Annex 6: Local science and innovation talent: skills provision now and for the future

As noted under research, the inter-disciplinary nature of eco-innovation for Clean and Sustainable growth means that all three of our capabilities transcend traditional boundaries between academic subjects. For example, while businesses under the Environmental Industries Technologies and Services (EITS) capability will draw skilled staff from degrees such as Environmental Sciences, Ecology or Earth Science, they might also draw on Engineering, Chemistry and many biology-based programmes. Future Energy Systems will draw on skills from Engineering, Advanced Manufacturing and the Environmental Sciences. Advanced Manufacturing Chemical and Materials will rely on skills from Advanced Manufacturing, Engineering, Materials Science, Chemistry but also, especially given the growing importance of waste management and a circular economy, multiple aspects of the Environmental Sciences.

That also links to NWCA's recognition, developed over a number of years, (i) that training in science and innovation needs to encompass multiple levels and (ii) that "traditional disciplinary training" within STEM needs to be complemented by training for the wider skill-sets demanded by business. Our position resonates with the NESTA report (2017) which concludes that future trends in key skills for 2030 include strong drivers from environmental sustainability, globalisation, technological change and demographic change as the population grows and ages. Unlike low and middle-level skills there is growing demand for higher level professionals as roles become more cross-cutting and need to think 'outside the box'. Report findings also confirmed the importance of higher-order cognitive skills such as originality, fluency of ideas and active learning. Skills related to system thinking — the ability to recognise, understand and act on interconnections and feedback loops in sociotechnical systems —such as judgement and decision making, systems analysis and systems evaluation feature prominently. Again, this is close to the NWCA's long-standing focus on growing absorptive capacity to drive innovation, leadership/entrepreneurialism and ultimately improve productivity.

On that basis, this chapter takes an integrated perspective on local science and innovation talent across all three capabilities and is structured as follows. After assessing employment in sectors pertinent to our capabilities (A6.1), we first summarise training at pre-degree provided by the NWCA's HEIs and FEIs provision (A6.2.1). We then (A6.2.2) consider provision of undergraduate degrees, and graduate inflow and outflow. Thirdly, we summarise the NWCAs post-graduate training at Masters (A6.2.3) and doctoral level, including doctoral training centres (A6.2.4). We then (A6.3) focus on activities within the NWCA that "cross the great divide" to provide wider skill sets and business awareness for the region's STEM graduates.

6.1 Employment in relevant sectors

Compared with the UK average, the NWCA has a lower percentage of residents qualified to NVQ4 or above (37.6% compared with 43.5%). This statistic varies markedly within the region, from almost 50% in Fylde to 25% or less in Eden, Stoke-on-Trent and Barrow-in-Furness.

The percentage of residents employed in science, research, engineering and technology professionals (SOC21) and science, research, engineering and technology associate professionals (SOC31) are both lower in the NWCA than the UK as a whole (4.08 compared with 5.60 for SOC21, 1.17 and 1.80 for SOC31). These averages disguise very large variation within the region with some areas (e.g. Barrow-in Furness, Copeland and Warrington) being well above the UK average whilst others, notably the more rural areas (e.g. Eden), having extremely low employment in these professions.

A6.2 Training and talent for Clean and Sustainable Growth

A6.2.1 Pre-Degree level training

The region has invested strongly in supporting training pertinent to this SIA. For example, 'Lancashire Energy Skills HQ' owned and operated by Blackpool and The Fylde College is leading an initiative that will support oil and gas in addition to renewable and low-carbon energy generation training and skills. The £9.8m project, which opened in 2017, houses the National College for Onshore Oil & Gas sited in the newly formed Blackpool Enterprise Zone. The project represents significant investment by the College and the Lancashire Enterprise Partnership, who are providing £6.2 million of Growth Deal funding towards the cost.

A6.2.2 Higher level apprenticeships

All higher education institutions within the NWCA are committed to the co-creation of industrially relevant education options, including high quality apprenticeships, to meet the needs of regional and national industry. Degree and Higher Degree apprenticeships remain a recent addition to the training portfolio and few connected to our SIA focus areas are currently available (Table A6.1).

This provision of apprenticeships relevant to Clean Growth is still developing at all levels, within the region and nationally.

A growing number of Apprenticeship standards are being published, particularly in the broad area of Engineering, where there are currently 89 at L3, 25 at L4, 3 at L5, 16 at L6 and 5 at L7. At Masters level a Postgraduate Engineer (L7) Standard is now available with Cranfield, Aston, Warwick and Sheffield the only registered training providers. Apprenticeship standards related to water management are still limited with 10 at L3, 1 at L4, and no Standards at higher levels. Only 10 Standards focus on energy, the majority are at Level 3 (e.g. Junior Energy Manager and Facilities Manager) and the most recently agreed is a Power Manager at Level 7 with currently no training providers in place. Of the 17 Waste management apprenticeships open, only one is above level 5.

Within the NWCA the only apprenticeships at Level 7 are in business, management and leadership but there are a number of developments within the region or just beyond its boundaries that aim to address this issue. The Liverpool City Region (LCR) Apprenticeship Hub is a collaborative group, responsible to the LCR Employment and Skills Board. Funded by the European Social Fund through the Education and Skills Funding Agency, it aims to increase the awareness, number and quality of apprenticeships available to regional residents by supporting and coordinating activities, making apprenticeships work for businesses and individuals.

Just outside the NWCA, Wigan & Leigh College is the largest College provider of apprenticeships in Greater Manchester offering 50 different apprenticeships at Level 2 and 3. A £6 million City Deal programme, supported by the Skills Funding Agency and the Department for Business, Innovation and Skills, is now operational and is designed to 'gap fund' the Apprenticeship Hub to address identified market failures in Greater Manchester around low levels of unemployed young people entering apprenticeships and low volumes of apprenticeships offered at level 3 and above in priority growth sectors. Staffordshire University has secured £8 million funding from the Higher Education Funding Council for England's Catalyst Fund towards the cost of a landmark project, which will see a new state of the art Digital Apprenticeships and Skills Hub built on its Stoke-on-Trent campus.

While these developments will offer many new opportunities, the evidence from this audit suggests there is a real gap in higher level apprenticeship provision across the NWCA region and nationally in energy, water and waste management. Set against a backdrop of the regional need for higher level skills in the workforce, there could be a strong case for aligning new programmes across the NWCA towards these sectors.

Table A6.1
Current degree apprenticeships relevant to our SIA themes (including business management) at NWCA higher education institutions

Liverpool John Moores University	Building Surveying (L6) Construction Management (L6) Business & Management Practice (L6) Civil Engineering (L6) Digital & Technology Solutions (L6) Electrical and Electronic Engineering (L6) Business Scale-ups MBA (L7) Leadership & Management Practice MSc (L7) MBA (L7)
University of Central Lancashire	Chartered Manager (L6) Software Engineering designed with BAE for the aerospace industry (L6) Building Surveying L6 Executive MBA L6
Blackpool & the Fylde College	Business and Management (L 6) Engineering apprenticeships x 10 (L 3 and 4) Sustainable Waste Management (L3)
University of Cumbria	Chartered Manager Degree Apprenticeship (L6) Senior Leaders Masters Degree (L7)
Lancaster University	Management & Leadership (L6)
Keele University	Exploring options
University of Liverpool	Exploring options

Table A6.2
STEM recruitment NWCA institutions

Level of study	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Undergraduate	13,140	11,545	12,440	12,955	13,615	13,725
Postgraduate (taught)	2,470	2,085	2,210	2,225	2,240	2,885
Postgraduate (research)	700	740	790	800	840	905

6.2.2 Degree level training

An analysis of HESA data for the NWCA partner higher education institutions suggests STEM recruitment in Undergraduate and Postgraduate taught programmes has remained relatively static over the six years from 2011/12 to 2016/17 (Table A6.2). Just over 40% of undergraduate students in STEM subjects recruited across the NWCA originate from the North West and this proportion is relatively static over the period, approximately 8% from Wales and the West Midlands, 5% from Yorkshire and 4 % from the South East (Table A6.3). Overseas recruitment has remained relatively constant at approximately 18% over this period (Table A6.3).

Over the five years 2011/12 and 2015/6 an average of 6706 individuals graduated in STEM subjects from the higher education institutions in the NWCA (HEIDI+). Of those graduating in 2015/16 more than two-thirds were employed in regions that include members of the NWCA; 54% in the North West of England, 7.3% in the West Midlands and 6.2% in Wales. Another 6.2% were employed elsewhere in the north of England.

Of those 2015/16 STEM graduates just over 70% found employment in STEM-based sectors, and of those approximately 20% were employed in sectors explicitly linked to Clean and Sustainable Growth as defined in this SIA.

6.2.3 Masters level training

In the six years between 2011/12 and 2016/17 NWCA institutions trained just over 14,000 students on postgraduate taught degrees in STEM subjects. Over this period annual recruitment increased 14% overall from 2470 in 2011/12 to 2885 in 2016/17 (Table A6.4). North West based individuals make up approximately 30% of the intake, and Wales and West Midlands combined add an additional 12% of total PGT recruited (Table A6.4). Overseas recruitment to the region's taught Masters programmes has varied from year-to-year but represented a noticeably lower percentage in 2016/17 (29%) than in previous years (37-40%).

6.2.4 Doctoral level training

In the six years between 2011/12 and 2016/17 NWCA institutions trained just under 5,000 students on postgraduate research degrees in STEM subjects. Over this period postgraduate research degrees recruitment increased 23% from 695 in 2011/12 to 900 in 2016/17 (Table A6.4). North West based individuals make approximately 30% of total PGT recruitment, with 12% coming from Wales and West Midlands combined (Table A6.5). It is notable that the region recruits as many overseas candidates into our post-graduate research degrees as we recruit from within our broad area (averaged over the six years 41% from overseas, 42% from the North West, Wales and the West Midlands).

The region is host to fifteen doctoral training centres (DTCs) pertinent to this SIA (Table A6.6). It is notable, given our underlying hypothesis of the need for greater connectivity across the region and across disciplines, that a high degree of connection is evident in these DTCs. The Centre for Global Eco-Innovation (page 4) plays a key role in this existing network, already bringing together five of the NWCA's universities (Lancaster, Liverpool, LJMU, Chester and Cumbria). In addition, two Lancaster-led NERC funded DTCs (ENVISION and STARS) also include Bangor University. It is equally notable that our DTCs, especially the Centre for Global Eco-Innovation and Waitrose Collaborative Training Partnership, directly link post-graduate research with industry. As noted elsewhere, this existing successful collaboration around DTCs is one powerful foundation for this SIA and one which we are confident can be built on in the future, expanding to embrace all participating higher education institution, regions and sectors.

Table A6.3
STEM recruitment for UG at participating institutions by UK region

Domicile (UK region)	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
North West	5,930	4,830	5,180	5,545	5,610	5,720
Wales	905	1,040	1,070	1,020	1,045	1,115
West Midlands	805	790	845	940	1,180	1,200
Yorkshire and The Humber	645	530	595	675	710	705
South East	490	410	455	465	525	530
East Midlands	395	390	420	445	475	390
East of England	385	315	360	375	425	380
London	300	270	325	385	435	390
South West	320	275	290	295	315	295
Northern Ireland	295	190	240	275	380	390
North East	220	185	185	190	245	180
England region unknown	5	5	5	10	15	15
Scotland	55	45	50	55	65	45
Channel Islands and the IoM	60	45	40	45	45	60
UK region unknown				5	0	0
UK total	10,810	9,320	10,060	10,725	11,470	11,415
Non-UK	2,330	2,225	2,380	2,230	2,145	2,310
Grand total	13,140	11,545	12,440	12,955	13,615	13,725

Table A6.4
STEM recruitment for Postgraduate Taught (PGT) at participating institutions by UK region

Domicile (UK region)	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
North West	705	560	590	625	685	1,050
Wales	165	135	125	120	105	110
West Midlands	160	135	155	145	145	200
Yorkshire and The Humber	75	55	65	75	60	95
South East	75	60	75	90	65	90
East Midlands	55	30	45	60	45	70
East of England	45	40	40	60	45	80
London	50	55	50	70	50	70
South West	45	40	40	40	50	50
Northern Ireland	10	10	15	20	15	15
North East	30	20	10	25	15	30
England region unknown	95	90	85	5	110	170
Scotland	35	40	30	35	25	15
Channel Islands and the IoM	5	10	5	5	5	10
UK region unknown		5				0
UK total	1,550	1,285	1,330	1,375	1,420	2,055
Non-UK	920	800	880	850	820	830
Grand total	2,470	2,085	2,210	2,225	2,240	2,885

Table A6.5
STEM recruitment for Postgraduate Research (PGR) at participating institutions by UK region

Domicile (UK region)	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
North West	220	220	235	255	275	250
Wales	50	50	55	55	45	75
West Midlands	35	35	35	30	35	55
Yorkshire and The Humber	25	25	20	25	20	25
South East	20	20	25	25	20	25
East Midlands	10	10	15	20	15	20
East of England	15	15	10	20	10	10
London	10	10	5	10	15	20
South West	10	10	10	20	15	20
Northern Ireland	5	0	5	5	0	5
North East	5	10	5	10	5	10
England region unknown	5	25	15	0	40	10
Scotland	5	10	10	10	10	10
Channel Islands and the IoM	5	0	0	0	0	5
UK region unknown	0	5				
UK total	420	445	445	485	505	540
Non-UK	280	295	345	315	335	365
Grand total	700	740	790	800	840	905

Table A6.6
Doctoral Training Centres within the NWCA

Lancaster University	Centre for Global Eco-innovation ENVISION Soils Training and Research Studentships (STARS) HiWire Centre for Doctoral Training (CDT) EPSRC STOR-I Centre for Doctoral Training BBSRC Doctoral Training Partnership in Food Security The North West Nanoscience Doctoral Training Centre
University of Liverpool	Centre for Global Eco-innovation Manchester & Liverpool Doctoral Training Programme Fusion DTC EPSRC/ESRC Centre for Doctoral Training in Quantification and Management of Risk & Uncertainty in Complex Systems & Environments EPSRC Centre for Doctoral Training in New and Sustainable Photovoltaics The EPSRC Centre for Innovative Manufacturing in Additive Manufacturing EPSRC Centre for Doctoral Training in the Science & Technology of Fusion Energy NERC Adapting to the Challenges of a Changing Environment (ACCE) NERC Understanding the Earth, Atmosphere and Ocean
Bangor University	ENVISION Soils Training and Research Studentships(STARS)
Keele University	NERC CDT in Oil and Gas
Liverpool John Moores University	Centre for Global Eco-Innovation
University of Chester	Centre for Global Eco-Innovation
University of Cumbria	Centre for Global Eco-Innovation