

**ADAPTATION AND RESILIENCE
(CLIMATE CHANGE)
(A&RCC)**

Report for 2010/11

JUNE 2012

**Adaptation and Resilience
(Climate Change)
(A&RCC)
Report for

2010/ 11**

**Commissioned by the Department for Business, Innovation and
Skills from**



June 2012

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We welcome feedback on the issues raised by this BIS commissioned study and comments should be sent to:
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Contents

Contents	4
2. Methodology.....	7
2.1 Methodology.....	7
2.2 New Research Model for Isolating A&RCC Content.....	8
2.3 Illustrative Example	9
2.4 Revised Baseline.....	11
3. Global A&RCC 2010/ 11	13
4. UK A&RCC 2010/ 11	17
4.1 UK A&RCC Sales, Employment Companies and Growth	17
4.2 UK Imports	23
4.3 UK Exports	26
Appendix A	29
A&RCC Definition.....	29
Appendix C	30
Apportionments	30
Appendices not included	
B: Example Spreadsheet	

1. Introduction

This is the second report commissioned by BIS, Defra and DECC on Adaptation & Resilience for Climate Change (A&RCC) primarily covering the period 2010/ 11. This follows on from the pilot study commissioned last year which aimed to identify and measure A&RCC activities in the UK and the wider global economy for 2009/10. The definition of A&RCC was provided by Defra as part of the original brief for this research. An initial list of A&RCC activities to be investigated was also provided by Defra and these included:

- 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, and
- Water Irrigation & Foot Printing.

A more detailed breakdown of each A&RCC activity is included at Appendix A.

In the pilot report for 2009/ 10, A&RCC activities were examined in two contexts. The first was an estimation of the value of the A&RCC activities as listed above, additional to those contained in Low Carbon & Environmental Goods and Services (LCEGS) data. These activities were being researched and quantified for the first time. The second was an estimation of the A&RCC content of the activities included in the Low Carbon & Environmental Goods and Services (LCEGS) sector. LCEGS activities have been measured for a number of years (Innovas/ K-Matrix 2009, K-Matrix 2010, K-Matrix 2011¹), but this was the first attempt to calculate the proportion of LCEGS economic value that could be specifically attributed to A&RCC. The results of this provisional analysis can be found in the 2009/ 10 A&RCC pilot [report](#).

The 2009/ 10 pilot report recorded a number of observations about the provisional analysis of A&RCC activities. The key learning from this analysis was that measuring the intended use of established/ new products and services specifically for their

¹ Reports available at: <http://www.bis.gov.uk/policies/business-sectors/low-carbon-business-opportunities/market-intelligence/market-data>

A&RCC is difficult to capture when basing the assessment on high level data for economic activities, rather data needs to be detailed enough to make a more informed judgement on the adaptation and resilience component of that activity. The provisional results from the 2009/ 10 pilot were considered to overstate the economic value of A&RCC activity. This 2010/ 11 report builds on the preliminary analysis of the pilot study, focusing on establishing a more robust methodology for measuring the economic value of the A&RCC activities listed above, not included in the LCEGS data.

2. Methodology

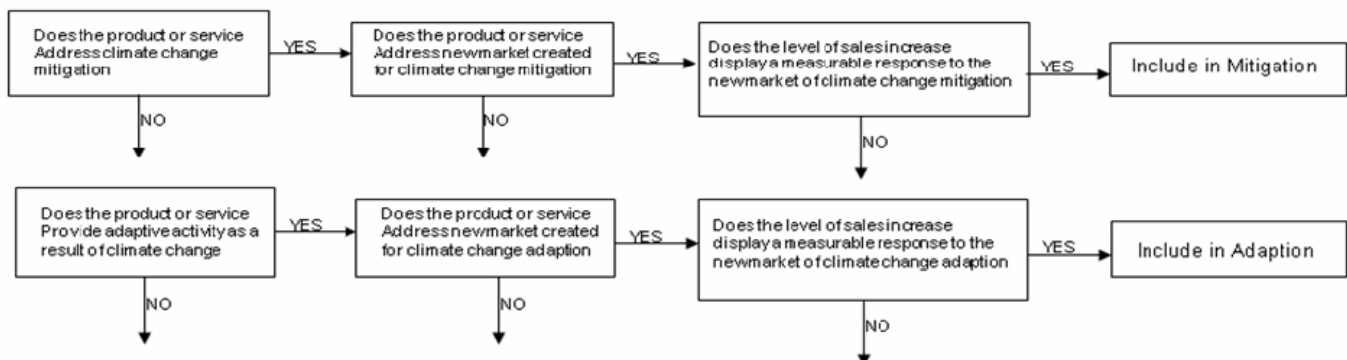
2.1 Methodology

The analysis of A&RCC economic activity is based upon an existing methodology employed for estimating the LCEGS (and other) UK sectors. This methodology is used to define and quantify unobserved or "difficult-to-measure" markets where standard statistical data sources are non-existent, restricted or rapidly out-dated. This is achieved by identifying, evaluating, interpreting and transforming multiple data sources to estimate new values and by using a rules-based approach to collecting, assessing, selecting and then managing these data sources. A detailed explanation of the standard methodology is outlined in the LCEGS 2010/ 11 report, available [here](#).

The decision making criteria used to decide if an economic activity should be considered as adaptive or resilient is based on the 2009/10 pilot report.

The model at Figure 1 was applied to the new A&RCC activities identified by Defra. It takes into account both Adaptation to and Mitigation of climate change. It is a triple-gate approach that addresses the claim for A&RCC (Step 1), the intent to create new A&RCC market rather than create a substitution effect for existing goods and services (Step 2) and finally, the A&RCC market size i.e. is it measurable and significant. The most critical stage in the model is Step 2, trying to isolate the "intent" of use for products and services that may have multiple functions and applications.

Figure 1: Decision Model



While the decision making model provides a valid route to defining A&RCC activity, it is this isolation of intent or purpose that was found deficient in the 2009/ 10 analysis because of the level of product and service detail at which it was being applied.

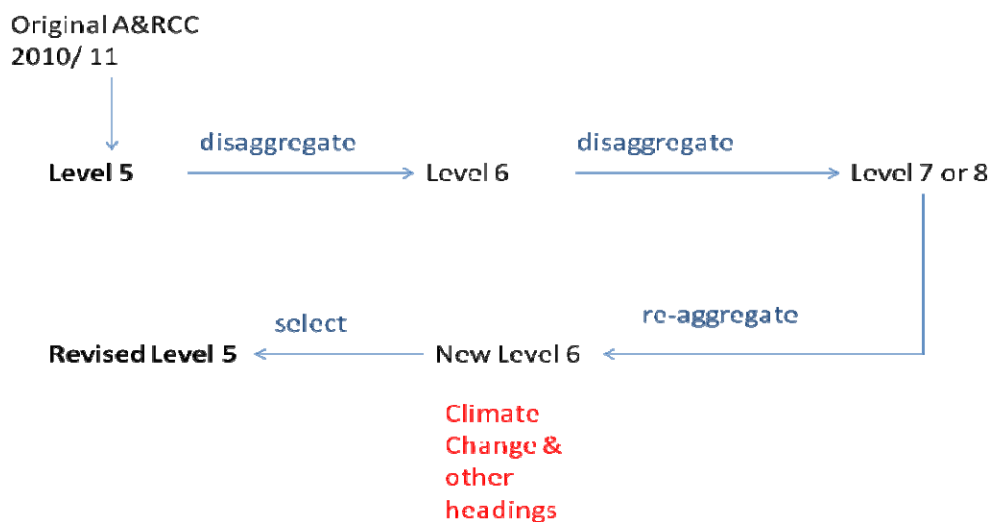
2.2 New Research Model for Isolating A&RCC Content

Product and service analysis can be conducted at many different levels, ranging from an aggregation of all sector- related activities (high level) to disaggregated individual outputs. The standard approach for the current methodology works with hierarchical levels of data- ranging from 1 to 5- where 5 (equating to a six level SIC code) represents the most disaggregated level for market activities. At this level sector activities can be described uniquely in terms of their function and this has proved sufficient for most economic development requirements. Level 5, however, does not provide the necessary level of detail to determine the end- user market or purpose/ intent for a particular product or service. This information generally resides at a more detailed level (6, 7 or 8).

In a pilot analysis conducted in 2009/ 10 a very small sample of LCEGS Level 5 activities were disaggregated to Level 6. This exercise was designed to test whether a deeper analysis could provide a more accurate reflection of Adaptation and Resilience activities. The result was positive but the sample was too small to be able to extrapolate the results more widely across LCEGS or A&RCC activities. The outcome of the exercise did, however, influence the methodology for the 2010/ 11 study.

For the 2010/ 11 report all 180 A&RCC activities from 2009/ 10 are subject to a deeper analysis with a view to isolating the true Climate Change content of these activities more accurately. The research model is shown at Figure 2.

Figure 2: Research Model



The model requires the calculation of values for A&RCC activities for 2010/11 using the 2009/ 10 methodology. This provides a baseline from which further changes in value can be measured.

It then requires a further disaggregation of the initial A&RCC activities to Levels 6, 7 or 8. It is at this level that the use/ purpose/ intent of a product or service in response

to Climate Change becomes much clearer. Deciding what is/ is not Climate Change related is still a subjective exercise even at this level of detail, but the decision about what activities and values should be included is now based upon much more traceable evidence.

Research at this level of detail creates many more data lines than the original 180. Each new level of disaggregation adds 4-5 new data lines, so that for each of the original A&RCC activities at Level 5 there are up to 100 new subdivisions. This creates a new A&RCC research data set of approximately 18,000 data lines. It is clearly impossible to demonstrate a research base of this size so an example of how this analysis works in practice is shown in Section 2.3 and at Appendix B.

After disaggregating A&RCC activities to levels 7 or 8, the next step is to re-aggregate the data at Level 6 in such a way that Climate Change content is differentiated from non- Climate Change content. These are grouped under new categories:

- Response to Climate Change
- Responses to General Environmental/ Ecological Disasters
- Responses to General Environmental Policies and Targets
- General Maintenance
- Traditional (non- Climate Change) Applications
- Other non- Climate Change Services

On average three other headings plus Climate Change are applied to each of the original 180 Level 5 activities. At level 6 the Climate Change category now reflects a much more accurate assessment and valuation than the previous Level 5 calculation for A&RCC. This Level 6 value can now be substituted for the previous A&RCC value and becomes the new baseline for A&RCC activity.

This process is applied to all of the A&RCC activities and to all of the economic values calculated for each activity- sales, employment, companies, growth, imports and exports- although the detailed example below focuses on the sales value only

2.3 Illustrative Example

To illustrate the above process a detailed example of the analysis is provided. The process is described here and the actual data is provided as an appendix spreadsheet (B). The example relates to a single activity in the A&RCC data set at Level 5- Transport Infrastructure(3)/ Road(4)/ Anti Subsidence Works(5). This section should be read in conjunction with Appendix B.

Anti Subsistence Works is disaggregated to Level 6 (9 new activity headings), Level 7 (27 new activity headings and for some activities to Level 8 (61 new activity headings). This is illustrated by Columns F-H at Appendix B.

For each activity at Level 7 or 8 there is a comment that explains if this activity is assessed as relevant to Climate Change and whether the whole of the activity value is relevant or whether an apportionment needs to be made.

The criterion for inclusion is that an activity has to be described as relevant to at least one of the following (this is an illustrative rather than a definitive list):

- Anti flood
- Water Course re direction due to changing hydrology
- Subsidence due to changing water table and water course
- Construction retrofit for harsher climatic conditions in terms of temperature and water spray
- Under pinning of structures and pinning of strata
- Expansion and contraction outside original design parameters due to changing environments for example bridge and road joints
- Application and development of higher grade anti corrosion coatings and systems for harsher environments
- Development and application of rain water channelling equipment for larger water volumes
- Sea defence systems and land corrosion
- Water volume management due to higher river and water coarse flow rates
- Extra ordinary water coarse development for water provision in agriculture for dryer growing seasons
- Insurance against climate change effects only
- Financial Instruments for adaptive remediation and resilience
- Consulting for adaptive remediation and resilience
- Specialist architectural services for adaptation and resilience
- Other specialist services to adaptation and resilience.

If the criterion is met, the activity is assigned to a new Level 6 category called "Climate Change," if not, then it is assigned to another category (see Column J for allocations).

Once an activity has been labelled for the "Climate Change" category then a decision is made as to whether the whole or part of the value should be apportioned to Climate Change. Industry- based evidence is used to determine what proportion of an activity value should be assigned. If industry- based evidence is not available the apportionment is based upon data triangulation i.e. using other data sources from without the industry to provide greater certainty. The apportionment process varies significantly across A&RCC activities; therefore, a summary of how apportionments have been applied to the data values shown at Appendix B is included at Appendix C. Where apportionment has been used this is recorded in the comments column (I). The level of apportionment is shown as a percentage at Column K and varies between 20% and 100%. In all cases, whether apportionment has been applied or not, the target confidence level for each final value is 80%.

At the end of this inclusion/ apportionment exercise two columns of values have been created. The first is the value of each activity prior to any apportionment. The second column reflects the results of the apportionment. The final step of the research model is to recombine the values into the new Level 6 categories and to identify the new value of the Climate Change element.

For Anti Subsistence Works the original 2010/ 11 value was £717m. As a result of the above process a new value of £101.8m has been calculated for A&RCC, with the remaining £615.2m allocated to other non- Climate Change related categories. The new value equates to 14% of the previous value. The final step in the research process is then to take this new Level 6 value and substitute it for the previous A&RCC value and create the new baseline value for A&RCC.

This example explains the process that has been applied to all 180 A&RCC activities and the results are summarised below.

2.4 Revised Baseline

The 2009/ 10 A&RCC pilot study estimated the global value of A&RCC activities in 2009/ 10 at £361bn. Extending the methodology used in this pilot to 2010/ 11 gives estimates for the global value of A&RCC activities at £374,771m or £375bn.

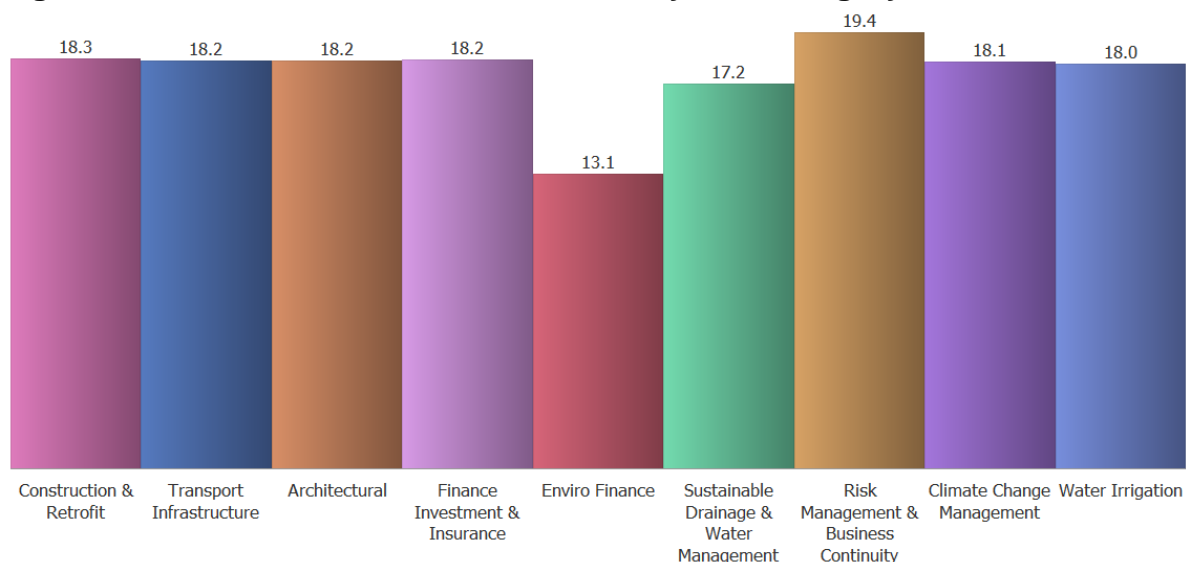
The revised estimate of the global value of A&RCC activities in 2010/11 is £65,772m or **£65.8bn**. The value for 2009/ 10 has been revised to £63,389m or **£63.4bn**².

This means that the new global baseline activity value for A&RCC equates to 17.56% of the previous value for 2010/ 11. This level of adjustment between old and

² Revision of the 2009/ 10 A&RCC values is based upon the application of the 2010/ 11 percentage changes to 2009/ 10 rather than a complete recalculation of 2009/ 10 using the new methodology. It is a retrofit rather than a new build.

new values varies for each sub category of A&RCC activity (see Figure 3) between 13.1% of Enviro Finance to 19.4% of Risk Management & Business Continuity, but shows a degree of consistency across most sub category.

Figure 3: Revised Value as % of old value by Sub Category of A&RCC 2010/ 11



The results from the 2009/10 pilot study estimated the UK A&RCC activities in 2009/10 at £11.3bn. Using the same methodology as in the pilot, UK A&RCC sales in 2010/11 are estimated at £11,747m or £11.7bn.

The revised estimates of the UK value of A&RCC activities in 2010/11 are £2,111m or **£2.1bn** and **£2.0bn** in 2009/10.

This means that the revised UK baseline value for A&RCC equates to 18% of the previous value for 2010/ 11. Taking this into account:

- UK employment for A&RCC in 2010/ 11 was 117,098 and has been revised to 21,012
- UK companies involved in A&RCC in 2010/ 11 was 8,745 and has been revised to 1,566
- UK Imports for A&RCC in 2010/ 11 was £1.39bn and has been revised to £250m
- UK Exports for A&RCC in 2010/ 11 was £1.48bn and has been revised to £265m.

These figures now form the new economic baseline for all of the analysis in Sections 3 and 4.

3. Global A&RCC 2010/ 11

The new global baseline for global A&RCC sales in 2010/11 is £65,772m or **£65.8bn**. The distribution of sales value across the sub categories of A&RCC is shown at Figure 4.

Figure 4: Global A&RCC Sales (£m) 2010/ 11

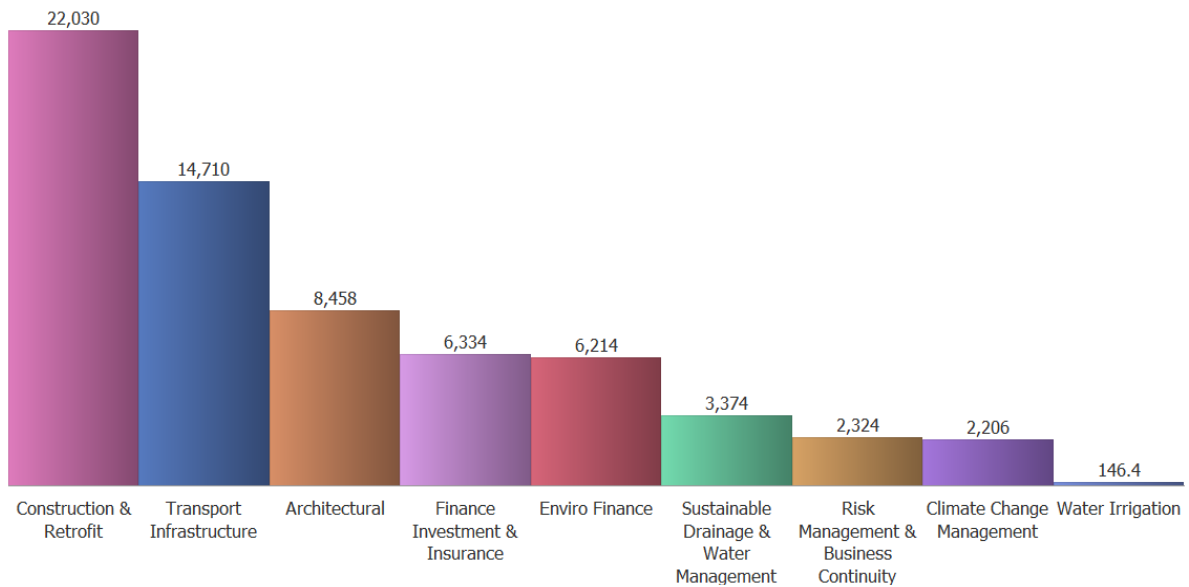


Figure 5: Global A&RCC Sales (%) 2010/ 11

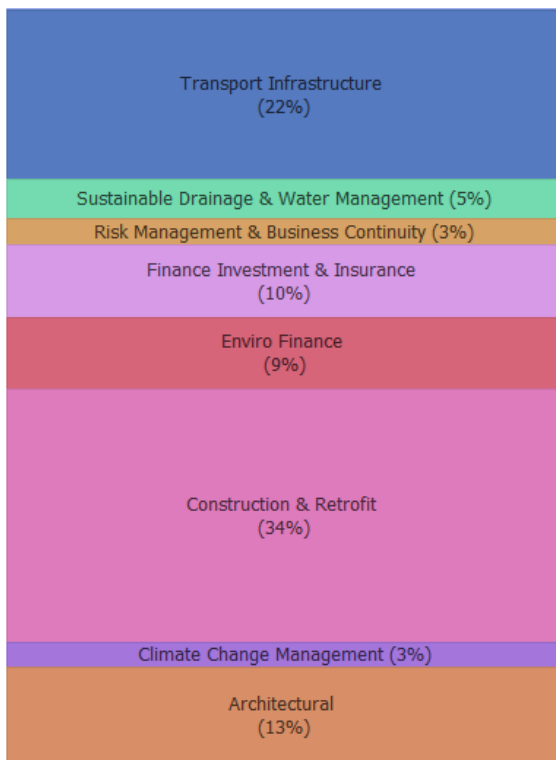


Figure 5 shows global sales values as a percentage, with Transport Infrastructure and Construction and Retrofit accounting for 56% of the total.

A&RCC activities in 2010/11 represent a 3.7% growth over the revised 2009/ 10 figure of £63,389m.

The Top 53 global economies account for approximately 90% of global sales for most economic sectors. In the case of A&RCC, they account for 94% of global sales. Table 1 shows the Top 53 global economies ranked by value for 2010/ 11 and with their percentage of global market.

Table 1: A&RCC Sales 2009/ 10 and 2010/ 11 by Top 53 Countries

Country	Ranking	2010/11 Sales £m	2009/ 10 Sales £m	% of Global Market 2010/ 11
USA	1	14,316.66	13,796.06	21.8
China	2	8,552.34	8,249.12	13.0
Japan	3	4,267.37	4,112.67	6.5
India	4	3,875.95	3,743.57	5.9
Germany	5	2,663.80	2,568.09	4.1
France	6	2,273.63	2,186.55	3.5
UK	7	2,110.64	2,031.22	3.2
Italy	8	1,840.69	1,775.11	2.8
Russian Federation	9	1,718	1,654.48	2.6
Brazil	10	1,653.21	1,593.37	2.5
Mexico	11	1,248.95	1,203.73	1.9
Canada	12	1,110.26	1,072.48	1.7
Spain	13	1,095.02	1,056.01	1.7
South Korea	14	1,083	1,043.13	1.6
Indonesia	15	992.56	958.7	1.5
Australia	16	725.59	894.91	1.1
Turkey	17	632.85	609.92	1.0
Argentina	18	614.61	593.48	0.9
Taiwan	19	602.98	580.47	0.9
Thailand	20	584.84	564.26	0.9
South Africa	21	578.32	557.1	0.9
Netherlands	22	566.35	545.8	0.9
Iran	23	562.51	541.99	0.9
Poland	24	521.04	502.58	0.8
Philippines	25	475.11	457.65	0.7
Pakistan	26	458.04	440.84	0.7
Belgium	27	380.85	366.22	0.6
Saudi Arabia	28	379.26	364.93	0.6
Egypt	29	364.98	351.71	0.6
Colombia	30	348.76	336.34	0.5
Ukraine	31	343.22	330.94	0.5
Bangladesh	32	332.97	320.75	0.5
Sweden	33	312.55	301.37	0.5
Hong Kong	34	290.16	279.37	0.4
Austria	35	286.39	275.85	0.4
Greece	36	275.93	265.97	0.4
Switzerland	37	272.58	262.81	0.4
Malaysia	38	270.38	261.06	0.4
Vietnam	39	264.78	255.31	0.4
Algeria	40	250.97	241.97	0.4
Portugal	41	220.49	212.78	0.3
Romania	42	206.4	199.25	0.3
Denmark	43	200.82	193.7	0.3
Chile	44	198.08	190.77	0.3
Czechia	45	191.13	184.27	0.3
Finland	46	181.23	174.92	0.3
Hungary	47	180.09	173.48	0.3
Peru	48	179.15	172.38	0.3
Venezuela	49	170.36	164.13	0.3
Morocco	50	152.72	147.18	0.2
Singapore	51	135.28	130.18	0.2
New Zealand	52	103.74	100.16	0.2
United Arab Emirates	53	80.28	77.36	0.1

The UK is seventh overall, with 3.2% market share, behind the US, China, Japan, India, Germany and France. This compares with the UK's position of sixth for LCEGS in 2010/ 11.

The UK is ranked sixth for Construction & Retrofit, Architecture, Risk Management & Business Continuity, Enviro Finance, and Sustainable Drainage & Water Management and Water Irrigation. It is ranked 7th for all other A&RCC activities.

In Figure 6 the Top 13 European economies are ranked by sales value. The UK, with £2.1bn of sales is ranked third behind Germany and France.

Figure 6: A&RCC Sales (£m) 2010/ 11 by Top 13 European Economies

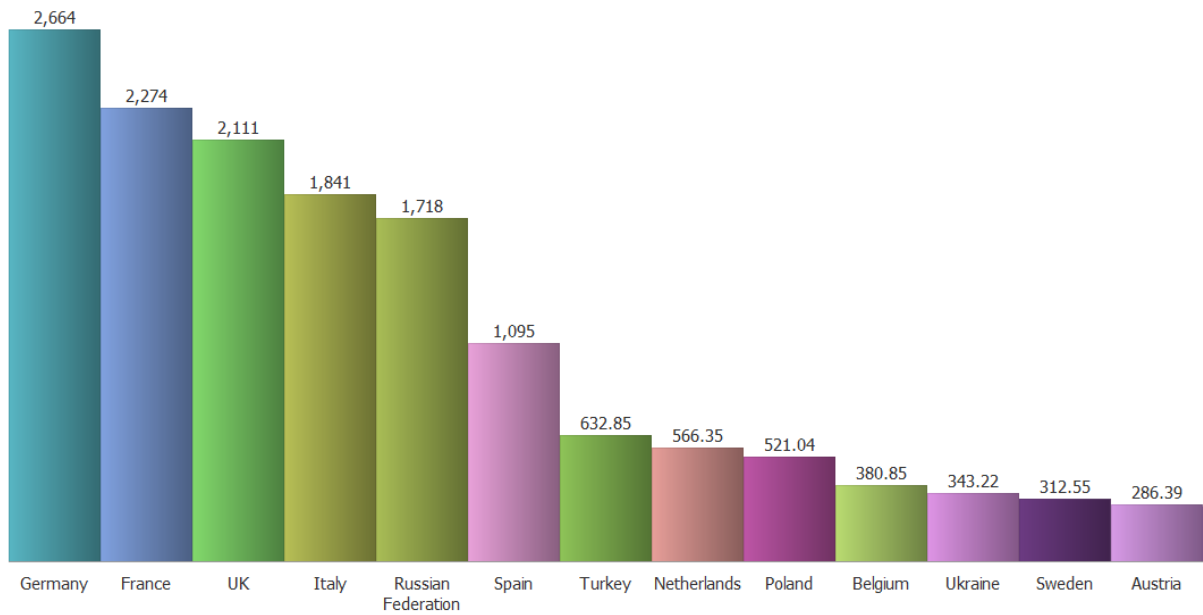
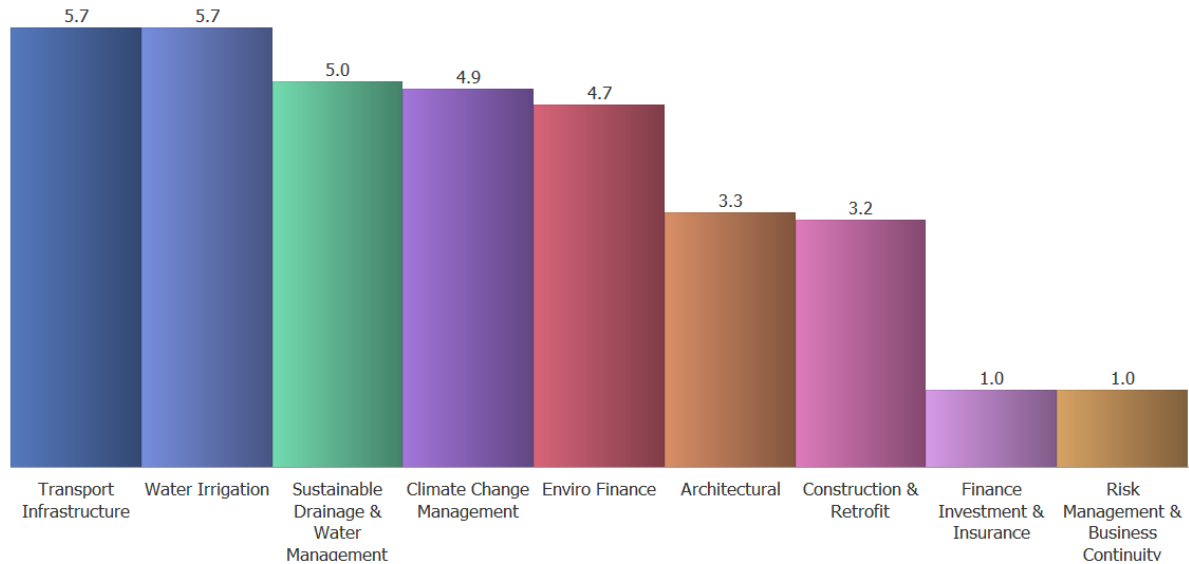


Figure 7 shows how global growth rates varied across the nine sub categories of A&RCC. Growth ranges between 1% and 6%, for an average of 3.8%. These annual growth rates are on a par with annual growth rates in 2009/ 10. Overall, the 2010/ 11 A&RCC growth rate of 3.8% was slightly higher than for LCEGS as a whole.

Figure 7: Global Annual Growth % 2010/ 11 for A&RCC

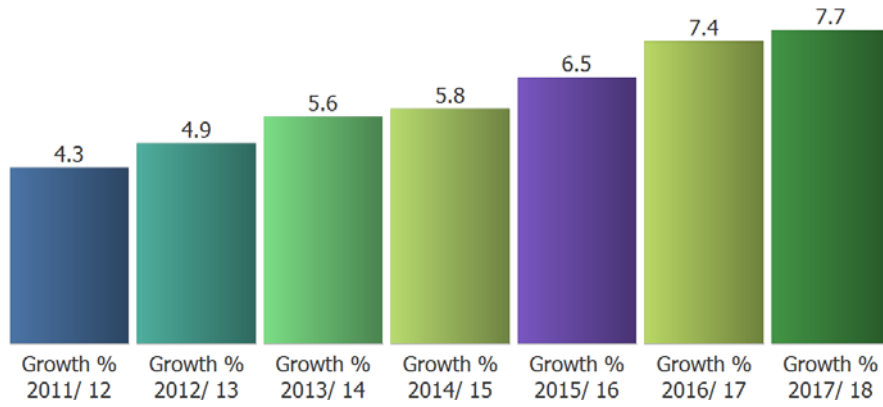


In Figure 8 we show the forecast growth rates for the A&RCC total to 2017/ 18³. These forecast growth rates are higher than previously calculated growth rates for the pilot of A&RCC and are slightly ahead of the forecast growth for LCEGS over the

³ Growth forecasts are calculated by taking the mean value of a wide range of forecasting sources. The methodology is also used for the BIS LCEGS 2010/ 11 report and is explained in more detail there.

same period. This is a healthy growth forecast when compared with the rest of the UK economy as a whole.

Figure 8: Global Growth Rate Forecast (%) from 2011/ 12 to 2017/ 18 for A&RCC



4. UK A&RCC 2010/ 11

4.1 UK A&RCC Sales, Employment Companies and Growth

The new baseline for UK A&RCC sales in 2010/11 is £2,111m or **£2.1bn**. The distribution of sales value across the sub categories of A&RCC is shown at Figure 9.

Figure 9: UK A&RCC Sales (£m) 2010/ 11

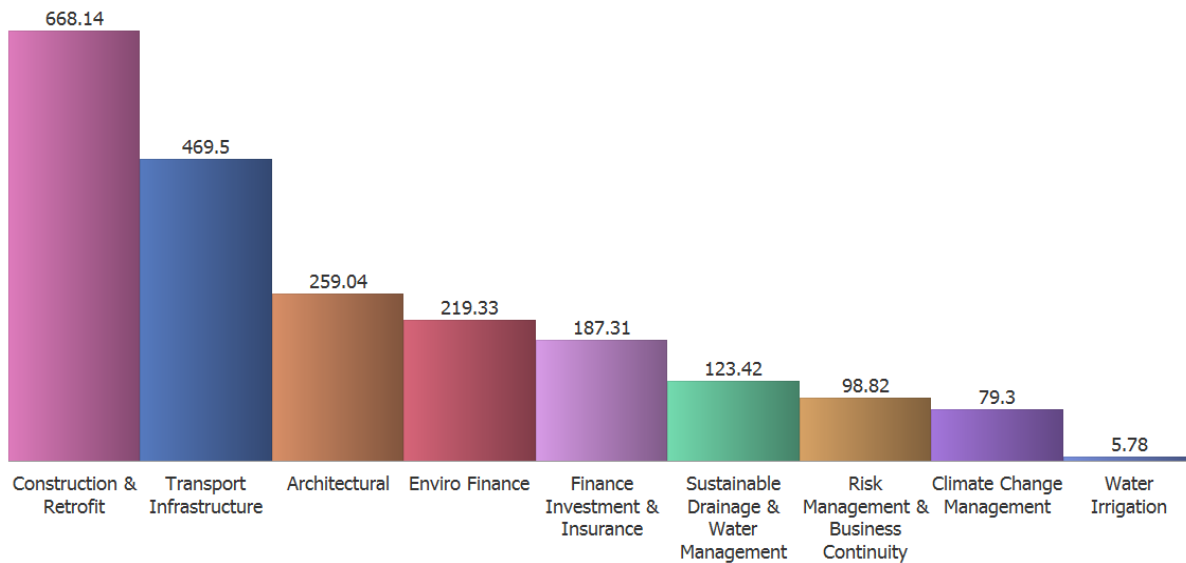


Figure 10: UK A&RCC Sales (%) 2010/ 11

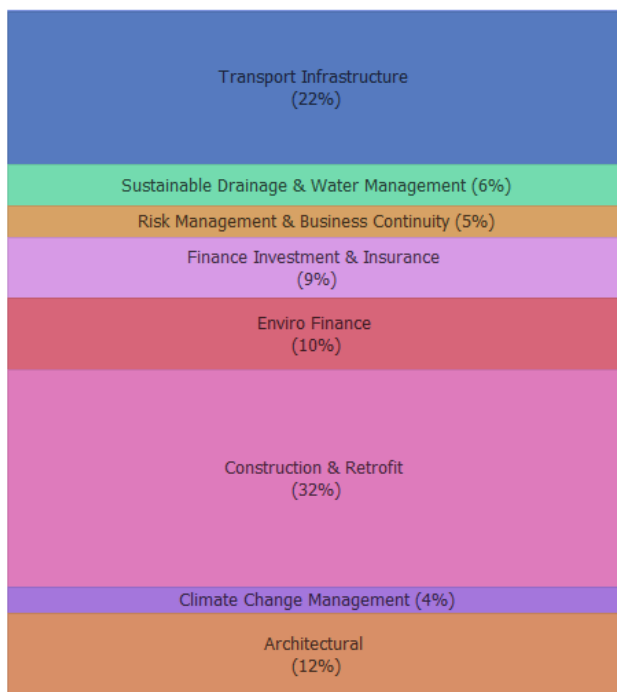


Figure 10 shows UK sales values as a percentage, with Transport Infrastructure and Construction and Retrofit accounting for 54% of the total. The distribution of UK activity shows some minor variations from the global distribution at Figure 5.

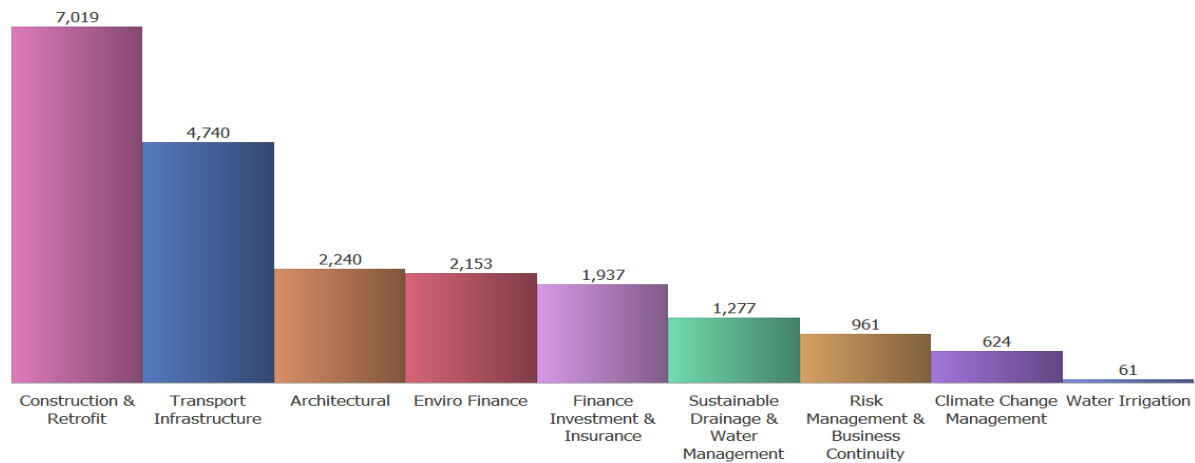
A&RCC activities in 2010/11 represent a 3.9% growth over the revised 2009/ 10 figure of £2,031m. This is illustrated in Table 2, where 2009/ 10 and 2010/ 11 values are compared. Table 2 shows that growth is spread disproportionately across the different sub categories.

Table 2: UK A&RCC Sales 2009/ 10 and 2010/ 11 Compared

Level 3	2010/11 Sales £m	2009/ 10 Sales £m	% Growth
Architectural	259.04	250.44	3.4
Climate Change Management	79.3	74.87	5.9
Construction & Retrofit	668.14	647.35	3.2
Enviro Finance	219.33	207.64	5.6
Finance Investment & Insurance	187.31	185.57	0.9
Risk Management & Business Continuity	98.82	97.83	1.0
Sustainable Drainage & Water Management	123.42	117.5	5.0
Transport Infrastructure	469.5	444.55	5.6
Water Irrigation	5.78	5.47	5.7
Total	2110.64	2031.22	3.9

The UK employment level for A&RCC total activities in 2010/ 11 is 21,012 (Figure 11). The distribution of employment shown at Figure 11 is consistent with the UK figures for 2009/ 10 and broadly reflects the distribution of A&RCC sales for 2010/ 11.

Figure 11: UK A&RCC Employment 2010/ 11



The total number of UK companies involved in A&RCC activities in 2010/ 11 is 1,566 (Figure 12). The distribution of companies shown at Figure 12 is consistent with the UK figures for 2009/ 10 and broadly reflects the distribution of A&RCC sales and employment for 2010/ 11.

Figure 12: UK A&RCC Companies 2010/ 11

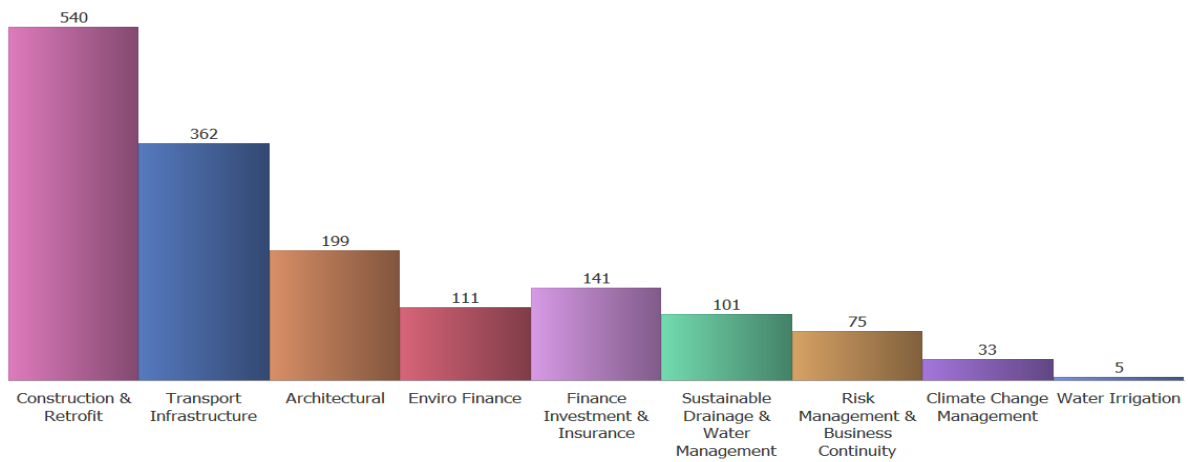
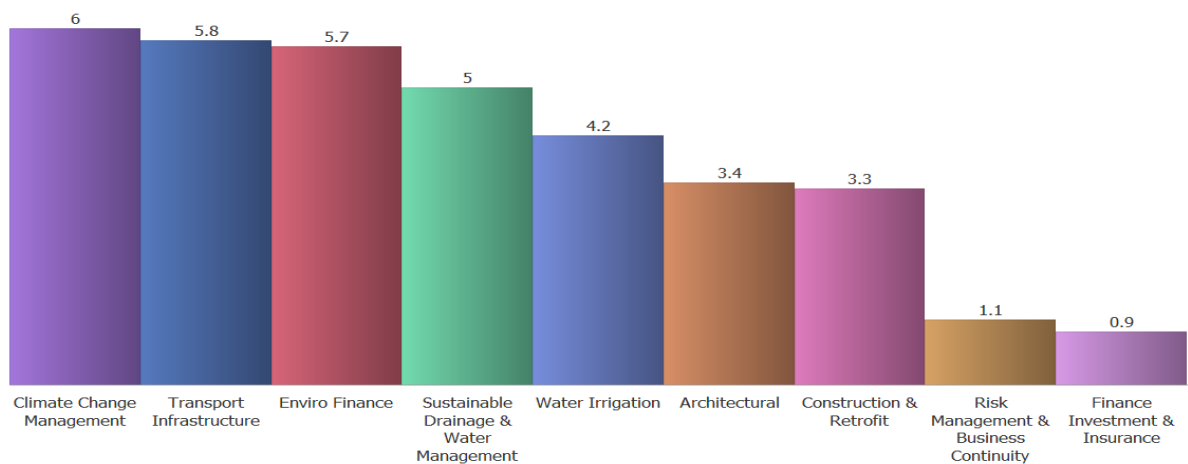


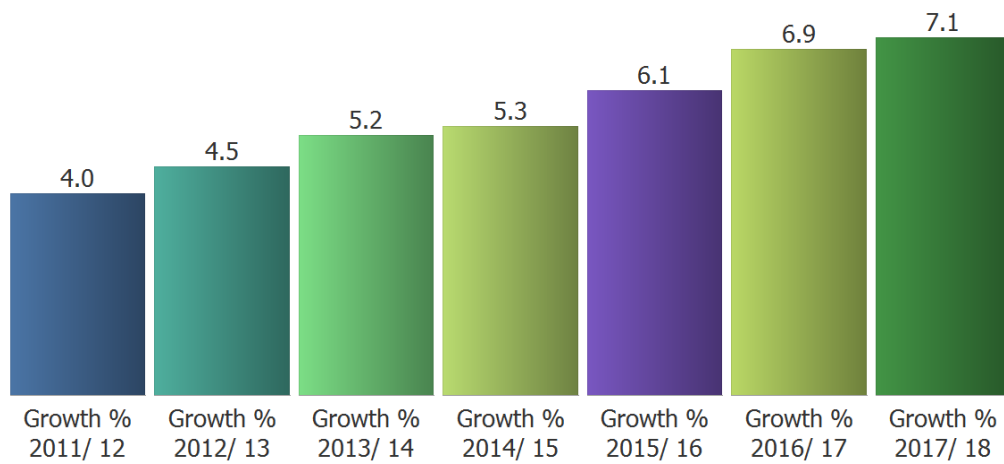
Figure 13 shows (graphically) how UK growth rates varied across the nine sub categories of A&RCC. Growth ranges between 1% and 6%, for an average of 3.9%.

Figure 13: UK Growth for A&RCC over 2010/ 11



The UK growth forecast for A&RCC total activities is similar to the global forecast (Figure 8). Figure 14 shows the forecast growth rates for UK A&RCC Climate Change content to 2017/ 18.

Figure 14: UK Growth Rate Forecast 2011/ 12 to 2017/ 18 for A&RCC



In Table 3 the key measures are shown at the next level of detail. At Level 4 Road Transport Infrastructure (£250m), Environmental Finance (£184m), Rail Infrastructure (£181m) and Architectural Project Management Services (£150m) are the four largest activities and account for £765m or 36% of the total.

Table 3: UK A&RCC Sales, Employment and Companies for 2010/ 11 at Level 4

Level 3	Level 4	Sales	Companies	Employment
Architectural	Architectural Design Services	20.1	16	209
Architectural	Architectural Engineering	89.1	80	944
Architectural	Architectural Project Management Services	149.8	139	1,503
Climate Change Management	Waterways and Barrier Management	71.5	30	552
Climate Change Management	Weather Station Services	7.8	3	58
Construction & Retrofit	Adaptive Civil Engineering Services	32.6	24	335
Construction & Retrofit	Agricultural	28.5	27	309
Construction & Retrofit	Domestic	40.5	33	426
Construction & Retrofit	Domestic Urban Enviro Redesign & Re Engineering	18.9	15	189
Construction & Retrofit	Industrial	79.4	62	769
Construction & Retrofit	Industrial Urban Enviro Redesign & Re Engineering	77.6	65	889
Construction & Retrofit	Manufacture of Retro Fit Engineering Equipment	86.7	69	924
Construction & Retrofit	Manufacture of Retro Fit Materials	67.0	49	617
Construction & Retrofit	Manufacturers of Temporary Accommodation For Renovation Projects	18.1	15	195
Construction & Retrofit	Public	57.5	47	624
Construction & Retrofit	Public Urban Enviro Redesign & Re Engineering	35.3	24	379
Construction & Retrofit	Retro Fit Buildings Services	68.5	55	731
Construction & Retrofit	Suppliers of Temporary Accommodation For Renovation Projects	14.6	13	165
Construction & Retrofit	Supply of Retro Fit Engineering Equipment	18.5	14	199
Construction & Retrofit	Supply of Retrofit Materials	24.5	22	268
Enviro Finance	Enviro Finance	183.8	76	1,472
Enviro Finance	Enviro Finance Planning	35.6	13	289
Finance Investment & Insurance	Banking Services	39.7	36	444
Finance Investment & Insurance	Equity Investment Services	73.6	56	762
Finance Investment & Insurance	Insurance Services	74.1	50	762
Risk Management & Business Continuity	Business Continuity	30.6	24	302
Risk Management & Business Continuity	Risk Mitigation	68.2	50	670
Sustainable Drainage & Water Management	Agricultural	8.9	9	88
Sustainable Drainage & Water Management	Domestic	21.3	18	217
Sustainable Drainage & Water Management	Industrial	42.5	39	441
Sustainable Drainage & Water Management	Public	50.7	34	506
Transport Infrastructure	Rail	180.7	146	1,997
Transport Infrastructure	Road	249.8	177	2,316
Transport Infrastructure	Waterways	39.0	31	404
Water Irrigation	Agriculture	3.5	2	35
Water Irrigation	Leisure Areas	2.3	1	21

Table 4 shows forecast growth rates to 2017/ 18 for Level 4 activities. The highest growth activities (using 2011/ 12 as the indicator) in the UK are: Water Irrigation for Agriculture (6.2%), Manufacture of Retro Fit Engineering Equipment (5.8%), Sustainable Drainage & Water Management for Industry (5.7%), Enviro Finance (5.3%) and Construction and Retro Fit for Industry (5.3%).

Table 4: UK A&RCC Growth Forecast to 2017/ 18 at Level 4

Level 3	Level 4	Growth % 2011/ 12	Growth % 2012/ 13	Growth % 2013/ 14	Growth % 2014/ 15	Growth % 2015/ 16	Growth % 2016/ 17	Growth % 2017/ 18
Architectural	Architectural Design Services	3.2	3.7	4.2	4.3	4.9	5.6	5.8
Architectural	Architectural Engineering	2.1	2.4	2.7	2.8	3.2	3.6	3.7
Architectural	Architectural Project Management Services	5.0	5.7	6.5	6.7	7.6	8.7	9.0
Climate Change Management	Waterways and Barrier Management	4.8	5.4	6.2	6.4	7.2	8.2	8.5
Climate Change Management	Weather Station Services	2.7	3.1	3.5	3.6	4.1	4.7	4.9
Construction & Retrofit	Adaptive Civil Engineering Services	5.1	5.7	6.5	6.7	7.6	8.6	8.9
Construction & Retrofit	Agricultural	3.8	4.4	4.9	5.1	5.8	6.6	6.8
Construction & Retrofit	Domestic	4.3	4.9	5.5	5.7	6.5	7.4	7.6
Construction & Retrofit	Domestic Urban Enviro Redesign & Re Engineering	2.6	3.0	3.4	3.5	4.0	4.5	4.6
Construction & Retrofit	Industrial	5.3	6.0	6.8	7.1	8.0	9.1	9.4
Construction & Retrofit	Industrial Urban Enviro Redesign & Re Engineering	2.2	2.5	2.9	3.0	3.4	3.8	4.0
Construction & Retrofit	Manufacture of Retro Fit Engineering Equipment	5.8	6.6	7.5	7.8	8.8	10.0	10.4
Construction & Retrofit	Manufacture of Retro Fit Materials	5.1	5.8	6.6	6.8	7.7	8.7	9.0
Construction & Retrofit	Manufacturers of Temporary Accommodation For Renovation Projects	3.8	4.3	4.9	5.0	5.7	6.5	6.7
Construction & Retrofit	Public	4.4	4.9	5.6	5.8	6.6	7.4	7.7
Construction & Retrofit	Public Urban Enviro Redesign & Re Engineering	3.3	3.7	4.2	4.3	5.0	5.6	5.8
Construction & Retrofit	Retro Fit Buildings Services	3.3	3.7	4.2	4.4	4.9	5.6	5.8
Construction & Retrofit	Suppliers of Temporary Accommodation For Renovation Projects	4.4	5.0	5.7	5.9	6.7	7.6	7.9
Construction & Retrofit	Supply of Retro Fit Engineering Equipment	4.9	5.5	6.2	6.5	7.3	8.3	8.6
Construction & Retrofit	Supply of Retrofit Materials	3.1	3.5	3.9	4.1	4.6	5.2	5.4
Enviro Finance	Enviro Finance	5.3	6.0	6.8	7.0	8.0	9.1	9.4
Enviro Finance	Enviro Finance Planning	3.8	4.3	4.9	5.0	5.7	6.5	6.7
Finance Investment & Insurance	Banking Services	1.8	2.0	2.3	2.4	2.7	3.1	3.2
Finance Investment & Insurance	Equity Investment Services	4.5	5.1	5.8	6.0	6.8	7.8	8.0
Finance Investment & Insurance	Insurance Services	1.5	1.7	1.9	2.0	2.2	2.6	2.6
Risk Management & Business Continuity	Business Continuity	1.8	2.0	2.3	2.4	2.7	3.0	3.2
Risk Management & Business Continuity	Risk Mitigation	2.9	3.2	3.7	3.8	4.3	4.9	5.1
Sustainable Drainage & Water Management	Agricultural	5.1	5.7	6.5	6.7	7.6	8.7	9.0
Sustainable Drainage & Water Management	Domestic	3.3	3.8	4.3	4.5	5.1	5.7	6.0
Sustainable Drainage & Water Management	Industrial	5.7	6.5	7.3	7.6	8.6	9.7	10.0
Sustainable Drainage & Water Management	Public	5.1	5.8	6.5	6.7	7.7	8.7	8.9
Transport Infrastructure	Rail	4.4	5.0	5.7	5.9	6.7	7.5	7.8
Transport Infrastructure	Road	4.5	5.1	5.8	6.0	6.8	7.7	7.9
Transport Infrastructure	Waterways	4.7	5.3	6.0	6.2	7.1	8.1	8.3
Water Irrigation	Agriculture	6.2	7.0	7.9	8.2	9.3	10.5	10.9
Water Irrigation	Leisure Areas	2.9	3.3	3.8	3.9	4.5	5.1	5.2

4.2 UK Imports

The UK Imports value for A&RCC total activities in 2010/ 11 is £250m. Figure 15 shows the distribution of Imports across the sub categories of A&RCC, with Construction & Retrofit accounting for 35% of the total. 2010/ 11 shows 3.4% growth in Imports in to the UK compared to the previous year.

Figure 15: A&RCC Imports 2010/ 11 (£m)

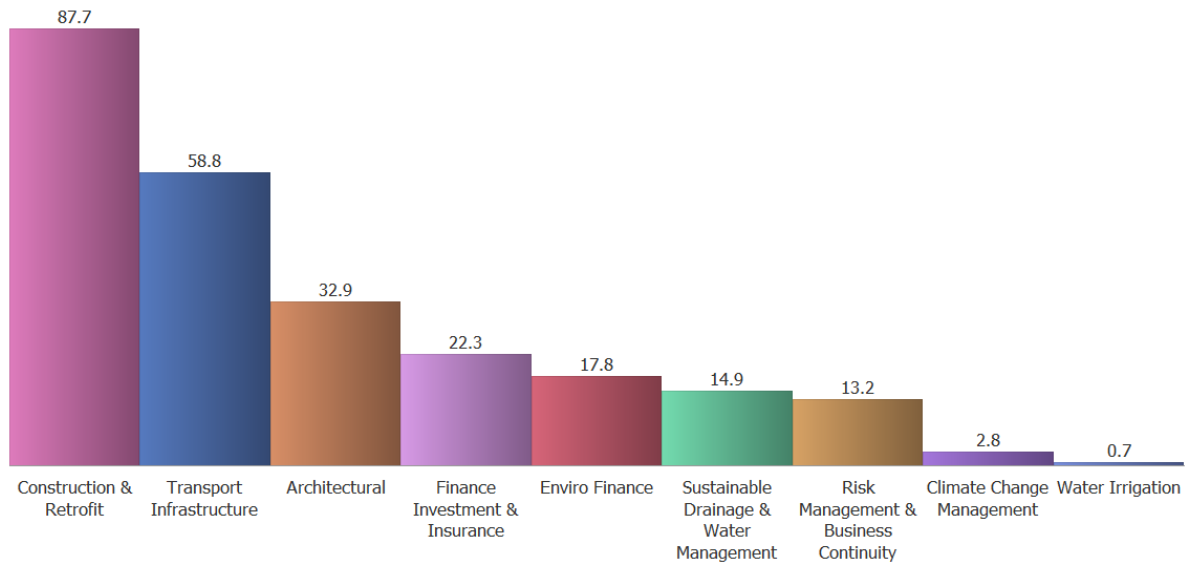


Figure 16 shows the top 13 countries providing A&RCC Imports into the UK in 2010/ 11. China accounts for 8%, followed by Hong Kong (5%), South Korea (5%) and the US (5%). The ranking of countries differs from that of LCEGS, as we would expect for different products and services, with the US ranked much higher for A&RCC activities than for LCEGS.

Figure 16: A&RCC Imports to the UK in 2010/ 11 (£m) by Country of Origin

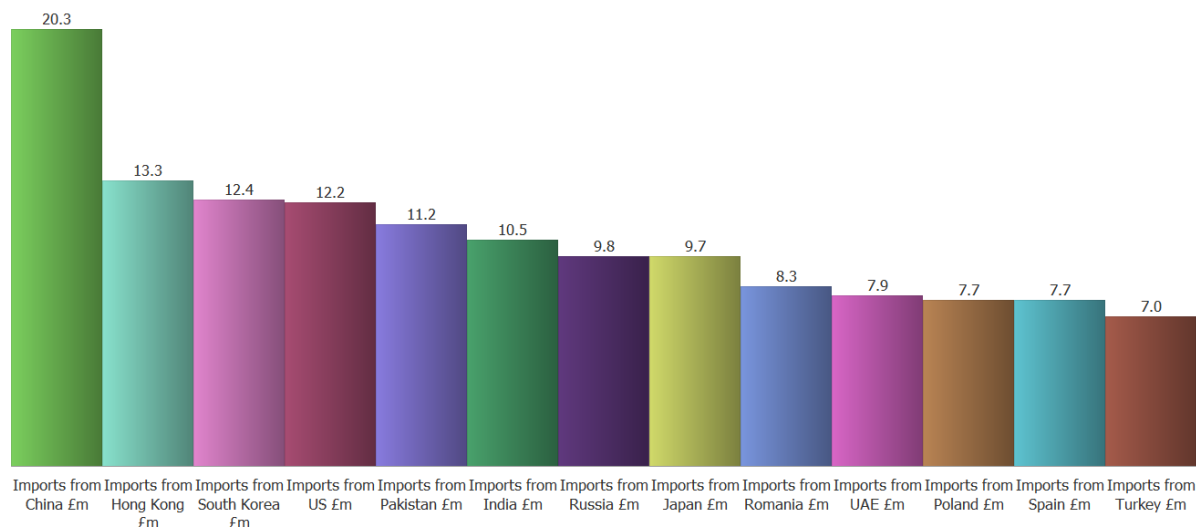


Table 5 shows UK imports at Level 5 in a heat map format where Red starts at 0, Green finishes at £900k and Orange represents the midpoint (with gradations of

colour in between). The heat map has been rationalised down to the 23 largest importing A&RCC content activities and for the top 17 importing destinations. Table 5 shows a distinctive Import pattern for:

- A range of Environmental Finance Services from the US and China
- Road and Rail Anti Subsistence Works activities from most of the 17 countries
- Architectural Project Management Services for Industrial projects from most of the 17 countries.

Table 5: A&RCC Imports 2010/ 11 (£m) at Level 5

Level 4	Level 5	China £m	France £m	Hong Kong £m	India £m	Indonesia £m	Italy £m	Japan £m	Pakistan £m	Poland £m	Romania £m	Russia £m	South Korea £m	Spain £m	Taiwan £m	Turkey £m	UAE £m	US £m	
Enviro Finance	Enviro Banking Services	0.6	0.1	0.0	0.2	0.1	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.9
Enviro Finance	Enviro Specific Equity Investment Services	0.3	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Enviro Finance	Enviro Specific Insurance Services	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Enviro Finance	Enviro Specific Capital Venture Services	0.3	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Enviro Finance	Enviro Specific IPO Services	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Enviro Finance	Enviro Specific Fund Management Services	0.3	0.1	0.0	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Enviro Finance Planning	Business & Investment planning Services	0.4	0.1	0.0	0.2	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.6
Waterways and Barrier Management	Sea Defence Management Services	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Architectural Project Management Services	Industrial Projects	0.8	0.2	0.6	0.4	0.2	0.3	0.4	0.5	0.3	0.4	0.4	0.5	0.3	0.2	0.3	0.4	0.3	0.3
Insurance Services	Weather Insurance Services	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Risk Mitigation	Risk Assessment Services	0.5	0.2	0.4	0.3	0.1	0.2	0.3	0.4	0.2	0.3	0.3	0.4	0.2	0.2	0.2	0.3	0.3	0.2
Industrial Urban Enviro Redesign & Re Engineering	Industrial Estates	0.6	0.2	0.5	0.3	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.3
Public Urban Enviro Redesign & Re Engineering	Public Areas	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of Retro Fit Materials	Manufacture of Retro Fit Water Proofing Materials	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Retro Fit Buildings Services	Retro Fit Electrical Services	0.4	0.1	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Public	Manufacture of Path & Standing Area	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Public	Bank Maintenance Services	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Rail	Anti Subsidence Works	0.9	0.3	0.7	0.4	0.2	0.3	0.4	0.5	0.4	0.4	0.5	0.6	0.4	0.3	0.3	0.4	0.4	0.4
Rail	Flood Abatement Works	0.4	0.1	0.3	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.2
Road	Anti Subsidence Works	0.8	0.3	0.6	0.4	0.2	0.3	0.4	0.5	0.4	0.4	0.4	0.6	0.3	0.3	0.3	0.3	0.4	0.3
Road	Flood Abatement Works	0.7	0.2	0.5	0.4	0.2	0.2	0.3	0.4	0.3	0.3	0.4	0.5	0.3	0.2	0.3	0.3	0.3	0.3
Road	Re Location and & Re laying	0.4	0.1	0.3	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.2
Waterways	Bank Maintenance Services	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1

4.3 UK Exports

The UK Exports value for A&RCC total activities in 2010/ 11 is £265m, a 5% growth on the previous year. Figure 17 shows the distribution of Exports across the sub categories of A&RCC, with Construction & Retrofit accounting for 32%, Transport Infrastructure 22.5% and Architecture 13% of the total.

Figure 17: A&RCC Exports 2010/ 11 (£m)

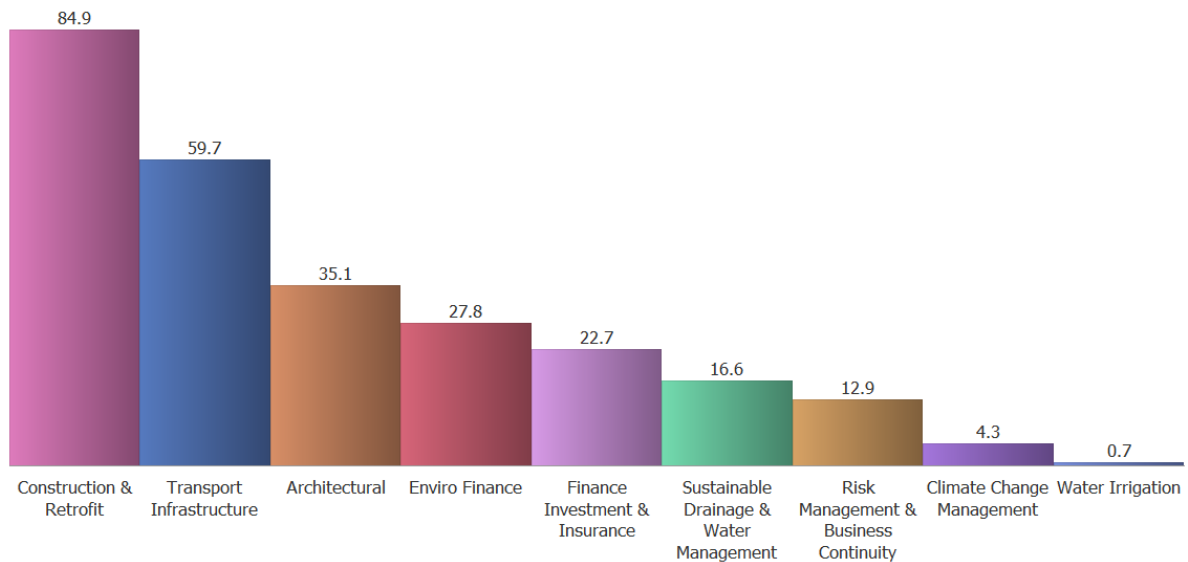


Figure 18 shows UK exports for the top 13 export destinations in 2010/ 11. The top countries are South Africa and Canada (6%), followed by Germany, Italy, Hong Kong and Singapore (4%). This is a very different ranking order to LCEGS as a whole but is consistent with the analysis in the 2009/ 10 A&RCC report.

Figure 18: A&RCC Exports 2010/ 11 (£m) by Country of Origin

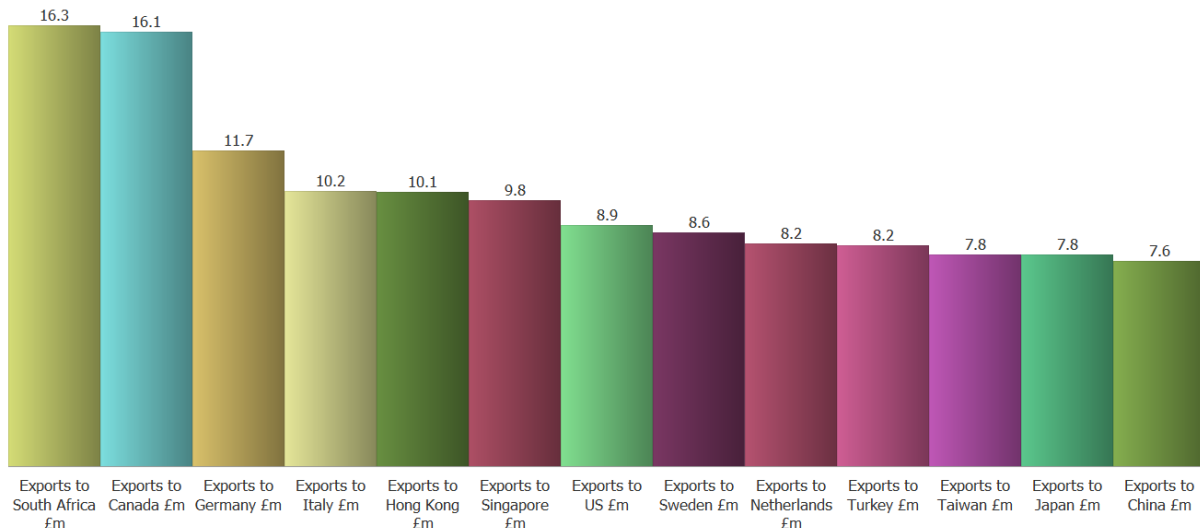


Table 6 shows UK exports at Level 5 in a heat map format where Red starts at 0, Green finishes at £16m and Orange represents the midpoint (with gradations of

colour in between). The heat map has been rationalised down to the 24 largest exporting A&R activities and for the top 22 exporting destinations. Table 6 shows a polarised export pattern with:

- Environmental Finance activities being most important to the US, China, India, Japan and Germany
- Road and Rail Transport Infrastructure activities being most important to Canada, Germany, South Africa, Singapore, Italy and Hong Kong.

Table 6: A&RCC Exports 2010/ 11 (£m) at Level 5

Level 4	Level 5	Brazil £m	Canada £m	China £m	Germany £m	Hong Kong £m	India £m	Indonesia £m	Italy £m	Japan £m	Mexico £m	Poland £m	Portugal £m	Russia £m	Singapore £m	South Africa £m	South Korea £m	Spain £m	Sweden £m	Taiwan £m	Turkey £m	Ukraine £m	US £m
Enviro Finance	Enviro Banking Services	0.2	0.1	0.9	0.3	0.0	0.4	0.1	0.2	0.4	0.1	0.1	0.0	0.2	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	1.4
Enviro Finance	Enviro Specific Equity Investment Services	0.1	0.1	0.5	0.1	0.0	0.2	0.1	0.1	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.8
Enviro Finance	Enviro Specific Insurance Services	0.1	0.0	0.4	0.1	0.0	0.2	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Enviro Finance	Enviro Specific Capital Venture Services	0.1	0.1	0.5	0.1	0.0	0.2	0.0	0.1	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.8
Enviro Finance	Enviro Specific IPO Services	0.1	0.0	0.4	0.1	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Enviro Finance	Enviro Specific Investor Relations Services	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Enviro Finance	Enviro Specific Fund Management Services	0.1	0.1	0.4	0.2	0.0	0.2	0.1	0.1	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.7
Enviro Finance	Consulting Services	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Enviro Finance Planning	Business & Investment planning Services	0.1	0.1	0.6	0.2	0.0	0.3	0.1	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	1.0
Waterways and Barrier Management	Inland Waterways Defensive Management	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Waterways and Barrier Management	Sea Defence Management Services	0.1	0.0	0.3	0.1	0.0	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Architectural Project Management Services	Industrial Projects	0.2	0.8	0.1	0.5	0.5	0.1	0.3	0.5	0.3	0.2	0.4	0.3	0.3	0.5	0.8	0.2	0.2	0.4	0.4	0.4	0.3	0.1
Risk Mitigation	Risk Assessment Services	0.1	0.4	0.1	0.3	0.3	0.1	0.2	0.3	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.2	0.2	0.0
Industrial Urban Enviro Redesign & Re Engineering	Industrial Estates	0.1	0.5	0.1	0.3	0.3	0.1	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.3	0.5	0.1	0.1	0.3	0.2	0.3	0.2	0.0
Retro Fit Buildings Services	Retro Fit Electrical Services	0.1	0.3	0.1	0.2	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.0
Industrial	Supply of Porous Surfacing Materials	0.1	0.2	0.0	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.0	0.1	0.1	0.1	0.0
Public	Bank Maintenance Services	0.1	0.3	0.1	0.2	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.0
Rail	Anti Subsidence Works	0.2	0.8	0.1	0.5	0.5	0.1	0.3	0.5	0.3	0.2	0.4	0.3	0.3	0.5	0.8	0.2	0.2	0.4	0.4	0.4	0.3	0.1
Rail	Flood Abatement Works	0.1	0.3	0.1	0.2	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2	0.1	0.2	0.1	0.0
Road	Anti Subsidence Works	0.2	0.8	0.2	0.5	0.5	0.1	0.3	0.5	0.3	0.2	0.4	0.3	0.3	0.5	0.8	0.2	0.2	0.4	0.4	0.4	0.3	0.1
Road	Flood Abatement Works	0.1	0.6	0.1	0.4	0.4	0.1	0.2	0.4	0.2	0.2	0.3	0.2	0.3	0.4	0.6	0.2	0.1	0.3	0.3	0.3	0.3	0.1
Road	Surface Water Drainage Works	0.0	0.2	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.0
Road	Re Location and Re laying	0.1	0.3	0.1	0.2	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2	0.2	0.2	0.1	0.0
Waterways	Bank Maintenance Services	0.1	0.3	0.0	0.2	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.0	0.1	0.1	0.1	0.1	0.0

Appendix C

Apportionments

When allocating sales values to adaptation and resilience, the data sources varied widely not only in terms of what they included in their definition for adaptation and resilience but also their granularity of detail. In some cases reported data was clear and the sales were accounted separately, however in others the sales figures reported included several other aspects not classified as adaptation and resilience. In cases such as this there is a need to triangulate with data sources outside of the industry. In the worked example included these additional data sources are shown where further evidence is needed to apportion an activity value. Our experience of needing these additional sources has varied across the major sub categories of A&RCC and a brief summary of this is provided below.

In the case of enviro finance and enviro finance planning we have taken into account only those activities which have been identified by the industry as relevant to climate change as this sector is relatively well informed via the actuarial and financial analytical sectors. Any variation in value identified via our data triangulation process, as a back check, was minimal.

In the case of waterways and barrier management we have looked at additional demand placed due to natural water course change and water burden management due to changing weather conditions. Although project definition was highly variable works procurement data gave higher definition and granularity in this area.

In the case of weather station services we have taken the new demand on the sector for longer term weather change forecasting for sectors other than those who would normally require weather services for normal operational need, for example agriculture, shipping, aviation etc

In the case of architectural project management services, architectural design services and architectural engineering data returns were relatively clear in the sector, as was the industry bodies' definition for adaptation and resilience.

In the case of insurance services we have used business return outputs from the actuarial sector where they clearly define new quotations business as a result of changing risk due to climate adjustment over previous years

In the case of banking services and equity investment services whilst the financial sector is relatively well informed and has rich data sets in support, the sub sectors of banking services and equity investment are extremely difficult to segment and, therefore, allocate sales proportion to adaptation and resilience. In this case it has been necessary to triangulate the data in order to get a view of the proportionality of activity relevant to adaptation and resilience.

In the case of risk mitigation the industry is well segmented with growing specialism in the area of climate change and its affect and also how adaptation and resilience contributes to

risk mitigation. As a result, data returns in this area are specific to adaptation and resilience and in this case, it has not been necessary to take market ripple effect into account as these services tend to rely only on technically proven demand.

In the case of business continuity, this sub sector is broad in that it covers both normally occurring events and natural and man-made disasters. We were somewhat surprised to discover that this sector does not delineate well those services that are specific to climate change and adaptation and resilience. Therefore in this case it has been necessary to break out the allocated figures via triangulation with the construction, water, strata management, flood abatement and risk mitigation sectors in order to allocate values to adaptation and resilience.

In the case of domestic, industrial and public urban enviro redesign & re engineering the industrial and public urban data sources were relatively specific in their delineation of adaptation and resilience. However, the domestic data had no delineation at all. Therefore as a result we have had to rely upon parallel data from the construction and civil engineering industry in order to see some proportionality in this area. Furthermore the domestic housing buildings insurance data networks have been helpful here.

In the case of agricultural we have used data provided via the procurement industry and its industrial bodies in order to see spend in the sector. The agricultural sector overall is not well documented for our purposes when looking at the allocation of spend on a farm by farm basis. The most reliable data used here was from the water industry and its network of supply. It was also necessary to triangulate this data with waterways and barrier management sector data which also looks at irrigation and spur supplies.

In the case of the manufacture of retro fit materials, supply of retrofit materials and retro fit buildings services. The construction industry trade bodies along with civil engineering and engineering institutions have been actively reporting the change in market demand as a result of climate change. Whilst data sources tend to conflict as a result of variances in definition and in this particular case significant differences as a result of the market ripple effect there are a large number of sources with which to triangulate. The key problem faced in this particular area was to reach agreement on the definition of a retro fit material that is relevant to climate change.

In the case of adaptive civil engineering services, the sector is well reported with detailed information on the proportionality of adaptive and resilience projects and associated spend overall. Minimal data triangulation was required in this area.

In the case of the manufacture of retro fit engineering equipment and the supply of retro fit engineering equipment the equipment is also used for other applications which are not associated with climate change, therefore it is necessary to relate sales to individual projects and specialisms which are specifically to do with climate change and adaptation and resilience. In order to achieve this we have triangulated data with additional data sources, which include the civil engineering, risk mitigation, architectural and actuarial sectors and their industry bodies.

In the case of the manufacturers and suppliers of temporary accommodation for renovation projects we have taken the sales values which are over and above the normal

market trend for these temporary accommodation units as the same units are used in various other applications. As this sector is relatively small in terms of the construction sector, the end use of unit sales for temporary buildings was relatively well reported.

In the case of construction & retrofit domestic, industrial, public and agricultural the industrial and public urban data sources were relatively specific in their delineation of adaptation and resilience. However, the domestic data had no delineation at all. Therefore as a result we have had to rely upon parallel data from the construction and civil engineering industry in order to see some proportionality in this area. Furthermore the domestic housing buildings insurance data networks have been helpful here. In the case of agricultural, however, the most reliable data used here was from the water industry and its network of supply. It was also necessary to triangulate this data with waterways and barrier management sector data which also looks at irrigation and spur supplies.

In the case of sustainable drainage & water management domestic, industrial, public and agricultural we have relied almost solely on data from the water industry and its network of supply. Adaptation and resilience is a key focus in this sector at this time.

In the case of transport infrastructure rail and road sector data is relatively good, with some triangulation from the procurement chain.

In the case of transport infrastructure waterways we have relied almost solely on data from the water industry and its network of supply. Adaptation and resilience is a key focus in this sector currently.

In the case of water irrigation agriculture we have relied heavily on the procurement sector data as individual reporting is limited on a farm by farm basis.

In the case of water irrigation leisure areas the sector has almost no detailed reporting on expenditure in this area. Therefore we have been reliant primarily on data streams from the civil engineering and construction industries for meaningful data.

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