5 million people will have diabetes.
- These changes mean that health spending is anticipated to become one of the biggest burdens on public spending as people live longer and the health service has to deal with more complex needs.
- Over the last 10 years, there has been considerable innovation in genetics, biotechnology, material sciences and bioinformatics. Areas such as low cost genetic sequencing; genome mapping; biomarker tests and targeted drugs are some of the advances that could lead to more tailored health informatics and personalised treatments to improve patient outcomes in the near future.
- However, technological interdependencies, for example biomarkers reliant on advances in other fields such as molecular biology and genomics, may lead to some advances being slowed down.
- The pressure on cost and resources is Increasing the drive for 'telehealth'. The latter is the delivery of health related services and information through telecoms technologies. Telehealth is making a significant impact on the shift from hospital based care to one that is more focused on patient centric diagnosis, treatment and monitoring. However, there is a risk that diagnostic advances, especially with the growth of home testing will increase rather than help meet, demand.
- Innovation and the development of new medical devices and sensors combined with new opportunities to capture data gained in the home and other care environments is likely to lead to further growth in the telehealth market.
- The impact of social media and the internet on health is expected to increase further, with researchers gaining access to data tools such as PatientsLikeMe, a patient network that provides a real-time research platform. Apps are also playing a role in supporting professionals and service users.
- There is also the opportunity to improve health outcomes through wellbeing and a drive towards healthy behaviour. However, research from the Department of Health (2012) indicates that only 40% of the population are motivated to adopt healthy lifestyles with the remaining 60% having a more negative attitude towards health.
- Medical and technological advances could facilitate a shift away from the delivery of care in large institutions to home based environments. A stronger focus on prevention and support for wellbeing could also make a considerable impact on improving health outcomes.

Health – Existing Assets

The RD&E pilots new ways of undertaking patient care for the Department of Health and the National Institute for Innovation

- The University of Exeter Medical School focuses on four major themes: Diabetes, Cardiovascular Risk & Ageing, Neurology & Mental Health and Environment & Human Health. The School has important strengths in diabetes and the role of genetics in diseases.
- The Exeter Medical School provides support to SMEs through working on joint grant funded projects to test products such as diagnostic tests and design processes. However, the overwhelming majority of these companies are not based in Exeter itself, indicating that the existing base of SMEs in this area is small or that a critical mass of companies has not been identified.
- The University of Exeter's College of Engineering, Mathematics and Physical Science has strengths in a number of areas that pertain to health. The Computer Science department uses methods such as statistical data analysis, modelling, search and optimisation for applications such as search for genetic causes of type 2 diabetes. The Mathematics department undertakes research to look at linkages between human health, weather and climate. The work of the Biomedical Physics research group looks at how to understand processes that may be involved in diseases from which to develop novel therapeutic approaches.
- A number of these research areas are also areas of particular expertise within The Royal Devon & Exeter Hospital (RD&E). The latter hosts Local Research Networks in diabetes and stroke. The RD&E is a regional specialist centre for recruitment in diabetes, medicines for children and stroke clinical trials/studies.
- The Exeter Clinical Research Facility at the RD&E provides services for clinical research that can be used by commercial companies, for undertaking experimental medicine research and those requiring research and tissue banks. The CRF manages the Peninsula Research Bank and the RD&E Tissue Bank which collects tissue for forthcoming studies examining biomarkers.
- The Peninsula Prime Site based in Exeter is a major asset, notably as it brings together clinical trials and research centres across the South West thereby creating critical mass. Although the population of Exeter is not large enough to provide enough scale within the area of clinical trials, the fact that the RD&E and the Medical School are key partners of the South West Quintiles Prime Site and the South West Health Innovation Network is of significant importance in terms of providing greater scale through a South West Health Network and access to a larger and stable population.
- Innovation is strong within the RD&E which pilots new ways of undertaking patient care for the Department of Health and the National Institute for Innovation before it is rolled out across the NHS. Examples of new technology being piloted to speed up infection diagnosis, is the trialling a new diagnostic machine that will halve the time it takes to identify infections.
- The Wellcome Wolfson Medical Research Centre due to open in the near future will enable a close partnership between the Medical School and the RD&E and will focus on research relating to the origins and causes of diabetes. The Centre will focus on 'translating 'work from the laboratories into treatments and therapies for patients.

Health – Opportunities

The Living Systems Building is anticipated to generate commercial interest from companies in the areas of medical instrumentation, pharmaceuticals and diagnostics. It will open in 2016

- The area of big data relating to health is a growing area, with two important related research centres being launched in 2013. This includes the Hitachi Europe European Big Data laboratory at The University of Manchester, which has a particular focus on improving healthcare using informatics. The Li Ka Shing Centre for Health Information and Discovery (Oxford University) focuses on approaches to generating, storing and analysing large medical science datasets to inform the understanding and treatment of human diseases.
- The growing interest in the combination of health and big data and the opening of related research centres, potentially present an opportunity for Exeter. The work of the School of Mathematics, Computer Sciences and the Medical School could also present the opportunity to position the University of Exeter as centre of expertise in the areas of big data and health, especially if focussed on different niche areas such as health and climate, particularly as the health sector will potentially be required to respond to changing patterns of health need driven by climate change.
- The Living Systems Building (due to open in 2016) will house the major research themes of systems biology and translational medicine. The interdisciplinary approach will include mathematicians, physicists, systems engineers, biochemists, cell and molecular biologists and clinical scientists. It is anticipated that this Centre is likely to create significant opportunities to generate commercial interest from companies in the areas of medical instrumentation, pharmaceuticals and diagnostics.
- The R&DE has a strong relationship with the University of Exeter's Medical School and the School of Psychology, but at present not with the Department of Mathematics. However, there is a strong recognition that the use of data analytics/modelling in health and medicine presents a very important opportunity for Exeter and that more could be make of linkages between the R&DE and the Met Office around illness prediction based on weather conditions.
- The RD&E is putting in place full digital records for its patients, which is a joint project with Musgrove Park Hospital. It is expected that there might be a level of interoperability with other hospitals in the South West. This could lead to future opportunities for trials in telehealth research projects.
- At present, the translation of ideas from the RD&E into commercial opportunities has not been as significant as expected. There is limited spin-out activity from the R&DE. With every NHS Trust in England now having a regional NHS Innovation Hub (Innovation South West) who are experts in commercialising healthcare IP, this could be an opportunity to further encourage an increase in spin-outs from the RD&E and other local Trusts.
- Existing expertise within Innovation South West (NISW) could also present an opportunity for the University of Exeter and the R&DE to work more closely together, such as is demonstrated by the Durham and Newcastle Universities' Knowledge Transfer Account (KTA) with local NHS Trusts. This is a knowledge transfer scheme that takes outputs from research from both universities funded by the Engineering and Physical Sciences Research Council (EPSRC) and commercialises them in the healthcare sector. A unique feature of the scheme is that it uses the clinical base of the NHS Trusts to translate the engineering and physical science research results into a position where they can be exploited by the healthcare industry.

Health – Opportunities & Actions

Quintiles, founded by Dennis Gillings, a mathematics alumnus from the University of Exeter is now of the world's largest provider of biopharmaceutical development and commercial outsourcing services

Opportunity - continued

- The recent establishment in 2012 of the Quintiles Prime Site (one of two in the UK) is potentially likely to increase the RD&E ability to attract further clinical research, particularly for trials in new drugs and the location of the Wellcome Wolfson Medical Research Centre on the RD&E site will also potentially present significant opportunities for more commercial collaborations.
- Quintiles, founded by Dennis Gillings, a mathematics alumnus from the University of Exeter, has at the core of its business the use of clinical data analysis and management to significantly improve the success of clinical trials. Quintiles is now of the world's largest provider of biopharmaceutical development and commercial outsourcing services. As a result, this could provide significant PR and marketing potential to promote Exeter as a centre of expertise in health combined with data analysis, an opportunity which is not currently maximised.
- The Quintiles commercial research activity includes live or pending patents, providing a potential pipeline of patent opportunities. In addition, The University of Exeter's Commercial Intellectual Property catalogue includes a number of medical related opportunities, including in biosensors for malaria diagnostics and diagnostic biomarkers. These provide opportunities for commercialisation.
- With the universities ever competing for more funds and commercial linkages, a clear understanding of the research strengths of a Medical School and differentiators between other medical schools in the UK is important. The already strong base in diabetes research, with recent predictions from the Department of Health that by 2035, diabetes will cost the NHS £16.8bn, 17% of its entire budget, this is likely to be an

Area of important opportunity, especially in preventing the onset of diabetes with health checks and better education on lifestyle changes to prevent it, leading continued growth of medical devices in area of monitoring and management systems.

Actions

Impact of knowledge economy on existing businesses

- Work in partnership with medical/health related business support organisations such as Innovation South West and Medilink South West to provide support for commercialising health technology products, especially within start-ups and SMEs.
- Identify local professional services experts particularly in the area of IP, patents and related to the medical sector who can provide specialist support.

Spin-outs from existing organisations

- Work with the RD&E to ensure that the infrastructure is in place to support spin-outs from the RD&E and that where possible relationships with related support organisations (e.g. Medilink, Innovation South West) are maximised and promoted.
- The Interdisciplinary nature of the Living Systems Building could present opportunities for spin-outs. With the anticipated opening in 2016, this provides opportunities for the City to explore opportunities with the University of Exeter for creating a 'soft landing' initiative to support potential commercial opportunities.

Health – Actions (*cont.*)

Develop linkages with Healthcare UK (a joint venture between the Department of Health and UKTI to promote the UK's healthcare expertise)

Attraction of new investment

.

- Develop a marketing strategy which identifies the differentiators of the Medical School and other Exeter health 'assets' compared to other potential competing locations so as to effectively position Exeter's strengths in this sector and maximise related commercial opportunities.
- Through the LEP, develop linkages with Healthcare UK (a joint venture between the Department of Health and UKTI to promote the UK's healthcare expertise) to ensure their awareness of Exeter's health related strengths and potential commercial opportunities.
- Work with stakeholders including the University of Exeter, Medical School, RD&E to leverage existing health/medical related commercial relationships, for example: GlaxoSmithKline, AstraZeneca and Intuitive Surgical (the manufacturers of the da Vinci surgical robot).
- Ascertain the opportunity to develop linkages with companies within the Quintiles supply chain.
- Establish a network of high profile health/medical related ambassadors such as Dr Dennis Gillings to promote Exeter's medical related expertise at international medical conferences etc.

Supporting the existing base to grow institutions

- Identify opportunities with the University of Exeter, Innovation South West, RD&E to potentially identify opportunities for developing health based Knowledge Based Transfer Accounts (KTA) so as to maximise commercial opportunities from the locally based NHS Trusts.
- Explore opportunities for working with the University of Exeter and key partners such as the RD&E and the Met Office to explore the potential for establishing a centre relating to big data and health.
- Facilitate stronger linkages between the RD&E, the Met Office and the University of Exeter in the area of illness prediction based on weather conditions.

Water - Trends

The UK has particular strengths in water and waste water treatment and consultancy services within these areas

- Climate change has a considerable impact on water resources, making this sector an important part of climate adaptation. As set out within this reports section on the climate change sector, 'sustainable drainage and water management' is one of the sub-sectors identified by Defra and BIS as sitting within the A&RCC (Adaptation & Resilience for Climate Change) sector.
- The (BIS) 'Adaptation & Resilience Climate Change Report (2013) indicates that in 2011/12, 'sustainable drainage and water management' generated £3.6bn of sales globally, a growth of 8.5% from the previous year and the UK was ranked sixth globally, with sales of £123m and representing 6% of A&RCC activity. In addition, other A&RCC sub-sectors include water; such as 'Climate Change Management' which is largely represented by 'waterways and barrier management' and water is also represented within 'Transport & Infrastructure'.
- The UK has particular strengths in water and waste water treatment and consultancy services within these areas. Key requirements for adaptation and examples of technology include:
    - Water storage and transfer
    - Water harvesting
    - Water treatment (desalination, household water treatment)
    - Water efficiency and optimisation (water recycling technologies)
    - Water management (automatic telemetry, remote sensing, GIS mapping)
    - Emerging opportunities in flood mitigation including adapting coastal defences
- The water industry operates on five-yearly cycles called Asset Management Plan (AMP) periods. Prices are set by Ofwat at the beginning of each five year period, following submissions from the water companies about their anticipated cost to deliver their business plans.
- The next AMP6 (Asset Management Plan 6) for the period 2015-20 means that water companies will be currently/shortly planning for their next major investment programmes, including putting in place new frameworks and partnerships with engineering contractors.
- The water industry is highly regulated and continues to be impacted by regulation and restructuring. The Water Bill introduced in June 2013 and currently being considered by Parliament will lead to substantial changes within the industry.
- The changes will potentially encourage competition by enabling new businesses to enter the water market to provide new sources of water or waste water treatment services. Retail markets are expected to open to all non domestic water and sewage consumers in England from 2017, with other reforms to be introduced after 2019.
- The provisions within the Bill are also designed to make it easier for water companies to buy and sell water from each other. It is anticipated that it will improve the coordination between water resource management and drought planning.
- As well as the impact of new regulation, the industry is facing a number of other challenges, including: ageing water infrastructure; climate change; higher levels of demand due to increasing population; skills shortages and an ageing workforce.

Water – Existing Assets

The Centre for Water Systems has important collaborations with companies including South West Water, United Utilities, Yorkshire Water, ABB and other consulting engineering consultants including AECOM

- Exeter has a high proportion of its employees working in 'water collection, treatment and supply'. With a location quotient of 7.52, Exeter has more than seven and half times the proportion of people employed in this sector than the national average.
- The presence of South West Water's headquarters in Exeter reflects the high proportion of employees in this sector. There are approximately 500 employees based locally and across a wide range of disciplines including geotechnical, waste, infrastructure, telemetry, automation and IT. South West Water also has its own laboratories, providing analysis services including mass spectrometry scans. The company is increasing its emphasis on climate change adaptation. This is in part reflected by a recent focus on recruiting staff with a stronger skills base in data analytics and risk management.
- South West Water has strong existing connections with Exeter's knowledge assets, which include the Met Office, the University of Exeter as well as The Business School. The company also commission work from the Met office on extreme weather forecasts for areas such as coastal defence.
- The water related sector in Exeter also benefits from the presence of The Environment Agency which has its South West regional office located in Exeter. The Agency is responsible for a number of areas that impact the water industry, including: water resources, water quality, assessing flood risk, water adaptation planning together with flood and coastal risk management. The South West regional office carries out the same functions as those at head office apart from emergency services.
- There are strong linkages between the Environment Agency and the Met Office through a partnership to deliver the remit of the Floods Forecasting Centre. This centre combines meteorology and hydrology expertise into a specialised hydrometeorology service.
- In addition, the Floods Forecasting Centre, the Met Office has a team that works specifically with the water industry. Services include support in resource management, leakage, asset management and flooding events.
- In terms of higher value added/knowledge services (i.e. outside of installation contractors) the water industry supply chain in Exeter is predominantly based around the services of consulting engineering firms as opposed to manufacturers. These includes Hyder Consulting, AECOM and Pell Frischmann.

Research & Development

- The Centre for Water Systems at the University of Exeter specialises in water systems engineering. It uses techniques adopted from the field of artificial intelligence, such as genetic algorithms and genetic programming. Industry based research projects have included water distribution systems utilising risked based decision making.
- The Centre for Water Systems has important collaborations with companies including South West Water, United Utilities, Yorkshire Water, ABB and other consulting engineering consultants including AECOM who have a base in Exeter.

Skills

- As well as relevant engineering degree related courses, the University of Exeter offers an MSc in Water Management.
- The University Technical College in Engineering, Water and the Environment that is due to open in September 2015 (Newton Abbott) is a partnership that includes the University of Exeter and South West Water. It is anticipated that this UTC will help to ensure a supply of relevant talent for the water industry, particularly engineering related.

Water – Opportunities

Flood prevention; Water efficiency and optimisation (water recycling technologies) as well as water management (automatic telemetry, remote sensing, GIS mapping) are also areas that could present opportunities for Exeter to grow the water related supply chain

- The water industry presents a significant opportunity due to the reforms that are anticipated to encourage competition by enabling new entrants as well as the potential to attract foreign direct investment.
- Engineering consulting, contractors and manufacturers all contribute to providing a full range of services and products from water supply and sanitation to surface water management, with the latter including flood modelling and risk assessment.
- Flood mitigation and costal defences are particularly important, with coastal defences a growing area of investment for South West Water. Water efficiency and optimisation (water recycling technologies) as well as water management (automatic telemetry, remote sensing, GIS mapping) are also areas that could present opportunities for Exeter to grow the water related supply chain.
- British Water estimates that the water industry has a capital expenditure of approximately £10bn a year. South West Water has a strong policy focus on encouraging spend in the regional economy. This places Exeter in a prime position to ensure that the economic benefits are maximised locally.
- South West Water spends approximately £250m a year on its supply chain across a range of service ranging from software to basic construction activity and from smaller local contractors to long-term relationships with major partners. In terms of the knowledge economy (i.e. outside of utilities installation contractors) the supply chain in Exeter is predominantly based on the services of consulting engineering firms. However, there is the potential to grow a broader and deeper knowledge driven local supply chain.
- The water industry requires long term planning particularly as this is set within the context of the Asset Management Programmes that are developed every five years. South West Water is currently planning up to the year 2034/35 and has already identified a number of major investments they are planning to make before 2020. This includes increasing the use of renewable energies such as hydro and combined heat and power from the waste process.
- The long term focus and the requirement for strategic supply chain partnerships presents opportunities for growing capacity and capabilities within the local supply chain as well as the opportunity to attract new companies who could benefit not only from the commercial linkages with South West Water, but with the Environment Agency and the Met Office.
- It is also important to note that the Environment Agency has stated in its Corporate Plan (2013/14), that it will need to double its expenditure in flood defences to almost £1 billion a year by 2035. The significant amount of anticipated capital expenditure the UK's flood and coastal defences as well as wider investment by the water industry presents an opportunity to develop and attract high value companies, jobs and investment to Exeter.
- Although the concept of big data is relatively new to the water industry it is an area which has the potential to make a significant impact on water companies, especially given their drive to become more competitive and efficient as a result of competition. The increasing use of instrumentation (e.g. telemetry and metering) has led to the creation of a huge amount of data, with more data being collected in 'real-time'.

Water – Opportunities & Actions

Exeter's existing assets in the water industry combined with the over-arching expertise big data, risk management and climate change adaptability could enable Exeter to position itself as a centre of innovation in this industry

- The announcement in July 2013 of the University of Exeter's strategic partnership with IBM as the University's first Strategic Corporate Partner presents an areas of opportunity for the water industry. The partnership aims to encourage collaboration in areas such as water management, smart metering and analytics.
- The reforms in the water industry and the effect of climate change is likely to lead to a significant increase in innovation within the industry. Exeter's existing assets in the water industry combined with the over-arching expertise big data, risk management and climate change adaptability could enable Exeter to position itself as a centre of innovation in this industry.
- At present, the majority of the supply chain companies based in Exeter who service South West Water are concentrated on engineering consultancies. However, there is the potential to ensure a wider range of supply chain companies locally not only to supply South West Water (within the procurement framework arrangements) but other water companies and the Environment Agency. These could be for example in areas such as providing new technologies in remote sensing, water treatment etc.

Actions

Impact of knowledge economy on existing businesses

- Develop a water industry related supply chain plan to ensure where possible, that existing businesses in Exeter maximise their benefit from the anticipated investment this sector is likely to generate. This could include raising the profile of emerging opportunities to local businesses and working with them to help increase their knowledge capacity and capabilities to service this sector more effectively.
- Work with the University of Exeter to encourage take up by local businesses of expertise and facilities within the University. For example, the Centre for Additive Layer Manufacturing could provide assistance to businesses looking to develop prototypes for components. The take-up of available KTPs within 'sustainable water management' could also be encouraged.
- Forge relationship with South West Water to promote their supply chain events to local companies where investment opportunities are highlighted.

Spin-outs from existing organisations

- Ensure that the infrastructure (for example, with a 'soft-landing scheme) is in place to support spin-outs from organisations including the Environment Agency and South West Water. The potential for new entrants as a result of market reform in the industry may encourage the growth of spin-outs in the industry.

Attraction of new investment

- Develop a marketing strategy to position Exeter as the centre of excellence in water, particularly in sustainable water management and risk management.
- This could include the establishment of a group of relevant parties potentially around the Centre for Water Systems. Activities could include for example bidding for water related conferences/events to be held in Exeter. These could then also be used to inform entrepreneurs about potential business opportunities within the sector.
- Leverage supply chain relationships through South West Water, the Met Office and the Environment Agency as well as the University of Exeter.

Agri-tech & Food Security - Trends

In 2012, the Government identified 'Agri Science' as one of the 'Eight Great Technologies' These eight technologies are those where the UK has been identified as having particular strengths and where the UK could become world-leading

- The global population is anticipated to increase from 7bn people to 9bn by 2050. This is likely to impact considerably on the demand for food, water and other resources such as fertilisers. The pressure on the availability of food is likely to be a long term problem, with issues such as climate change and plant pests presenting a major threat to food security.
- Given these threats, the increasing importance of food security presents opportunities for the UK's agri-tech sector. The Government through its ' UK Strategy for Agricultural Technologies' (July 2013), in response, defined agri-tech as an economically distinct sector with the potential to attract related investment into the UK and open new markets for UK capabilities in innovation.
- The purpose of the strategy is to strengthen links between research spend and agricultural policy. As part of this process, the Government will be providing funding to boost the research, investment and commercial development of food production.
- In 2012, the Government also identified 'Agri Science' as one of the 'Eight Great Technologies' These eight technologies are those where the UK has been identified as having particular strengths and where the UK could become world-leading.
- The Government strategy is to increase investment across a range of disciplines in agri-tech and food security including:
  - crop and livestock genomics
  - agri-engineering (sensors, autonomous vehicles, robotics, precision agriculture)
  - genetics
  - nutrition
  - plant breeding
  - environmental sciences
  - industrial and synthetic biology
- Recent developments in areas such as genetics, informatics, satellite imaging, UAVs, remote sensing and meteorology will increase the trend towards innovation in the agri-tech sector.
- By using weather reports, soil conditions, GPS mapping, market demand etc, predictive analytics can be applied to improve crop yield and base decisions on the use of a large amount of data. More recently, there have been a number of initiatives where big data has been used to improve efficiencies and encourage sustainable farming. This includes the development of a crop management tool by PepsiCo with Cambridge University which provides detailed information on crops to help farmers reduce water use and increase efficiency.
- The concern about food security has lead to major agri-businesses putting in place measures to improve sustainability either organically or through acquisitions. In October 2013, Monsanto, acquired Climate Corporate for approximately $1.1bn. The latter uses weather and agronomic data to provide customised crop information and insurance services to farmers. This acquisition will enable Monsanto to use big data to improve farming productivity.
- Another example, also in the last quarter of 2013, is the launch of Syngenta's (the world's largest listed agricultural chemicals company by sales) 'Good Growth Plan' which has the objective to "increase average agricultural productivity of the world's major crops by 20% without using more land, water and other inputs such as pesticides".

Agri-tech & Food Security – Existing Assets

The University of Exeter has particular strengths in plant science and food security. Collaborations with Rothamstead Research have created a nationally important capability centre

- The University of Exeter has particular strengths in plant science and food security. The BIS interim report (July 2013) 'Universities & Growth' ranks the University of Exeter as 11th in agri-science in the UK in terms of funding received from the UK Research Councils, reflecting the importance of this area of research within the University.
- The University has a number of agri-science related research groups based in Exeter as well as in Cornwall, including the Centre for Ecology and Conservation. Research groups in Exeter includes: Cellular and Chemical Biology; Environmental Sciences; and Microbes and Diseases. The research of the Plant Biology Group includes many cross-disciplinary collaborations involving Mathematics, Physics, Geography and Social Science, ideally related to agri-tech and food security.
- The Centre for Rural Policy Research is also based in Exeter, with research strengths including agricultural, environmental resource management, agro-food regulation and the impact of climate change on farming and land use.
- As well as agriculture, the University has research expertise in acquaculture and fisheries. The Aquatic Resources Centre has over 600 fish tanks which recreate the freshwater and marine environment. This Centre can help facilitate research on climate change and the effects of pollution on marine life.
- The University of Exeter has a close research collaboration with Rothamstead Research. The latter which was founded in 1843, is the oldest agricultural research institution in the world. Headquartered in Harpenden, it also has a significant research centre in North Wyke. The latter houses the Farm Platform which is a new BBSRC (Biotechnology & Biological Science Research Council) National Capability centre. This provides access to a range of site based instrumentation in hydrologically isolated fields and farmlets.
- The Farm Platform is a research facility focussing sustainable ways to optimise productivity, whilst at the same time understanding the impact of farming methods on the environment. Data sets include the measurement of field and water chemistry and water flow rates, greenhouse gas emissions from soils, livestock data and farm management records.
- Rothamstead Research is also a partner in The Food Security and Land Research Alliance which is based at the Innovation Centre at the University of Exeter. This Alliance also includes the Universities of Bristol, Bath and Cardiff.
- The University of Exeter has commercial relationships with a number of agri-businesses. This includes for example, a ten year (up to 2019) licence deal with Syngenta Bioline Ltd, for a patent for an anti-fungal/anti-microbial agent used in crop-protection.
- As well as the Met Office's collaboration with the NFU providing weather forecasts to farmers, the Met Office's Climate Impacts Modelling Group has a number of applications for the agri-tech sector. Its main area of work includes: agriculture, ecosystems, water resources and flooding and how this interacts with the changing climate. This Group also develops and tests the 'Hadley Centre Earth Systems Models' for climate impacts covering soil, vegetation, hydrology and water resources.
- The Environment Agency's South West office in Exeter provides services to ensure that farmers comply with environmental regulations affecting farms and provide advice to farmers on compliance.
- In addition to agri-tech related graduates and post graduates from the University of Exeter, Bicton College, an FE college specialising in agriculture has on average approximately 4,500 full and part time students.

Agri-Tech & Food Security – Opportunities

The Food Security and Land Research Alliance based at the University of Exeter, has an objective to establish the South West of England as a centre of global significance in food security and land research

- With over 75% of land in the South West used for agriculture, agri-tech and food security is a significant area of importance regionally. The strengths of the University of Exeter in agri-tech and food security, as well as its research collaborations with Rothamstead presents an opportunity for positioning Exeter at the regional centre of the agri-tech sector.
- One of the key objectives of The Food Security and Land Research Alliance based at the University of Exeter, is to establish the South West of England as a centre of global significance in food security and land research, which adds further to the opportunity of positioning Exeter as an important location in this sector.
- The Government's recent focus on the agri-tech sector following the launch of the 'Agri Tech Strategy' in July 2013 provides an ideal opening for Exeter and the South West to position itself to benefit from the Government's investment in new technologies, a stated total of £160m. Already £30m of new investment is being made through BBSRC to fund new facilities in four campuses including Norwich Research Park and Rothamstead in Hertfordshire.
- The Agri Tech Strategy highlighted the importance of exploiting the potential of big data and informatics and position the UK to become a global centre of excellence in agri-tech. There is also £10m being made available for a Centre for Agricultural Informatics and Metrics of Sustainability, although where this will be located is still not clear. Given Exeter's differentiator in big data, this could be a significant opening for investment to be made available locally.
- Increased funding is also being made available through the Technology Strategy Board to focus on: crop productivity, sustainable livestock production, waste reduction and management, and greenhouse-gas reduction technologies.
- As well as major funding in the area of research, other smaller amounts of Government funding have been made available for the Agri-Tech sector. This includes the recent (July 2013) RGF funding of £3.2m for The Eastern England Agri-Tech Growth Initiative (a joint submission with two East of England LEPs).
- In addition to funding from the UK government, the European Commission is a major funder of agri-tech research. The recently established European Innovation Partnership on Agricultural Productivity and Sustainability supports closer partnership between farmers, advisors, researchers and businesses.
- The University of Exeter and Rothamstead locally has already benefited from BBSCR funding. Given the importance of the Agri Tech Strategy and the increase in funding for associated research, a key priority would be for the University of Exeter to position itself to obtain more funding so as to maintain and potentially increase its position of importance in this sector.
- Following from the Agri Tech Strategy, funding has already been allocated to research centres and other initiatives in the country, particularly in the East of England which has a strong reputation in this sector, it is important for the South West to also ensure it benefits from this new focus on the agri-tech sector
- The increasing importance of agri-engineering products such as sensors and other autonomous systems to capture data will lead to a growing requirement for expertise in handling of big data from a range of sources which is an area that Exeter has particular expertise in. Automatic telemetry, remote sensing, GIS mapping are also important technologies within the water sector and climate change.

Agri-Tech & Food Security – Actions

This is an area of genuine differentiation but at the same time there is a need to secure profile – with competition from the East of England

Actions

- In order to gain the maximum benefits from the Government's new priorities on the agri-tech sector and the associated research funding, the key area of focus should be on putting in place the mechanisms for ensuring Exeter benefits from this funding, particularly in the area of agri-tech and big data.
- The increasing trend by global agri-tech related companies such as Monsanto and Syngenta on improving productivity and sustainability relates closely to the National Capability at Rothamstead Research, North Wykes, providing the potential to develop linkages with key industry players.

Impact of knowledge economy on existing businesses

- Ascertain opportunities for bidding for funding through RGF and TSB funding to support agri-tech related businesses to develop new technologies and applications.
- Establish an agri-tech network to share best practice and enable collaborations across a range of organisations.
- Identify if opportunities exist within the existing business base to develop expertise on autonomous systems with uses for the agri-tech sector.

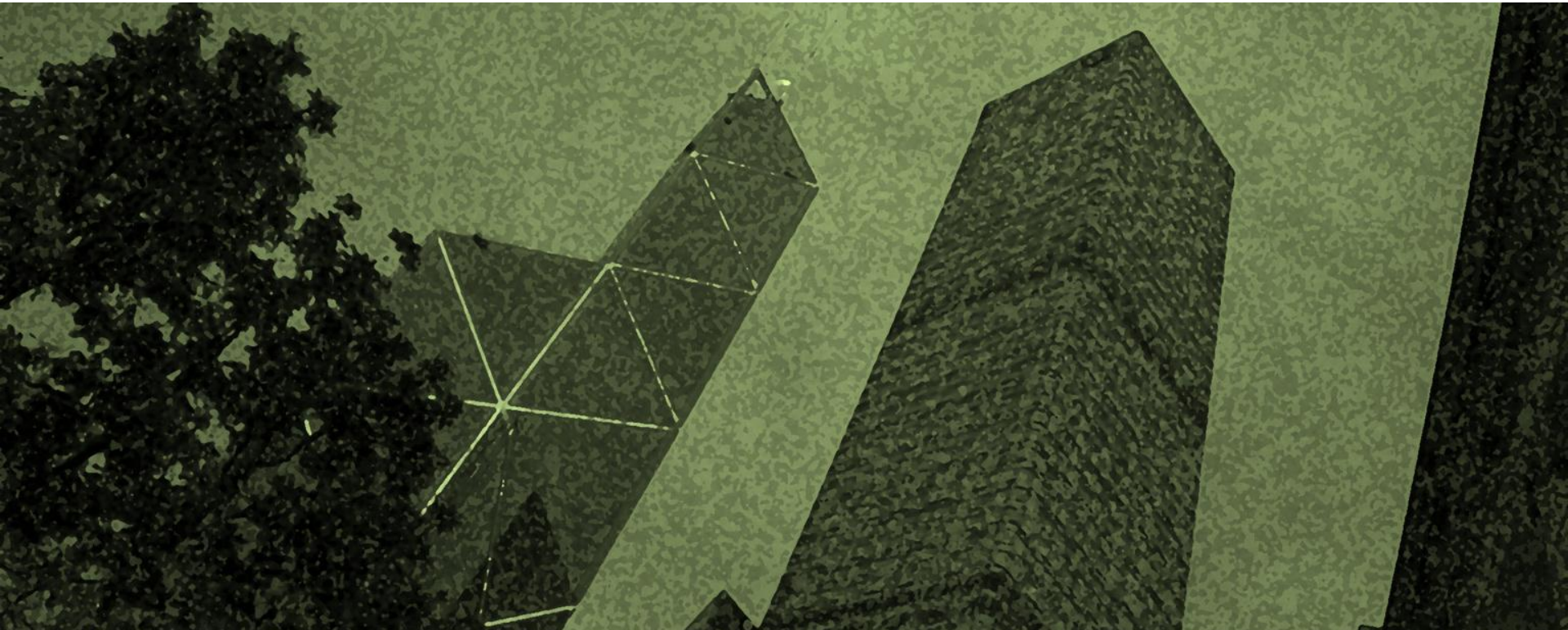
Attraction of new investment

- Maximise the University of Exeter's lead in The Food Security and Land Research Alliance to position Exeter as key player within the South West agri-tech sector.
- Leverage the Food Security and Land Research Alliance to further increase the profile of agri-tech sector in the South West, both in the UK and internationally.
- Establish linkages with the new Agri-Tech Leadership Council given their role in overseeing the investment in translational research resulting from the Agri-Tech Strategy.
- Develop relationship with the new UKTI agri-tech team and the agri-tech 'Business Ambassador' James Townshend to promote the strengths of Exeter and South West in agri-tech
- Identify existing linkages within the University of Exeter and the Met Office with major agri-tech related businesses such as Bayer Crop Science, Syngenta and Monsanto.
- Is there an opportunity to secure the Centre for Agricultural Informatics and Metrics of Sustainability or is this a decision that has been already made?

Supporting the existing base to grow institutions

- Maximise the opportunities for further investment in agri-tech research through the funding announced as a result of the Agri Tech Strategy, particularly in the area of crop science and big data.
- Align research funding activity with the focus of the TSB's Sustainable Agricultural and Food Innovation Platform which focuses on the main challenges of crop productivity.

7. Lessons from elsewhere



Lessons from elsewhere

York is an example of where significant financial investment has successfully combined with strong partnership working

Lessons from UK Science Parks

The UK comparator case studies below provide useful insight into how these locations have become successful in developing their science parks/knowledge economies. They are not intended to be seen as direct comparators to Exeter.

York

- The city of York has a well-established science and technology based cluster. Instrumental in this growth has been the development of the Science Park and also the creation of Science City York, along with the solid foundations of the research expertise at the University of York.
- **The University of York** is one of the UK's top universities. Its 2008 Research Assessment Exercise (RAE) score placed it eighth nationally. The University of York has a number of academic areas in which it undertakes cutting edge research including in health services, biology (particularly plant biology), chemistry and computer science.
- **York Science Park**, which was set up in the early 1990s (by the University of York) is now an established business community, with over 1,200 people currently working on the park within 85 different companies. Major companies include Smith and Nephew and the Food and Environment Research Agency (FERA). It operates in several sub-clusters with the main ones being creative and digital media, technology and biotechnology.
- The park is located next to the University of York and can offer direct links into the University and its associated research expertise. The park offers flexible accommodation and pricing options and well established support services, along with its partners such as Science City York, the Chamber of Commerce and York Professionals.
- Located on site to help facilitate collaboration is the University's Research and Enterprise Office and a range of University spin-out companies are also based on the park. It also has purpose built incubation with around 100 000 sq ft of specialist facilities including the Innovation, Bio and IT Centres, making York the first UK Science Park to offer dedicated IT, Bio and knowledge-based incubation space on a single site.
- **Science City York** (SCY) was launched in 1998 as a partnership led by the University of York and City of York Council with the support of key public and private organisations. Its aim was to develop a strong knowledge-based local economy. It has been a key factor in supporting the growth of the science cluster in the city and has been successful in raising the national profile of York as a location of science activity.
- To date it has assisted in the creation of over 100 technology companies and has helped to create and sustain around 2,800 jobs. As well as investing in land and premises infrastructure projects (using ERDF and other funds).

Lessons from elsewhere

Science City York is an example of a successful organisation working in partnership to help deliver key support to knowledge economy businesses in the city

York (*cont*)

- SCY also offers services to its tenants by brokering research-company relationships, business mentoring and managing industry driven sector networks – on its website it boasts a contact network of over 3,000.
- SCY has led projects which have resulted such assets as a dedicated Bioscience Business Centre which aims to help transform pioneering research into commercial ventures, the creation of Park Central (a new restaurant and exhibition area designed to facilitate networking and business collaboration), a £1.6m Centre of Excellence in Mass Spectrometry at the University of York and several other incubation facilities.
- Reasons cited for York's success include:

  - Investment – it has been quoted that £800m has been invested in York's science and technology infrastructure over the past 10 years. This has led to a related business of c5,000 companies.
  - Timing –at the time it was stated there was few other locations offering the level of York's investment into developing a cluster and specifically the support system of SCY.
  - Good partnership working with major players including the Universities, the Science Park, Science City York, York City Council and (formerly) Yorkshire Forward.
  - York's excellent quality of life offer.

Lessons from elsewhere

Cambridge Science Park is the UK's oldest and arguably most prestigious science park which benefits from its close connections to the world leading research and reputation of Cambridge University

Cambridge Science Park

- Cambridge Science Park was established by Trinity College in 1970 and is the UK's oldest science park. Over 100 companies are located on the park over 1.6 million sq ft of buildings. Some of the largest serving companies located on site include Napp Pharmaceutical, Biochrom and Cambridge Consultants.
- The Science Park first came about as Cambridge University's response to the Government's call for universities to expand their contact with industry. The Mott Committee at the University recommended the expansion of science based industry to take advantage of the academic scientific community already in existence. The land that was used was owned by Trinity College.
- The first company, Laser-Scan, moved in in 1973. There was slow growth for the first 5 years partly because at the time the science park concept was unfamiliar. Early locators on the site tended to be UK subsidiaries of multinationals. In 1984 the Trinity Centre opened which provided meeting and conference space. This was followed by the Cambridge Innovation Centre which helped to offer a wider range of accommodation options. By the 1990s there were 1,200 high tech companies in the Cambridge area with 35,000 employees. Today, the Science Park has expanded even further with more buildings, a conference centre and facilities. The University's Centre of Molecular Materials for Photonics and Electronics (CMMPE) is also located on site.
- There is the Research Services Division (RSD) which helps to identify, secure and manage research funding for the University and encourage collaboration between the University and industry. Most recently it has added Building 101which is a £17m, 80,000 sq ft new-build office and R&D building, which opened in June 2008 and has already attracted Dutch electronics giant Philips and well-known software solutions company Citrix.
- Cited reasons for success include:

  - The University connection – the world leading. research expertise as well as its prestigious reputation.
  - The pioneering decision taken in the 1970's by Trinity College.
  - The fact that 2 university sub departments are located there.
  - It is a pleasant low density site in rural surroundings with good employee amenities.
  - There are a range of flexible accommodation sizes (with grow on space) and well established networking and support facilities.
  - The success of the companies located on the site has bred more success – the image is that companies located here will be treated more seriously and enjoy more success.

Lessons from elsewhere

Norwich Science Park has enjoyed growth based on the location of significant research institutes rather than a major corporate inward investment

Norwich Science Park (NRP)

- Norwich Research Park (NRP) is a partnership between the University of East Anglia, the Norfolk and Norwich University Hospital, 4 independent global research institutes - the John Innes Centre, Institute of Food Research, the Genome Analysis Centre (all strategically funded by the Biotechnology and Biological Sciences Research Council – BBSRC) and The Sainsbury Laboratory. The John Innes Centre and the Sainsbury Laboratory are leading institutions in the field of plant science and microbiology.
- The NRP was first conceived as an idea in the 1960s when the University was being built and the John Innes Institute relocated there. The Sainsburys Laboratory followed in 1988 and the Hospital was built in 2001. Growth has developed over this time and NRP was established as a partnership between the member organisations in the mid 90s.
- NRP is a business community of research organisations with excellent science credentials and over 30 science and technology based businesses. With over 11,000 people including 2,700 scientists and an annual research spend of over £100 million, NRP claims that it is Europe's leading single-site cluster for plant, microbial, food, health and environmental research. The companies are located either in the Norwich BioIncubator, the Norwich Research Park Innovation Centre or hosted by one of the Park member organisations. Companies located on NRP include Anglia DNA Services, Genome Enterprise Ltd and ProtoPharma Ltd.
- NRP is set in over 160 hectares of parkland on the outskirts of Norwich and in total there are over 100,000 sq m of laboratory space, with over 6,000 sq m of conventional and containment glasshouses and nearly 200 sq m of controlled environment suites.
- Business support services and networking systems in place include regular surgeries held on site with accountancy and law firms, opportunities for medical trials at the Clinical Trials Unit and the Human Nutrition Unit caters to companies wishing to undertake dietary studies with human volunteers. The NRP can offer other specialised services such as waste disposal (biological, chemical and radioactive) and managed field plots for crop trials as well as the more generic business support such as conferencing facilities and computing and IT support.
- Technology transfer at the John Innes Centre, Sainsbury Laboratory, and Institute of Food Research is generally managed through Plant Bioscience Limited (PBL) (www.pbltechnology.com). PBL is an independent technology management company specialising in life sciences, particularly green and white biotech, food technology and biomedical science. The University of East Anglia has a Research Enterprise and Engagement Office through which business can access a wide range of expertise through the UEA Enterprise Centre (www.ueaenterprisecentre.com). They also support collaborative research arrangements, including Knowledge Transfer Partnerships and student placements in industry.
- The Intellectual Property company ip21 (www.ip21.co.uk) has a presence on the NRP and offers a full range of services including Patent, Trademark and Design Right services and a design innovation support consultancy.

Lessons from elsewhere

NRP is an example of a Science Park which has benefitted from major public investment

Norwich Science Park (NRP)

- NRP has benefitted from significant national investment – in 2011, the Government awarded the BBSRC £26 million to invest in the Park to deliver innovation from the research base and generate economic growth and job creation. Part of the plans for the future is the Enterprise Centre which will specifically offer business support and office space to companies within the low carbon sector.
- Cited reasons for its success to date include:

  - The location of nationally and internationally renowned research institutes – these define the NRP rather than any major global corporate investment.
  - A concentration of world-leading scientists coupled with the capability for multidisciplinary research.
  - Major public sector investment.
  - A focus on specific research/sector niches.
  - Flexible accommodation options.
  - Excellent transport links.
  - Access to high calibre staff both at the University and beyond – the area has a graduate retention rate of 40%.
  - Quality of life offer.

Lessons from elsewhere

Kista (Sweden) represents a strong example of where cluster development has led to an international region of excellence

Lessons from International Science Parks

The international exemplar case studies below provide useful insight into how these locations have become successful. They are not intended to be seen as direct comparators to Exeter.

Kista, nr Stockholm, Sweden

- Kista is the base for the 'Science City' in Sweden and is an example of a "cluster-driven science park". Located in a district to the NW of the capital, Stockholm, it is an hour away from Arlanda airport. It has developed into one of the world's most important ICT clusters and is said to be home to over 1,000 ICT companies. Kista is particularly prominent in mobile and wireless communications, multimedia and broadband systems.
- This is complemented by strong growth in several fields that make intensive use of ICT, such as biomedical and environmental engineering, as well as nanotechnology. Key companies located here include Ericsson (who employ 1/3 of all employees at Kista), Microsoft, IBM, Oracle, Intel, HP, Philips and Sun Microsystems.
- Based on 2012 data, Kista is home to 9,987 companies (1,168 ICT), 23,973 employees, 6,800 students and 1,100 researchers.
- The science park effectively started with the attraction of Ericsson to the area in the early 1980s. After the attraction of Ericsson, the area grew through the location of a university there. Development of the cluster was stimulated by a number of key government led interventions:
  - Improved infrastructure (links to Stockholm and the airport by road and rail).
  - The development of a university campus and research facility on site. Renewed investment in residential and retail development.
  - Sites and premises for further company investment
  - Branding and marketing for the City and its proposition
  - Development of the first large scale wifi network over a city area.
  - Creation of a large scale business centre, exhibition space, and amenity space for networking within the business park.

Lessons from elsewhere

Kista initially gained prominence after the attraction of a single major investor and the foundation of a university campus on site

Kista – Reasons for Success

- A less tangible example of how the Science Park encourages collaboration is the general feeling of community it engenders and the number and wide range of cultural events and clubs on offer which all help to foster communication between companies and organisations. This has been cited as a key reason for success by the Park management.
- The following inter-relating factors have all been cited as reasons for Kista's success:

  - Initial attraction of a major investor which then attracted a wealth of suppliers, partners and competitors.
  - Infrastructure development – including Broadband
  - Success initially based on companies; university followed.
  - Cluster development which has led to successful interaction between companies, research, academia and the public sector.
  - Vicinity to the airport and the capital city.
  - An entrepreneurial atmosphere.
  - Support/investment from Swedish government and EU projects.
  - A consistent approach and continued investment by key players.

Lessons from elsewhere

Sophia Antipolis Science Park is an example of where a strong vision and combined leadership has been a major influencer of success

Sophia Antipolis, nr Nice, France

- Sophia Antipolis is the base of the 'Technopole' science park close to Nice in France. It began with an initiative in the 1960s by a private individual, Pierre Laffitte. He had a vision to transform the profile of a farming area into one of the major high-technology centres in Southern Europe. A major corporate investor, IBM, was attracted there in 1962. In 1965 a university was established on site and in 1972 an area of 2300ha was designated as a science park zone. The key to the creation of the zone was the attraction of substantial investment and the support of a university before a sustainable community of companies was developed. Another key impetus was the investment from France Telecom which created a superior telecommunications structure and fibre optic network.
- During the 1970s, the private led initiative experienced financial difficulty but was saved by local and regional government investment who have now become the main players. The authorities made a major investment and the priority was seen to be to embark on a significant international promotion campaign which successfully led to an influx of foreign investment.
- The Science Park experienced another dip in fortunes in the 1990s. The influx of new companies halted - the reason was believed to be that low costs and a good infrastructure were no longer enough to attract or indeed keep companies there. Some companies left the Park and took with it their R&D capabilities. An important point to note is that up until this point, the companies located on the Park had operated in isolation and there had been little local interaction.
- It is now clear that the departure of some of the international companies in fact became a factor in its on-going success. Although the companies departed, many employees did not want to leave the area and as a result a number of new SMEs were created. Along with the creation of the SMEs came the establishment of many associations and networks, such as the Telecom Valley Association. This was set up by two key players on the park – Texas Instruments and France Telecom. They had seen the international companies leaving and wanted to set up systems to attempt to differentiate Sophia Antipolis so that it could become *the* European location for telecoms. An important factor in the setting up of these networks was establishing a series of incentives for companies to share ideas.
- Central to this was the Knowledge Management Platform (KMP) Project. Launched in 2002, this project aimed to create a map of competencies present in the Telecom Valley. The goal was to create a tool that could help improve the identification of key individuals, companies and projects, while facilitating cooperation and the creation of a shared language between its members.
- This step-by-step approach allowed firms to collaborate initially without the requirement of sharing strategic information, only information consistency. The aim was not to disclose the precise content of competencies but to give them more visibility in order to accelerate exchanges. This helped engender trust which then led to further collaboration on specific projects. It also helped identify gaps and complementary competencies. Companies saw the benefit of this mapping exercise and so were more likely to participate.

Lessons from elsewhere

Sophia Antipolis has become more successful as more SMEs have set up there; although major global players are still present and of notable importance

Sophia Antipolis – Reasons for Success

- Other wider incentives on offer to companies located on the Park include financial incentives in the form of loans (the amount varying depending on the amount invested, the number of jobs created and the level of technology transfer involved) and a reduction in taxes – companies are eligible for a 50% reduction in corporate taxes for a period of 5 years.
- The Science Park was further supported at this time with a number of scientific centres being founded there. The University of Nice located its research institutes there in 1986 and there is also a private engineering school, Eurocom. The scientific institutes became a source of technology transfer and close collaborations developed.
- Sophia Antipolis is now one of Europe's leading R&D hubs and its 2,300 hectare site is a base for over 1,400 companies employing c30,000 people. It has various specialisms including computing, electronics, pharmacology and biotechnology. Major companies located there include SAP, Orange, Air France, Intel, Hitachi and Cap Gemini.
- The park only allows companies whose activities are focused on R&D. The park actively encourages networking and idea sharing and at the heart of this is the Sophia Antipolis Foundation which was set up in 1984 and facilitates research, collaborations and exchanges. It organises conferences, networking events and clubs such as the Sophia Business Angels Club.
- Cited reasons for the key to its success include:

  - The initial significant investment by IBM, France Telecom and Texas Instruments.
  - Strong leadership and vision - in the form of Pierre Laffitte.
  - The active and successful engagement of a network of local organisations including local and regional government, the academic sector and the Chamber of Commerce.
  - The location on site of part of the University of Nice and various other research institutes and training organisations with their specialised laboratories and research facilities.
  - The number of indigenous SMEs and the ensuing establishment of associations and networks.
  - The pleasant climate and surrounding environment – this is heavily promoted ("300 days a year of sunshine").
  - Other quality of life aspects such as the cosmopolitan atmosphere as well as the strong tourism pull.
  - Excellent transport links and the proximity of an international airport.
  - Superior telecommunications network.

Lessons from elsewhere

Although on a much wider scale than Exeter, the Research Triangle example demonstrates the benefits of cluster development

The Research Triangle Park, North Carolina, US

- The Research Triangle Park was set up in the 1950s and is the largest research park in the world. It is located near the three universities of Durham, Raleigh and Chapel Hill, in the 13 county strong Research Triangle in North Carolina. It is home to over 170 global companies including IBM, GSK, Credit Suisse and Cisco.
- The site employs over 42,000 people. Nearly half of all companies located there (43% have between 1 and 9 employees. The major sectors are life sciences and biotechnology (45%) and information technology (18%). One important aspect to note is that the clusters which have developed expand much further into the wider Research Triangle – this is evidenced by the fact that in the Research Triangle there are quoted to be 500+ companies in the Research Triangle Bioscience Cluster.
- The North Carolina state in which the Park is located was voted the 3rd best US state for business by Forbes Magazine in 2010 and 2011.
- The idea for the development of a Science Park began with discussions amongst local academics and the state's economic leaders about ways to attract new industries to North Carolina. The idea of using the three triangle universities to attract research companies into a park area central to the universities quickly emerged from the dialogue. A few individuals were key to the early development of the plan from idea to reality, including from the universities, local politicians and private investors.
- The first company on the site was the Chemstrand Corporation in 1959 but other than that the Park was slow to attract companies for its first 5 years. Its turning point came in 1965 when the $70 million National Environmental Health Sciences Center arrived and IBM opened a 600,000 sq ft research facility on the Park. This initial major investment then attracted other companies over the ensuing decades.
- As well as the 3 universities and the Triangle Universities Center for Advanced Studies (TUCASI), other key organisations located on the site include the National Humanities Center, the Microelectronics Center of North Carolina and the North Carolina Biotechnology Center.
- Cited Reasons for Success include:

  - Initial vision and entrepreneurial leadership by key players both in the public and private sectors.
  - The proximity of 3 universities with their associated research expertise – Durham, Raleigh and Chapel Hill.
  - The location of various important research institutes (initially a strategy to make it easier to attract investment for the creation of the Park).
  - The creation of the Triangle Universities Center for Advanced Studies (TUCASI) which brought together the faculty from the three universities and Park scientists to work collaboratively.
  - For each cluster there are centres of innovation, mediators in recruitment, well established networking, education and community building opportunities.
  - A favourable geographical location and climate.

Lessons from elsewhere

By studying international exemplars of Science Parks, key lessons can be learnt and where applicable, applied to Exeter

International Exemplars – Initial Thoughts for Exeter

- Although each of these Science Park examples are unique and not directly comparable to Exeter, there are nevertheless key success factors that were common to each locality:
  - None of these examples had a key cluster strategy in place at the start of their journey.
  - All of these examples took many years to become successful and indeed some experienced slow growth in the beginning.
  - Strong leadership and vision – both private and public sector.
  - Effective engagement of all key players: – local/regional/national government, other public sector organisations, the academic sector and the business community.
  - Location of university departments/research units on the site.
  - Other important research or training institutions of regional/national importance also being present on site.
  - Effective and formal networking systems being in place resulting in effective communities which share ideas and research collaborations – once the critical mass of companies was established.
  - An attractive immediate and wider physical environment, pleasant climate and other quality of life benefits.
  - Key initial impetus in the form of a major global investor.
  - Major private/public sector investment.
  - Excellent connectivity – both physical and digital.

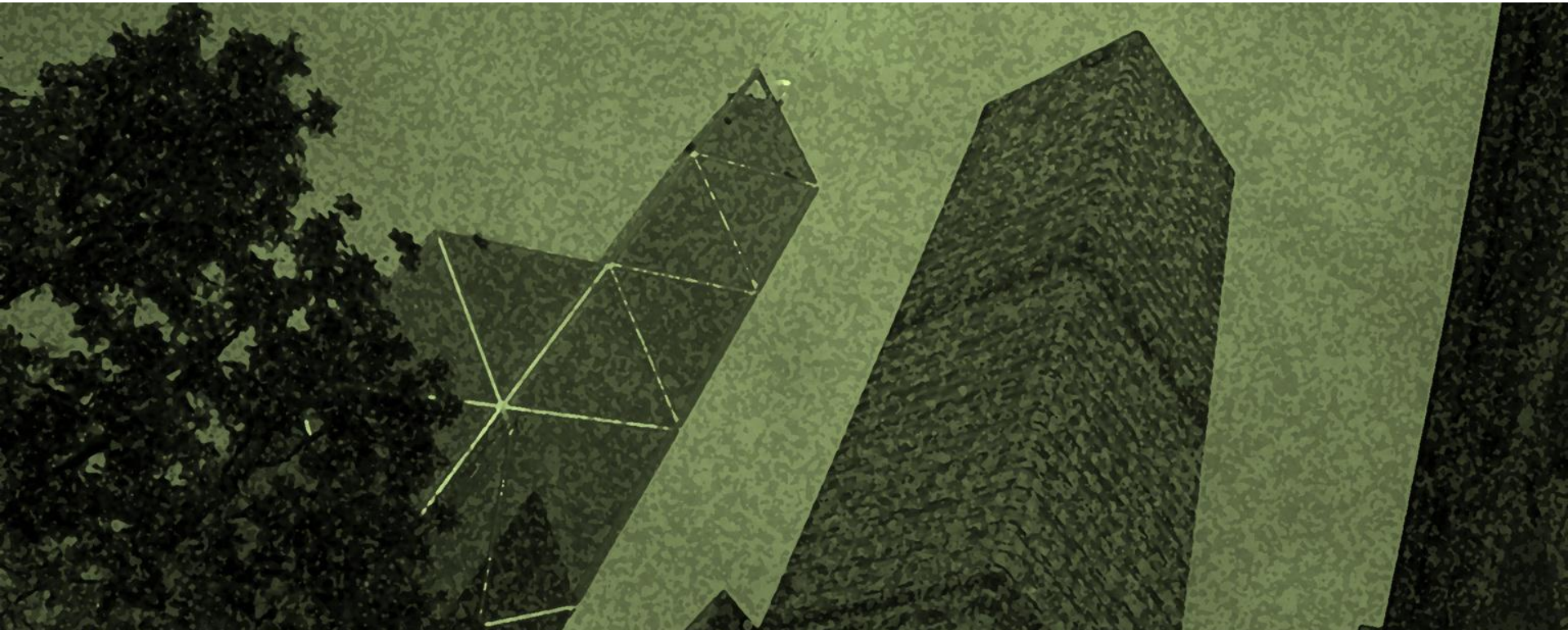
Lessons from elsewhere

The table summarises the critical success factors for each of the Science Park locations detailed in the previous pages

- Critical Success Factors that are common have not been included – e.g. business support networks, flexible accommodation options, strong university expertise and links, research institutes located on site, infrastructure and quality of life offer

Science Park	Launch	Size	Companies	Employees	Governance	Critical Success Factors
York Science Park	1991	137,000 sq ft accommodation over 6 buildings	85-100	1,200	A ltd company set up by University of York	Major public sector investment Good partnership working timing
Cambridge Science Park	1970	1.6m sq ft	100	5,000 work on site (includes organisations etc)	University of Cambridge	Prestigious reputation Pioneering vision at time of launch
Norwich Research Park	Location on site of some organisations began in 80s, NRP partnership set up mid 1990s	40,000 sq ft of lab and office accommodation with c25,000 being added in 2014 160 hectare site	30	11,000 but includes all scientists/others working in institutes etc	UEA along Hospital and 4 other research institutes	Major public sector investment A focus on specific research/sector niches
Kista Science City, Sweden	1980s	?	9,987	23,973	? Public sector	Initial major private investor A consistent approach and continued investment from key players
Sophia Antipolis Technopole, France	1962	2,300 hectares	1,400	30,000	A foundation set up in 1984, supported by partners such as Local/regional government	Initial mega investment Strong leadership and vision Engagement of local organisations Critical mass of SMEs seeking networking opportunities
Research Triangle Park, North Carolina, US	1950s	2,833 hectares, 22.5 million sq ft of built space	170	42,000	Public private partnership	Vision and leadership in both public and private sector

8. Recommendations



Recommendations

We suggest setting a 'vision'. Visions are useful for guiding future work - but they must be combined with specific and measurable objectives

This report has already set out a number of detailed individual recommendations and potential actions throughout the sector analysis and inward investment sections. The more general recommendations which could be taken forward by the City of Exeter are now laid out in this section. The recommendations and specific individual actions are then pulled together in an action plan in the next section.

1. The knowledge economy activities recommended should be focused on a broad range of sectors. It is difficult, if not impossible to define these sectors – in fact it is considered unhelpful to attempt to do so. This is because many sectors in the economy rely on knowledge-based activities and processes irrespective of the final product or service produced. Nevertheless this report has broadly set out those sectors which are generally considered to be excluded from the knowledge economy . These excluded sectors are personal and professional and public services as well as retail and wholesale activities.
2. It is our recommendation that the activities proposed are the basis of the economic strategy for the City. The economic strategy should be built around the knowledge economy because of the strengths of the opportunities presented by the University; Medical School; hospital; and Met Office. These are clear economic differentiators.
3. This report has however established that Exeter is has a relative paucity of large knowledge economy companies. In many ways therefore, whilst Exeter has the building blocks for the growth of a knowledge based economy, it is at the beginning of any shift in the economy towards this area. As a result we recommend that an overall 'vision' is created for the work. This can provide an overall direction for all future work carried out in this area. Our suggestion for such a vision is that the work undertaken by partners focuses on an effort 'to make Exeter the best-known city in the south-west of England for innovation'. Such a vision relies on a combination of actions and publicity.
4. Visions are useful for guidance purposes, but need to be combined with specific and measurable objectives for the work to be undertaken. We suggest that the objective of this knowledge economy strategy is that within 5 years the work results in the establishment of 75 new companies and 2000 new jobs linked to the sectors identified in this report (big data, climate change, water, agri-tech, and healthcare).
5. It has never been intended that this knowledge economy strategy is owned by, or exclusively delivered by the City Council. This is a strategy for the City of Exeter and those key players in the knowledge economy. On this basis, the actions and the resources required to undertake them must be shared between organisations.
6. If resources are to be shared there is a need for those involved to show genuine commitment and there is also a need for coordination. It is also recognised that any knowledge economy work – the type of work required to achieve the vision - will need to be undertaken over the long term. In order to ensure that the recommendations of this

Recommendations

There is a need for a body to drive the vision – a 'City of Innovation Board'. There is however no need for a new body – the structures that could undertake this work are already in place.

report and any future interventions are co-ordinated and delivered, there is a need for a governance structure to be put in place – a 'City of Innovation Board'. It is not suggested that a new committee or body is created - there are already structures in place that could take up this role and one such body that has already achieved much in this area is EXiST.

7. the creation of such a governing body will require some further work with regard to ownership, constitution, membership, resources and contractual position. Starting with an organisation that has much of this in place and has the buy-in and participation of many of the key players would be extremely useful.
8. Thought was also given as to whether the Science Park Board could fulfil the over-arching governance role. This organisation has a very specific remit and whilst the Science Park is likely to be extremely important in the development of the Exeter knowledge economy, the Science Park does not represent the entirety of the strategy.
9. There are four ways in which the knowledge base can directly lead to increased economic activity and therefore strengthen the local economy:
    a. Spin out activity from the University.
    b. New company start-ups and strengthening existing companies.

    The current structure of the Exeter economy however suggests that (a) and (b) alone are unlikely to create the step change in economic performance that is sought. The remaining two important ways in which the economy can be stimulated are:
    c. Attraction of inward investment.
    d. Strengthening of existing institutions.
10. This report has already demonstrated the sectors which are considered to be both strong in the Exeter knowledge economy and offer opportunities for further investment because of the changes that are likely to occur. These sectors are: big data; climate change; healthcare; water; and agri-tech.
11. By singling out these particular sectors this report does not suggest that assistance for companies across the entire knowledge economy cannot be made available, it simply identifies those areas where proactive project work is most likely to generate a positive outcome (and therefore provide the greatest value for the resource invested).
12. It is also recommended that the sectors identified are considered in their widest sense – across their entire supply chain and customer base. For instance the recommendations concerning a focus on climate change do not suggest that work is limited to those niche companies working on climate prediction, but to those wider companies to whom climate change will be highly relevant. This can be as diverse as companies from the flood prevention industry through to the insurance sector.
13. It can be noted that the five sectors selected also have some common linkages. These linkages may also be important in setting out the narrative of Exeter from an investment point of view. For instance work on climate prediction, clinical

Recommendations

The proposed super-computer is a potential game changer. This could be used as a mechanism to gain 'Catapult status' with BIS with more associated profile.

trials, hydrology and crop yield patterns may all require specialist skills in big data. Climate change, water availability and agri-tech are also intertwined.

14. The supercomputer investment secured by the Met office has the potential to provide a significant change to the Exeter economy. Under current proposals this computer will be located at Exeter Science Park and it is envisaged that private sector companies and others will have access to its computing power alongside the Met office. There is therefore clear potential for companies undertaking 'Big Data' initiatives to benefit from access (and proximity). This potential could offer benefits to all of the sectors identified in this report and more besides. There is some way to go in ensuring that the contractual terms of access are understood and can be promoted to third parties. The promotion of the supercomputer capacity and ability to provide a very clear understanding of the terms of its use will be important to attract interest. Work on this should commence immediately.
15. The supercomputer is being funded by the Met Office sponsor government department BIS. BIS is also responsible for the Technology Strategy Board (TSB) and the TSB is currently responsible for the new government initiative, 'Catapult Centres'. Catapult Centres are the U.K.'s new response to improving the capture of commercial benefit from innovation. They are centres where Universities, companies and innovation expertise are brought together in centres resembling the Fraunhofer Institutes of Germany. The resources, profile, governance and expertise that have been placed in the initial eight Catapult Centres which are already located elsewhere in the UK suggests that this is an initiative that should be seized by Exeter. If it seems that a high priority initiative should be to secure Catapult Centre status for the Met supercomputer & Science Park development. On the basis that both are controlled by BIS, this seems to be an achievable goal.
16. It is understood that the Met office could increase the capacity of the supercomputer by a significant amount, for a proportionately lower amount of money than the initial investment. This is an initiative which the Met Office is attempting to pursue and could be a short-term inward investment priority for Exeter. If significant private money could be secured from a private sector investor there could be a compelling argument for securing matching ERDF / other LEP funds such as Single Growth Fund. Existing relationships with companies such as Willis and Quintiles (and others), both of whom are likely to see opportunities in a supercomputer investment, should be pursued.
17. Exeter has undoubted strengths in the field of climate change. Much of the media coverage of the climate change issue has centred on climate prediction and the drive to reduce carbon emissions. From a commercial perspective, however, there is a growing industry around climate adaptation. This industry is concerned with technologies, products and services that will allow the effects of climate change to be mitigated. The industry is currently known as Adaptation and Resilience to Climate Change (A&RCC sector) and has been identified by BIS as an area of growing activity. This should become the

Recommendations

Big data, climate change, healthcare, water and agri-tech are all sectors which are likely to benefit from investment in short / medium term. This could represent an opportunity for more research funding; allow a strengthening of local business; and attract new players.

Area of the sector on which Exeter focuses on from an economic development sector and by harnessing the knowledge in the City could start to undertake a 'thought leadership' PR approach that positions Exeter as the leading location in this work

18. From a healthcare perspective the sector section sets out the opportunities that are likely to arise combined with the strengths of the city. Work in diabetes; cardiovascular risk and ageing; neurology and mental health; as well as environment and human health are all areas of strength in Exeter and each represent activities in which investment is likely. Work across each of these sectors can identify the companies with whom collaboration could be possible and the opportunity could be proactively presented.
19. One key Company with whom opportunities could be discussed in detail is Quintiles – the world's largest provider of biopharmaceutical development and commercial outsourcing services. Quintiles has one of two UK bases in the city and the founder of Quintiles is an alumnus of Exeter University. There is an opportunity to build on the Quintiles links with the city and recognise the Quintiles relationship as one of the key commercial relationships for the City.
20. Initiatives are already in place for Devon to become a centre of product introduction in the area of telehealth and digital health solutions. This is another area likely to demonstrate growth in the future, and an area in which, as a result of the planned trials, Exeter may be able to differentiate itself for medical device trials as well as representing a location which can provide good evidence of new commercial techniques. Creating a centre for such a trial environment could gain opportunities for further NHS funding, strengthening the institutions, or attraction of innovative companies in the telehealth sector.
21. The water industry also represents an economic strength for the City. This is partly as a result of the location of South West Water (owned by Pennon Group), but is also due to the large presence of the Environment Agency and various water engineering and consulting firms. Expertise in water is differentiator which is likely to lead to market opportunities. Globally climate change and population pressure is leading to a focus on the future of water resources whilst in the UK changes to the Water Bill 2013, are all likely to lead to change the competitive landscape. Flood prevention, flood mitigation, water efficiency and optimisation, water recycling technologies, automatic telemetry, remote sensing, and GIS mapping are all important areas of research and investment in the water sector. As such the development of the relationship with the Pennon Group, the Environment Agency and those companies close to both is an area of opportunity to strengthen the industry that is already in Exeter. This engagement can further inform a strategy for the sector.
22. The final recommended sector for activity for proactive activity is in the agricultural technology sector. This sector has been acknowledged by BIS as one of the eight great technologies in which UK commercial expertise is world class and whose continued success could make a huge

Recommendations

Many public agencies focus resources on building relationships and influence with UKTI. This will also be important for Exeter. Fewer agencies build influence with the TSB – this is an area of significant opportunity.

difference to the UK economy. The University of Exeter undertakes significant work in plant science, food security and contains the aquatic resources centre all of which are directly linked to agricultural technology. The University of Exeter has links with Rothamstead which has established a research centre now recognised as a national capability centre by the Biotechnology and Biological Science Research Council. This is an area of differentiation for Exeter and an area in which government research spending is likely to increase. Ensuring that the SW gains access to this future funding (against the East of England in particular) should be a priority.

23. Much of the work recommended focuses on the attraction of new investment. The organisation with primary responsibility for the attraction of inward investment into the UK is UKTI. There is an opportunity for Exeter City Council to put forward a proposition to UKTI for each of the core sectors. The objective is to ensure that the area is considered by UKTI and put forward to clients when potential investment projects from these sectors arise. Any strategy to form a relationship with UKTI however must also now involve the Investment Services Team (IST). IST is the outsourced UK delivery part of UK TI and they handle investment projects on UK TI's behalf. If success is to be gained from an inward investment perspective, it is vitally important that IST also understands the Exeter proposition.
24. The principle relationship with UKTI in the area is owned by the 'Heart of the South West Local Enterprise Partnership (LEP). Any propositions established for the key sectors must be shared with this organisation to ensure that they are also putting forward the most compelling case for Exeter.
25. Much of the work of UK TI is focused on the attraction of businesses. It is recommended that Exeter also considers the attraction of entrepreneurs, funders and key industry influencers (UKTI does operate a small scheme in this area – the Global Entrepreneurs Programme). Exeter should target these individuals through industry networks – introductions, alumni and social media.
26. In general inward investment decision-making concerns largely commercial factors. This is especially true when the investment decision is being undertaken by a large corporate client. The recommendation that the knowledge economy strategy also considers the attraction of individuals also means that the promotion of Exeter as a great place to live and undertake business is also an important aspect of the work required. As a result the quality of life aspects of Exeter need to be set out in a compelling manner.
27. Many public agencies focus significant effort on building relationships with UKTI. In terms of establishing a knowledge economy an equally important government agency is the Technology Strategy Board (TSB). Fewer public agencies focus on the TSB as an organisation with whom influential relationships should be built. This represents an opportunity for Exeter in terms of influencing future funding; further extending the understanding of Exeter's key sectors and those key businesses present in

Recommendations

A business development function should provide added value to the funding approach for business – expertise on public funds and an ability to provide input to the structure of business plans which can be provided to known active funders.

Exeter; and in ensuring that Exeter is considered for high-profile initiatives such as Catapult Centres. A long term strategy to build close links with the TSB at all levels is considered an important strand of the recommended work.

28. If the proposal to create a Catapult Centre cannot be realised it is recommended that the Fraunhofer Institute model is investigated. This is the successful German approach to linking universities, companies and innovation expertise which has been exported successfully to other countries – and one example is located in the UK (photonics in Strathclyde).
29. Links with the TSB will allow a greater visibility of the funding opportunities that are likely to arise from TSB competitions. These competitions are otherwise announced through the www.innovateuk.org website and at this point companies have a limited time to respond within a deadline. Greater visibility of up-coming competitions promoted to Exeter companies should increase the readiness and then subsequent success of Exeter companies in gaining funding and opportunities.
30. The opportunities to support Exeter based companies to gain public funding is another recommendation for the knowledge economy approach. RGF, TSB, Horizon 2020 are all grant funding schemes that could directly benefit R&D activity undertaken by companies in Exeter. ERDF, Growing Places Fund and the new Local Growth Fund could also offer some more tangential benefit. Successful applications for these types of funding for companies involves a knowledge of the scheme; a knowledge of State Aid legislation; and a knowledge of how various funds and schemes can operate together (with for example R&D tax credits for SMEs). This is a subject area where a dedicated member of staff could add significant value. This should be considered as part of the wider business engagement work.
31. The provision of funding for companies can also consider private sector funding support. It is recommended that part of the business engagement activity involves identification of the private equity / business angel funder most active in the sectors identified. It is recognised that these funders are probably based outside Exeter. The intention is to ensure that these funders recognise the strengths of Exeter; the likelihood of potential deals emerging from the work of Exeter; and the opportunities that they represent. The hope is that Exeter can reach a point where business plans from Exeter can be vetted by the business development team and then passed through to funders once they are in a state of readiness – this will allow funders to know that they are reviewing credible / well constructed business plans on which they can evaluate their funding decisions.
32. There is significant support for potential new-start businesses being developed by students of the University. This is manifested through advice; training; and the provision of business space – often at a good commercial rate – within the Innovation Centre. This support is not replicated in the wider economy. There is an opportunity however to examine vacant property owned by the public sector across the City and consider the provision of this space for start-up businesses. This could involve minimal

Recommendations

Under-pinning virtually all of the recommendations is the provision of a business development team aligned to the knowledge economy and with specific expertise around funding, promotion, and building linkages

expense – the provision of furniture and a good WIFI connection would be all that was initially required. Such space could be provided at zero cost / or apportioned cost to occupiers with a typical route for many of these centres through the allocation of 'hot desks' on a daily basis in an open plan area. This is a model that is increasingly popular in the digital sector in many other cities.

33. The provision of reliable and fast broadband across the City is obviously a pre-requisite for a knowledge economy strategy – particularly in considering sectors such as 'big data'. The roll out of improved broadband through the contract provided by Connecting Devon and Somerset to BT is underway and the more general commercial upgrade to areas not requiring public subsidy will be undertaken by a range of providers. There is concern within the City that the availability of the service will be slow to arrive; will upgrade exchanges but not necessarily all cabinets; and will still leave coverage black spots. This is an evolving issue – but it is clear that there will not be 100% next generation access for the entire area. As a result, in addition to maintaining pressure on Connecting Devon and Somerset and BT, there is a need to explore the use of ERDF / LEP funding to extend the coverage (this has been achieved elsewhere) and to ensure that alternative models of delivery are known and worked up in some detail to provide a solution to potential occupiers – line of sight and satellite links for example.

34. Many businesses believe that they could benefit from working with a University on R&D projects but do not know how to start the discussion / never get around to the discussion. In fact the University of Exeter both seeks relationships with business and sets out the different ways in which the University may work with business on its website. These practical ways in which contractual work is undertaken should form part of the inward investment offer for Exeter.

35. The provision of business support underpins many of the recommendations. This is not a strategy with suggestions for expensive promotional campaigns or procurement of 3rd party activities – but it does require people resource. This people resource could be re-aligned from other activities in the City but may also be additional. This is something that may be considered as part of a RGF programme bid. The business development activity is likely to result in support for business in terms of:

    - Inward investment promotion
    - Relationships with UKTI and TSB
    - Funding expertise (public and private)
    - Management of business start centre
    - Researching and pursuing company opportunities
    - Pursuing 'supply side' initiatives such as broadband
    - Creating linkages between companies and innovation opportunities

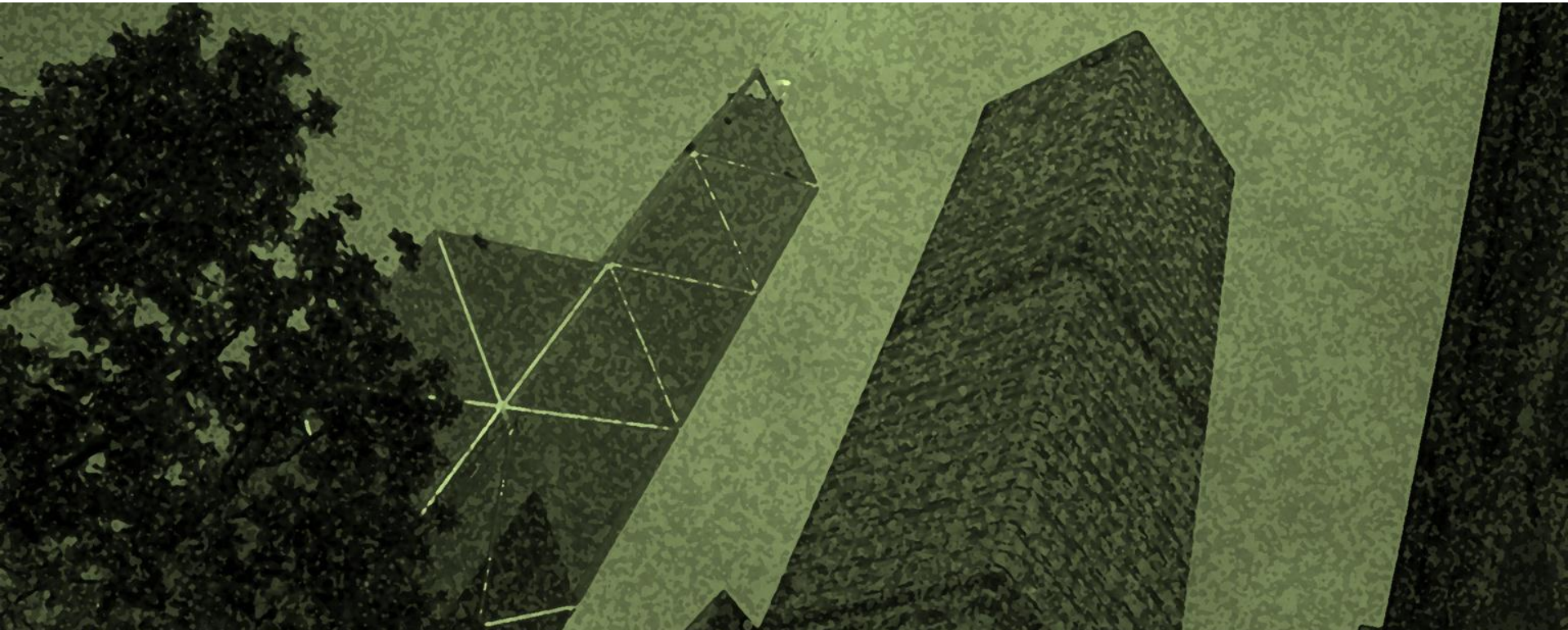
    this variety of people based activities is likely to require a minimum of 3+ people.

Recommendations

Building linkages between companies and innovation opportunities is something that needs kick-starting. Dialogue is unlikely to take place without intervention.

36. The last of these areas of intervention by the business development team is the most difficult to articulate and perhaps the most important to undertake successfully. Businesses collaborations and university linkages tend not to happen without the intervention of some support. The identification of linkages, the potential for joint working and the similarities between activities can often be spotted by a 3rd party and an introduction brokered. This may be because of the time available but may also be through the intervention of a neutral and trusted 3rd party. Where this service is provided well, it can be invaluable in driving the success of a knowledge economy – and this is seen in many of the example locations cited in this report. This is something that could stimulate activity at the Science Park which is likely to be a focal point for innovation – but should also extend to those companies beyond it. This is at least a full time role for 1 person – but the level of resource can be matched to the scale of ambition.

9. Action Plan



Actions

Action Heading	Immediate (Next 2 months) - Required Work
	Exeter City Council
'City of Innovation Board'	▪ Discuss with EXiST opportunity to put in place governance structure through existing organisation. Ascertain how constitution should be established, membership, roles etc.
Supercomputer	▪ Work with the Met Office to identify how Exeter City Council can with its partners support the case for the Supercomputer to be located at Exeter Science Park. ▪ Ascertain opportunity to secure Catapult Centre status for the Met Office supercomputer and Science Park development. ▪ Identify existing relationships with significant companies such as Quintiles, Willis etc through own and partner relationships (e.g. the University of Exeter) to ascertain companies who many have interest in using the Supercomputer and could potentially be used as a match funder for streams such as ERDF and LEP funds.
Access to public sector funding	▪ Through partners such as the University of Exeter, Devon County Council and the LEP identify funding streams that could benefit local companies in R&D activity and wider. ▪ Work with the University of Exeter to put in place strategy for building long term relationships with the TSB.
Broadband infrastructure	▪ Lobby Connecting Devon and Somerset and BT. ▪ Explore use of ERDF / LEP funding to extend broadband coverage to other parts of Exeter.
Attraction of new investment	▪ Ensure that the Heart of the SW LEP promotes Exeter's sector strengths to UKTI by developing inward investment propositions for each sector and facilitating introduction to key stakeholders for each sector. ▪ Put in place timetable which lists major forthcoming developments so that these can be maximised for PR opportunities, e.g. Living Building Systems Building; likely timing of supercomputer announcement; completion of implementation of digital patient records at the RD&E.

Actions

Action Heading	Immediate (Next 2 months) - Required Work
	Partners
Strengthening of existing institutions	▪ The Government's launch of the Agri Tech Strategy launched in July 2013 highlighted that £10m being made available for a Centre for Agricultural Informatics and Metrics of Sustainability. Where this is to be located is still not clear. As such, an urgent priority could be to ascertain whether the funding has now been allocated to an institution of this is still an opportunity for the University of Exeter to lobby for this investment.

Actions

Action Heading	Short Term (3 to 18 months) – Required Work
	Exeter City Council
Access to public sector funding	▪ Build internal capacity to identify public sector funding streams and how schemes work including understanding of State Aid. ▪ Allocate member of staff with responsibility for keeping up to date with TSB competitions and sharing this information to Exeter based businesses. Ensure support is also in place to help companies to through the competition process, for example with support from the University of Exeter. ▪ Identify funding streams available from the LEP when confirmed. ▪ Explore opportunities for accessing finance from the TSB funding call on 'big data' which is expected to be launched in early 2014.
Access to private sector funding	▪ Identify private equity houses / business angels that are most active in Exeter's key sectors.
Impact of knowledge economy on existing businesses	▪ For each identified sector, compile list of companies to identify opportunities for establishing cluster groups (if not already in place) to share best practice and knowledge exchange with relevant institutions. ▪ Once supercomputer announcement made, work with Met Office to clarify access to supercomputer by relevant companies both locally and outside of the area. ▪ Explore supply chain opportunities through the major organisations such as The Met Office and South West Water that local businesses could benefit from but do not currently have the capacity/capability to serve. Identify where local support (e.g. Manufacturing Advisory Service) could help enable local companies to meet supplier requirements. ▪ Working with relevant partners, identify how legislation (for example the Water Bill) could generate local opportunities for growing the sector further. ▪ Work with existing companies in sectors which are going experiencing mergers & acquisitions, such as consulting engineering, to secure further growth in Exeter.
Attraction of new investment	▪ Develop marketing strategy for each identified sector. ▪ Map commercial linkages within the Met Office. ▪ Put in place programme to attract entrepreneurs, e.g. use of industry networks, alumni and social media. ▪ Identify public sector owned vacant commercial property which could be used to provide cost effective base for business start ups.

Actions

Action Heading	Short Term (3 to 18 months)
	Exeter City Council continued
Attraction of new investment	▪ Put in place network of professional services organisations to provide a 'soft-landing' for new start ups and spin outs, including in the area of Intellectual Property. ▪ Develop an inward investment toolkit which can be used to further attract new companies to the area. ▪ Develop a compelling quality of life offer. ▪ For each sector, identify regional and national networking groups (e.g. Big Data Insight Group, Climate South West) for networking and sector intelligence opportunities. ▪ Identify relevant sector conferences which could be hosted in Exeter. ▪ For each sector identify target companies (and map whether there are already known contacts through partners) that could be approached with the intention of presenting the case for a presence in Exeter.
	Partners
Impact of knowledge economy on existing businesses	ExIST – ▪ Work with Exeter City Council to further add to contact list of relevant companies for each identified sector and establish cluster group.
Attraction of new investment	University of Exeter - ▪ identify potential 'ambassadors' from alumni base and company linkages ▪ Relevant academics to provide relevant contacts for lobbying to host conference in Exeter ▪ Identify commercial linkages with major companies not already based in Exeter but who could have the potential to establish a presence locally. ▪ Leverage existing commercial relationships with larger companies to identify opportunities for establishing a presence locally and work with the City Council to make the case for potential investment.
Strengthening of existing institutions	University of Exeter ▪ Exploration of opportunities with other partners including the Met Office and the RD&E to establish a centre of excellence relation to big data and heath.

Actions

Action Heading	Short Term (3 to 18 months)
	Partners, continued
Strengthening of existing institutions	University of Exeter ▪ Facilitate stronger linkages between the RD&E and the Met Office in the area of illness prediction based on weather conditions. ▪ Once University's London 'office' is opened (tbc) explore opportunities with Exeter City Council for promoting Exeter's businesses to London based private funders (e.g. private equity houses) ▪ Identify potential 'ambassadors' from the University of Exeter who may be happy to promote Exeter and facilitate introductions with Exeter City Council. ▪ Support the City by facilitating linkages to academics who could bid for sector related conferences (for example in the field of diabetes).

Actions

Action Heading	Medium (2 to 5 years)
	Exeter City Council
City of Innovation Board	▪ Identify opportunities for building further capacity within the City of Innovation Board and dedicated member of staff.
Impact of knowledge economy on existing businesses	▪ Explore opportunities for maximising from the University of Exeter 'Strategic Corporate Partners' programme which by this period should be well established. ▪ Identify Exeter businesses which may benefit from cross sector linkages (e.g. monitoring devices and information services) and facilitate groupings.
Attraction of new investment	▪ Map the Met Office's international linkages (e.g. NASA) that could be used to raise profile of Exeter in target overseas markets. ▪ Identify sector related UK and international exhibitions, where the City Council could partner with the private sector to promote Exeter's assets.
	Partners
Impact of knowledge economy on existing businesses	▪ Continue to extend the networks within the promotion of the knowledge based economy; the knowledge of these companies of the work underway, and then encourage the opportunities for collaboration between new members to the network. ▪ Review the work on earlier initiatives to ensure that it has been accessible to local business and adapt as necessary
Attraction of new investment	University of Exeter ▪ Maximise the presence of the University's overseas offices (e.g. India and China) to promote Exeter in overseas markets. ▪ Provide overseas based alumni with marketing collatoral to promote Exeter as an inward investment location. ▪ Ensure that the propositions of the Supercomputer and also access to the University are set out in a manner that engages business
Strengthening of existing institutions	RD&E ▪ Building on existing track record in clinical trials, position Exeter as a location for medical device trials

Mickledore 2013