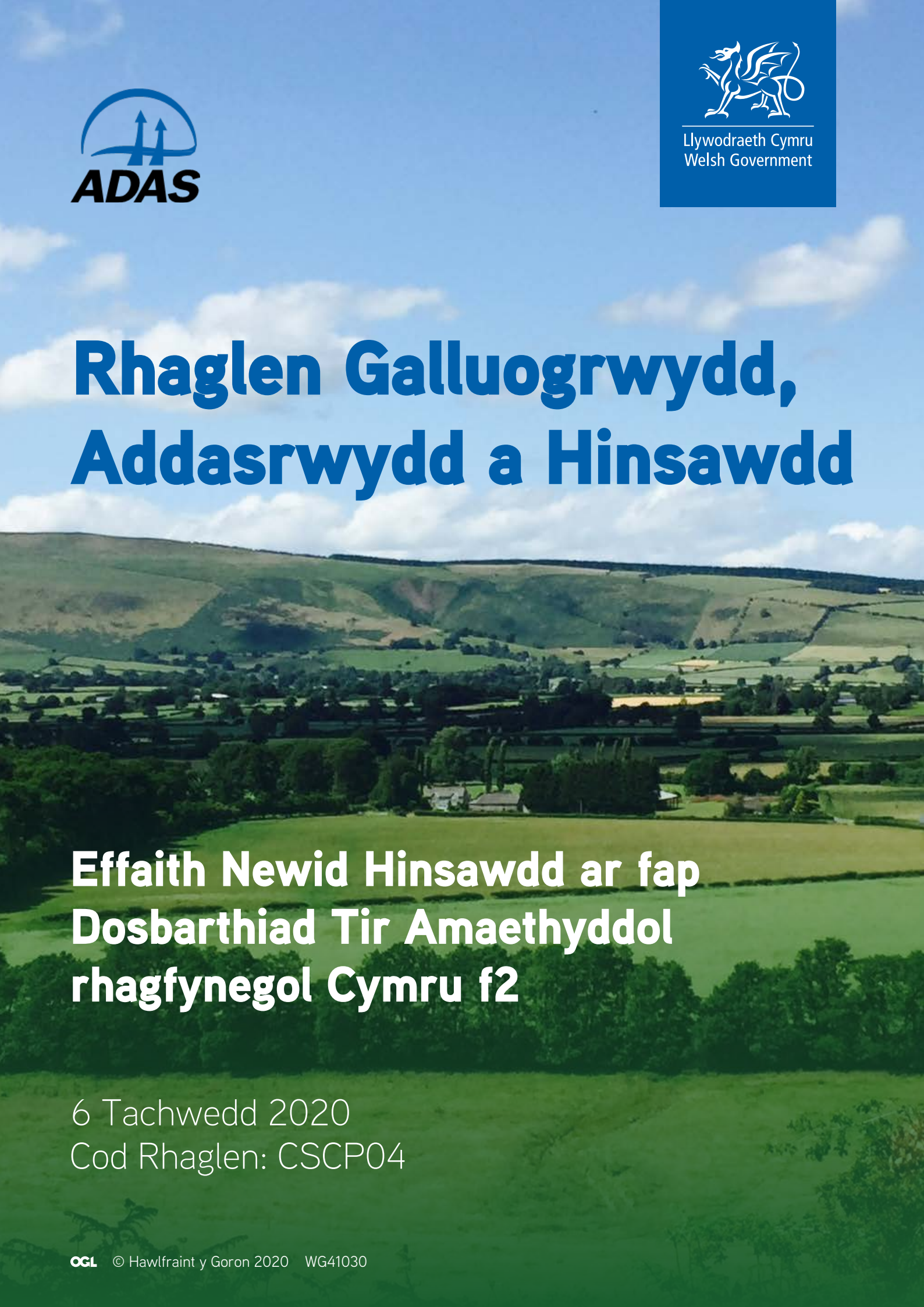


ADAS

Llywodraeth Cymru
Welsh Government

Rhaglen Galluogrwydd, Addasrwydd a Hinsawdd

Effaith Newid Hinsawdd ar fap Dosbarthiad Tir Amaethyddol rhagfynegol Cymru f2

6 Tachwedd 2020
Cod Rhaglen: CSCP04

Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig:
Ewrop yn Buddsoddi mewn Ardaloedd Gwledig
European Agricultural Fund for Rural Development:
Europe Investing in Rural Areas

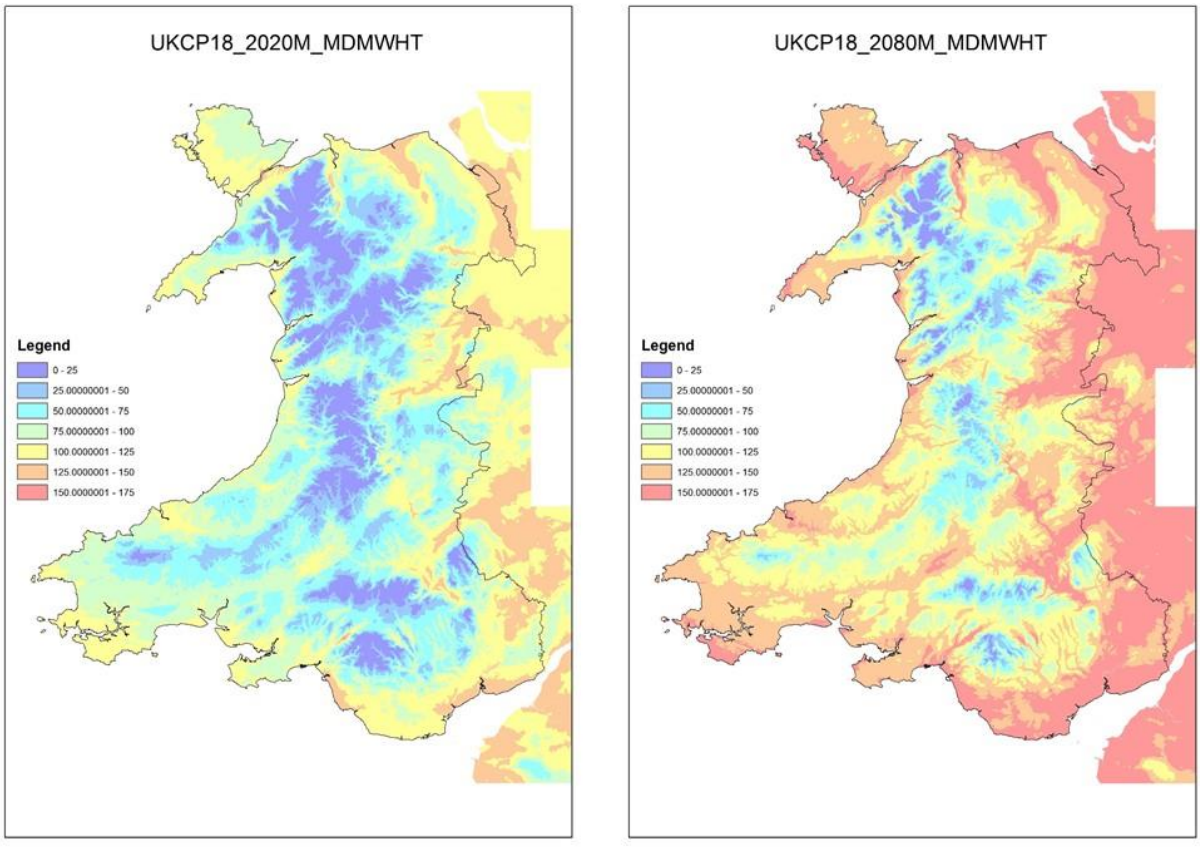
Llywodraeth Cymru
Welsh Government

Rhaglen Galluogrwydd, Addasrwydd a Hinsawdd

Effaith Newid Hinsawdd ar fap Dosbarthiad Tir Amaethyddol rhagfynegol Cymru f2

Paratowyd gan: **Caroline** Keay

Dyddiad: *06 November 2020*



Cynnwys

Tablau

Ffigurau

1 CYFLWYNIAD

Rhoddodd ADAS ddata agrohinsoddol UKCP09 i Cranfield wedi'i ryngosod o ddata'r Swyddfa Dywydd i grid 5km gan ddefnyddio dulliau tebyg i'r rhai a ddefnyddiwyd yn y prosiect SP1104 gwreiddiol. Yna, rhyngosodwyd y data grid 5km hwn i grid 50m gan ddefnyddio'r set ddata OSTerrain50 ar gyfer yr uchder ar bob pwynt 50m. Roedd y fethodoleg ar gyfer rhyngosod fel y'i disgrifiwyd yng nghyhoeddiad 1989 y Swyddfa Dywydd – Climatological Data for Agricultural Land Classification.

2 DULL

1. Cafodd naw set ddata 5km o ADAS eu llwytho i Oracle yn gyntaf. I wneud hyn ysgrifennwyd sgript perl (UKCP18import.pl) sy'n cymryd pob ffeil .csv ac yn cynhyrchu'r cod SQL gofynnol i greu'r tablau yn Oracle a llwytho'r data.

Tabl 1 Data Hinsawdd 5km ar gyfer Cymru a Lloegr

ADAS file	SQL loading script	SQL table	50m Table
2020H.csv	cr_UKCP18_2020H.sql	UKCP18_2020H	ALC_CLIMATE_50M_2020H18
2020L.csv	cr_UKCP18_2020L.sql	UKCP18_2020L	ALC_CLIMATE_50M_2020L18
2020M.csv	cr_UKCP18_2020M.sql	UKCP18_2020M	ALC_CLIMATE_50M_2020M18
2050H.csv	cr_UKCP18_2050H.sql	UKCP18_2050H	ALC_CLIMATE_50M_2050H18
2050L.csv	cr_UKCP18_2050L.sql	UKCP18_2050L	ALC_CLIMATE_50M_2050L18
2050M.csv	cr_UKCP18_2050M.sql	UKCP18_2050M	ALC_CLIMATE_50M_2050M18
2080H.csv	cr_UKCP18_2080H.sql	UKCP18_2080H	ALC_CLIMATE_50M_2080H18
2080L.csv	cr_UKCP18_2080L.sql	UKCP18_2080L	ALC_CLIMATE_50M_2080L18
2080M.csv	cr_UKCP18_2080M.sql	UKCP18_2080M	ALC_CLIMATE_50M_2080M18

2. Roedd gan y data hinsawdd 5km a ddarparwyd lawer o gridiau coll o amgylch yr arfordir. Roedd gan UKCP09 a UKCP18 wahanol bwyntiau coll. Er nad oedd y pwyntiau coll yn arwyddocaol yn y prosiect SP1104, daeth yn broblem fawr ar ôl i'r data gael ei ryngosod i 50m, yn enwedig yn Ynys Môn. Felly penderfynwyd llenwi'r gwerthoedd coll trwy ddefnyddio hafaliadau atchwel yn seiliedig ar wahaniaethau'r dadansoddiadau rhwng gwerthoedd hinsawdd y dyfodol a'r gwerthoedd gwreiddiol gan y Swyddfa Dywydd (1989). Dadansoddwyd y perthnasoedd a diffiniwyd yr hafaliadau llinol, gweler Tabl 2. Yn anffodus, nid oedd yr R^2 ar gyfer AT0 ac ATS yn berthynas gref iawn. Felly penderfynwyd defnyddio dadansoddiad aml-atchwel ar gyfer AAR gan ddefnyddio'r Dwyreiniad, Gogleddiad, Uchder ac AT0 Gwreiddiol, gweler Tabl 3. Yna cyfrifwyd ATS o AT0 gan ddefnyddio'r hafaliad gwreiddiol ar gyfer cyfrifo ATS o AT0 a Dwyreiniad (i'r 100m agosaf):

```
ATS = 611 + 1.11 AT0 + 0.042 EAST
```

Tabl 2 Paramedrau ar gyfer hafaliadau Atchwel Llinol

		ukcp09			ukcp18		
		slope	**intercept**	**R^2**	**slope**	**intercept**	**R^2**
2020L	AT0	0.753324	629.4214	0.693104	1.075337	55.0903743	0.593202
	ATS	0.815794	794.0155	0.714957	1.047116	95.10998732	0.639527
	AAR	0.958037	24.95593	0.949484	0.959156	22.56721597	0.950847
	ASR	0.806985	39.94931	0.906026	0.803406	42.5912798	0.91098
	FCD	0.954481	0.208584	0.943509	0.953428	0.674081054	0.946419
	MDW	0.919519	43.40369	0.887654	1.011495	21.5357702	0.839131
	MDP	1.025825	46.23278	0.866474	1.12812	19.09067377	0.796251
2020M	AT0	0.754373	646.0848	0.693126	1.072816	54.8185848	0.592301
	ATS	0.819732	807.0802	0.714131	1.046093	92.91176693	0.639349
	AAR	0.958622	24.54535	0.949384	0.958882	22.90313861	0.950851
	ASR	0.805958	39.56895	0.90571	0.804074	42.77736484	0.911085
	FCD	0.955424	-0.21002	0.943261	0.952686	0.971583417	0.946404
	MDW	0.92183	45.13103	0.886561	1.010614	21.15888126	0.839088
	MDP	1.028625	48.70129	0.865438	1.127076	18.54902548	0.79615
2020H	AT0	0.755049	656.9961	0.693132	1.07614	68.57494431	0.593304
	ATS	0.822266	815.735	0.713576	1.051312	104.3144606	0.640516
	AAR	0.958919	24.3144	0.949332	0.960517	21.66777462	0.950869
	ASR	0.805439	39.37506	0.905546	0.800084	42.42955354	0.911094
	FCD	0.955937	-0.43293	0.943133	0.95498	-0.049311958	0.946219
	MDW	0.923228	46.24886	0.885887	1.013611	23.15255209	0.838921
	MDP	1.030329	50.29917	0.864795	1.130749	21.36674233	0.796238
2050L	AT0	0.787683	748.6676	0.690692	1.102382	129.1676868	0.601648
	ATS	0.870113	877.6679	0.699574	1.090812	125.7565836	0.650067
	AAR	0.966999	0.086802	0.947123	0.962417	1.160548857	0.949624
	ASR	0.733595	27.05617	0.899675	0.716765	40.78069049	0.906637
	FCD	1.023284	-30.6778	0.938547	1.001633	-23.56787462	0.943496
	MDW	0.953	65.96724	0.869447	1.029259	37.93280684	0.838412
	MDP	1.065517	77.3372	0.848773	1.151602	41.0898643	0.798221
2050M	AT0	0.792799	831.11	0.689744	1.097163	125.9000444	0.600035
	ATS	0.889536	942.524	0.694085	1.086789	121.2667107	0.649213
	AAR	0.973871	-2.78679	0.946009	0.962727	0.592783145	0.949703

		ukcp09			ukcp18		
		slope	**intercept**	**R^2**	**slope**	**intercept**	**R^2**
	ASR	0.727499	24.52339	0.896636	0.717076	41.02858869	0.906556
	FCD	1.031893	-34.3212	0.935888	1.001347	-23.4067654	0.94358
	MDW	0.966327	74.70985	0.861982	1.026816	36.96342754	0.838134
	MDP	1.08145	89.83313	0.841727	1.148574	39.67251022	0.797703
2050H	AT0	0.797354	904.8127	0.688655	1.116107	185.0113891	0.60506
	ATS	0.906822	1000.492	0.68902	1.117061	166.9993998	0.654327
	AAR	0.979277	-4.82937	0.945125	0.969606	-5.313551131	0.949663
	ASR	0.723292	22.73162	0.894269	0.702629	38.76918661	0.904411
	FCD	1.0381	-36.9332	0.933775	1.015633	-29.63206271	0.942014
	MDW	0.977337	82.38023	0.85568	1.04478	46.40734083	0.836356
	MDP	1.094698	100.8048	0.835725	1.170656	53.13443371	0.797589
2080L	AT0	0.786796	827.3082	0.691395	1.128357	221.9389194	0.608881
	ATS	0.874828	976.7179	0.693066	1.117341	251.5087556	0.649666
	AAR	0.96732	1.589541	0.944722	0.981898	-8.565455646	0.946492
	ASR	0.721292	22.4106	0.894694	0.688484	37.87492553	0.900607
	FCD	1.037442	-37.6243	0.932943	1.018229	-32.26815213	0.938714
	MDW	0.961579	76.21435	0.859194	1.038532	55.23804615	0.826905
	MDP	1.074576	91.67682	0.838128	1.162583	65.09622069	0.786953
2080M	AT0	0.794904	958.0201	0.689725	1.133606	261.8120316	0.609822
	ATS	0.90561	1079.626	0.683929	1.130903	281.3460819	0.651023
	AAR	0.98327	-3.79537	0.941592	0.986	-12.13382195	0.946468
	ASR	0.708112	17.37096	0.88633	0.680328	36.87063243	0.89896
	FCD	1.056948	-45.9448	0.925575	1.027064	-36.05694155	0.937735
	MDW	0.984984	90.53668	0.844439	1.046432	60.41751086	0.825011
	MDP	1.102292	112.1033	0.824309	1.172249	72.42248032	0.785755
2080H	AT0	0.804226	1109.304	0.686938	1.165296	364.2071475	0.616293
	ATS	0.94112	1198.511	0.673031	1.185687	351.5007641	0.655912
	AAR	1.004703	-9.1731	0.93739	0.999435	-23.30436562	0.946069
	ASR	0.695597	12.10909	0.875987	0.651544	34.4820644	0.889869
	FCD	1.078114	-54.8111	0.915949	1.053924	-48.53391426	0.932368
	MDW	1.011422	106.8346	0.827314	1.074843	76.93069874	0.816079
	MDP	1.133657	135.3849	0.808262	1.207606	95.8023033	0.779577

Tabl 3 Hafaliadau Atchwel Lluosog ar gyfer AT0

UKCP09

		Intercept	EAST	NORTH	ALT	AT0	R2
2020L	AT0	1393.092	0.000131	-0.00049	-0.29227	0.278037	0.787125
2020M	AT0	1426.221	0.000132	-0.00049	-0.30221	0.268793	0.788296
2020H	AT0	1962.273	-1.8E-06	-0.00062	-0.52444	-0.04784	0.794554
2050L	AT0	2101.349	3.63E-05	-0.00067	-0.51425	-0.0525	0.814655
2050M	AT0	2190.115	4.8E-05	-0.00068	-0.50738	-0.05476	0.819981
2050H	AT0	2269.449	5.86E-05	-0.00069	-0.50123	-0.05677	0.824562
2080L	AT0	2185.789	2.22E-05	-0.00068	-0.51148	-0.05289	0.816059
2080M	AT0	2326.526	4.09E-05	-0.00069	-0.50059	-0.05648	0.824197
2080H	AT0	2489.361	6.24E-05	-0.00071	-0.48795	-0.06062	0.832939

UKCP18

	Var	Intercept	EAST	NORTH	ALT	AT0	R2
2020L	AT0	-4687.13	0.000731	0.001171	3.190336	3.832125	0.595447
2020M	AT0	-4745.56	0.000735	0.001189	3.227603	3.864328	0.787125
2020H	AT0	2006.964	-0.0003	-0.00053	-1.00567	-0.0982	0.605413
2050L	AT0	2107.459	-0.00027	-0.00057	-0.99778	-0.10419	0.617262
2050M	AT0	2098.598	-0.00028	-0.00056	-0.99807	-0.10355	0.614898
2050H	AT0	2182.554	-0.00025	-0.00059	-0.99262	-0.10682	0.623006
2080L	AT0	2248.995	-0.00027	-0.00062	-0.99494	-0.10586	0.627028
2080M	AT0	2298.33	-0.00027	-0.00063	-0.99214	-0.10716	0.628941
2080H	AT0	2444.489	-0.00022	-0.00067	-0.98368	-0.11257	0.641678

3. O ganlyniad i'r newid o'r pwynt 5km yn y data hinsawdd Dosbarthiad Tir Amaethyddol gwreiddiol i'r pwynt craidd yn y data UKCP a ddarparwyd gan ADAS (ar wrthbwysiad o 2500m), roedd sawl pwynt ar hyd yr arfordir mwy na 5km o'r data hinsawdd 5km agosaf. Roedd angen pwyntiau ychwanegol felly. Er mwyn llenwi'r rhain â data ystyrlon, defnyddiwyd arferion rhyngosod y Dosbarthiad Tir Amaethyddol a'r data a dynnwyd o'r data hinsawdd 5km amgylchynol agosaf ym mhob senario hinsawdd.

Tabl 4 Lleoliadau data senario hinsawdd ychwanegol

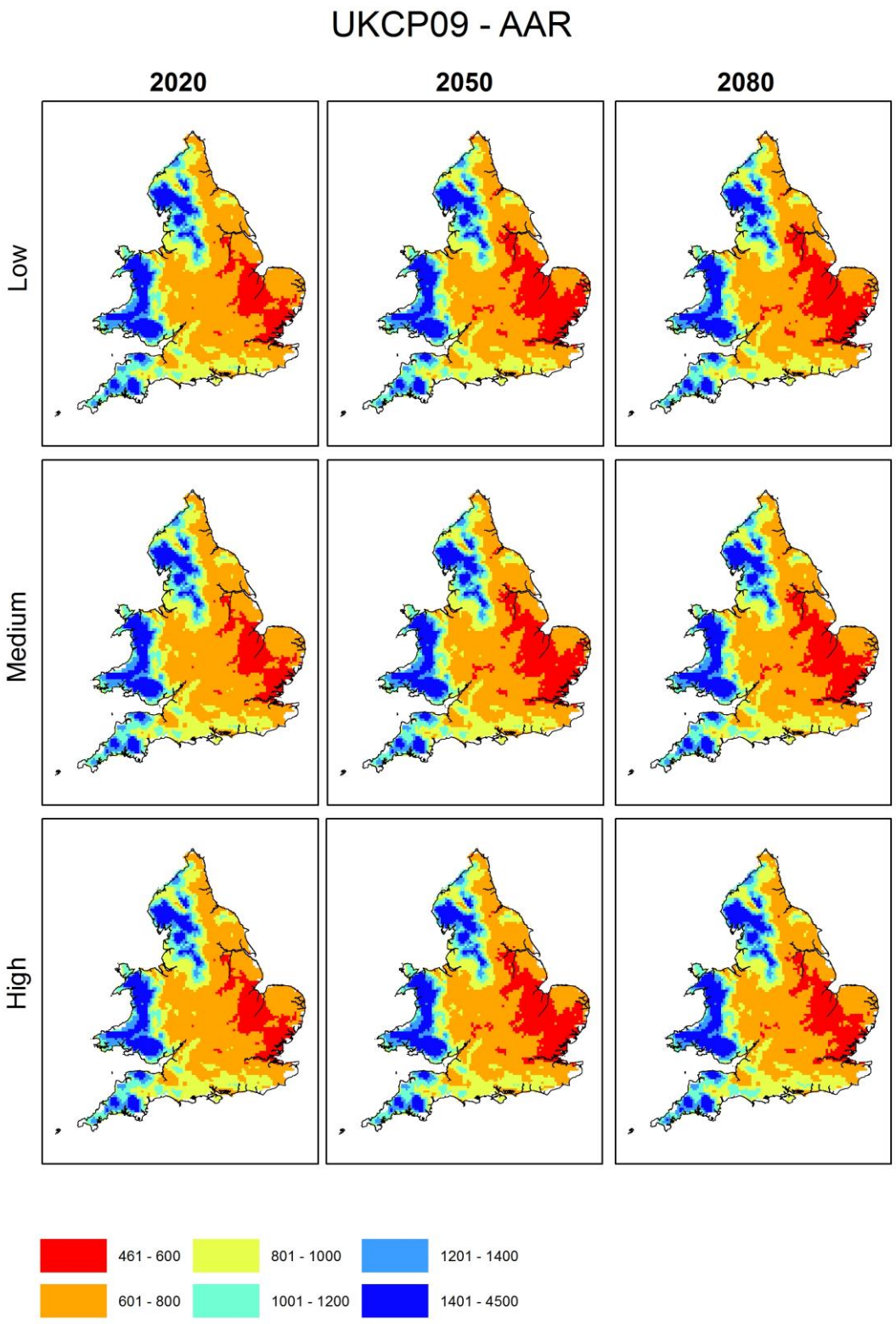
EAST	NORTH	UNIQUE	ID_5K
167500	222500	220165	6193
167500	227500	225165	6333
172500	222500	220170	6194
172500	207500	205170	5774
172500	212500	210170	5914
212500	322500	320210	9002
227500	392500	390225	10965
227500	397500	395225	11105
232500	372500	370230	10406
237500	362500	360235	10127
242500	362500	360240	10128

4. Rhyngosodwyd y setiau data 5km i 50m gan ddefnyddio sgript SQL (interp_scenario.sql)

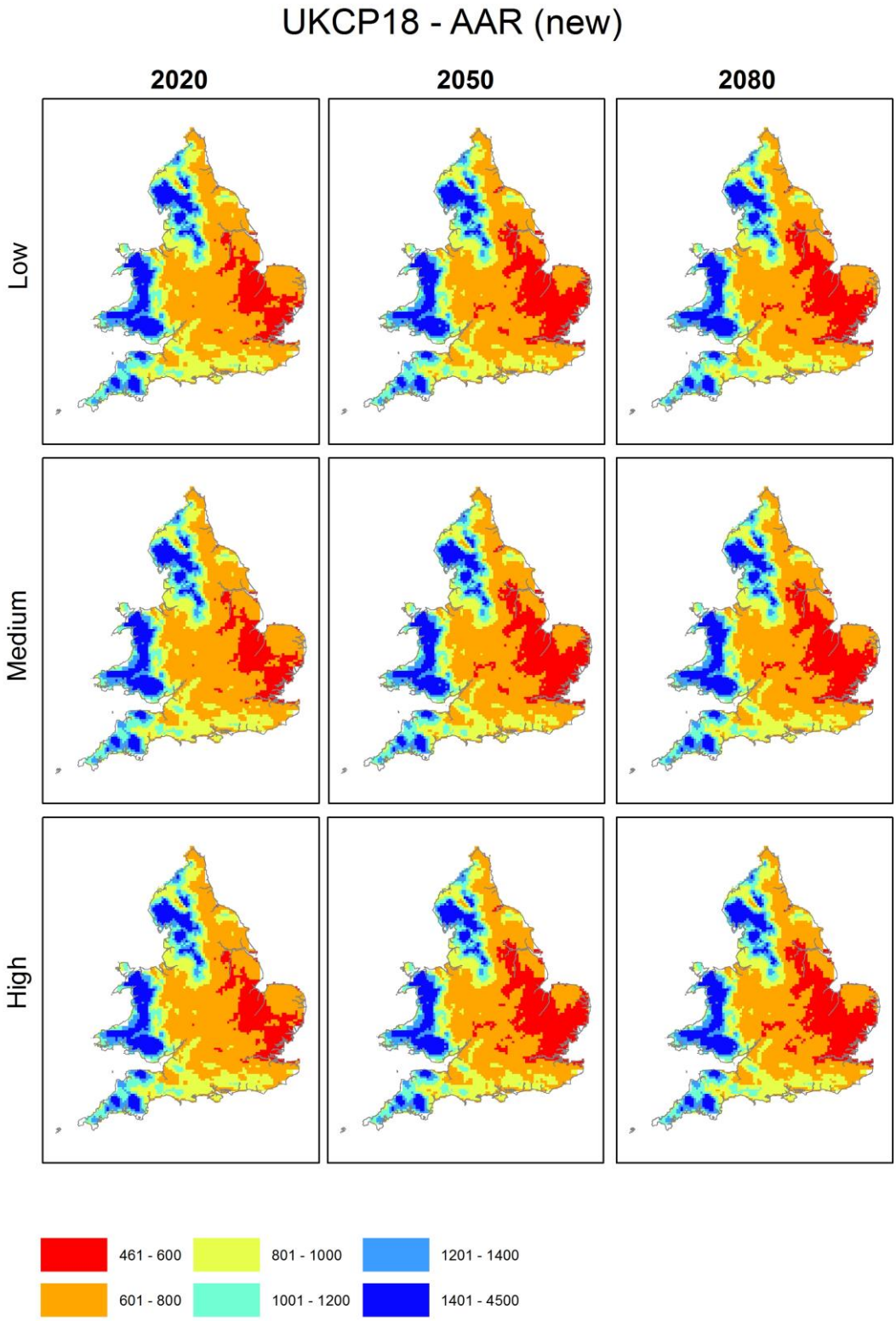
Mae'n dolenni drwy bwyntiau'r OS Terrain 50 gan gael y dwyreiniad, y gogleddiad a'r uchder ar bob pwynt 50m. Yna caiff y pedwar pwynt 5km amgylchynol eu dewis o'r data senario hinsawdd 5km (lle maent yn bodoli) a'r arferion rhyngosod a ddisgrifir ym METOFFICE (1989) a ddefnyddir i gael y newidynnau hinsawdd yn y pwynt. Roedd y data hinsawdd 5km gwreiddiol ym METOFFICE (1989) ar fan cychwyn y grid 5km, tra bod y data senario 5km newydd wedi'i leoli yng nghanol y grid 5km (ar wrthbwysiad o 2500m o'r gwreiddiol). Nid oedd y data newydd yn rhoi data'r gyfradd newid a ddefnyddiwyd i addasu'r data glawiad yn y setiau data gwreiddiol. O ganlyniad, cymerwyd y gyfradd newid o'r data gwreiddiol wedi'i pharu â chornel de-orllewin y sgwâr 5km.

5. Yna defnyddiwyd y setiau data 50m ynghyd â data cyfres 50m Soils_of_Wales i greu'r dosbarthiadau tir amaethyddol (cr_ALC_GRADE_SERIES_CLIMATE. SQL).

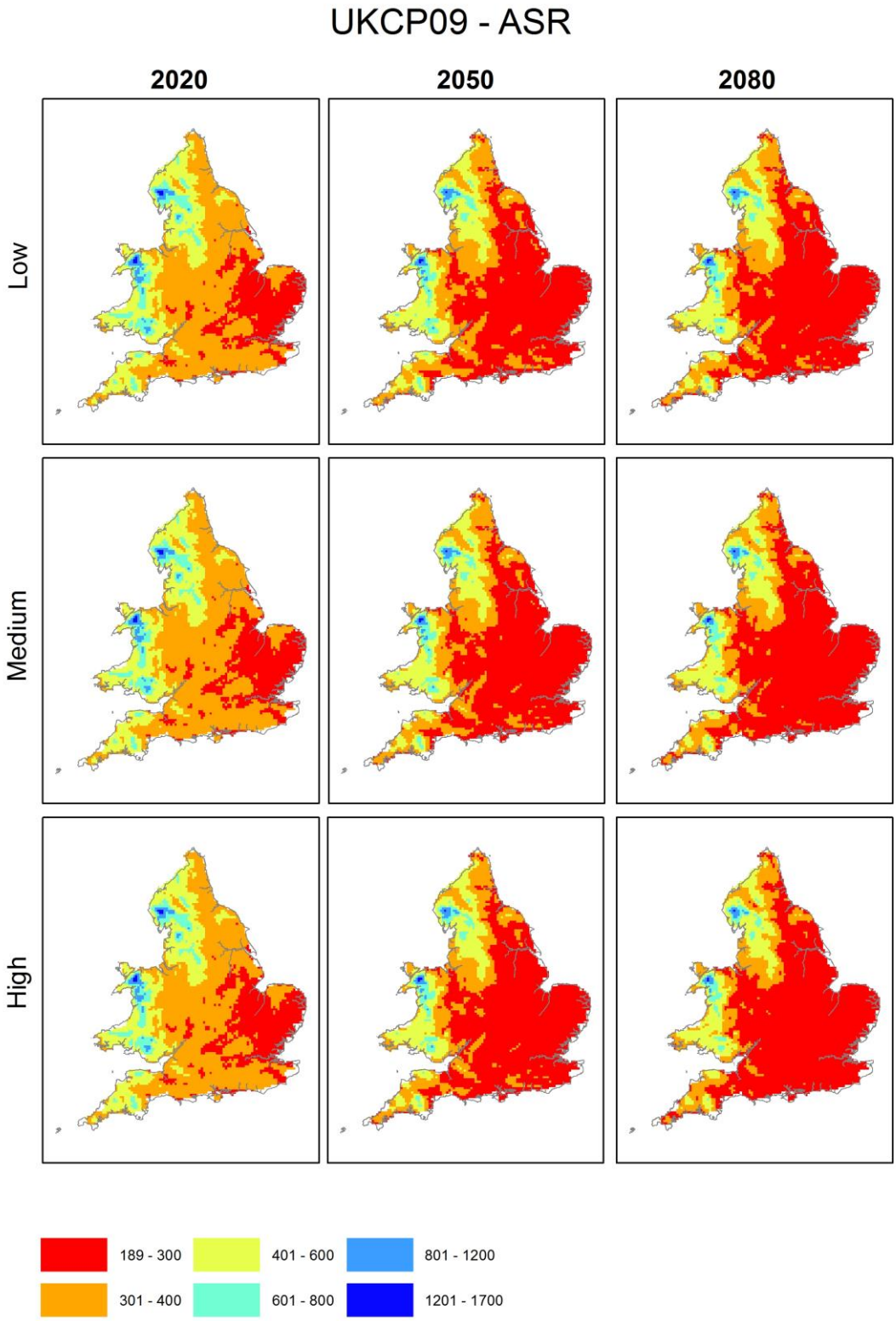
3 ATODIAD 1 – Mapiau UKCP Amaeth-hinsoddol 5 km



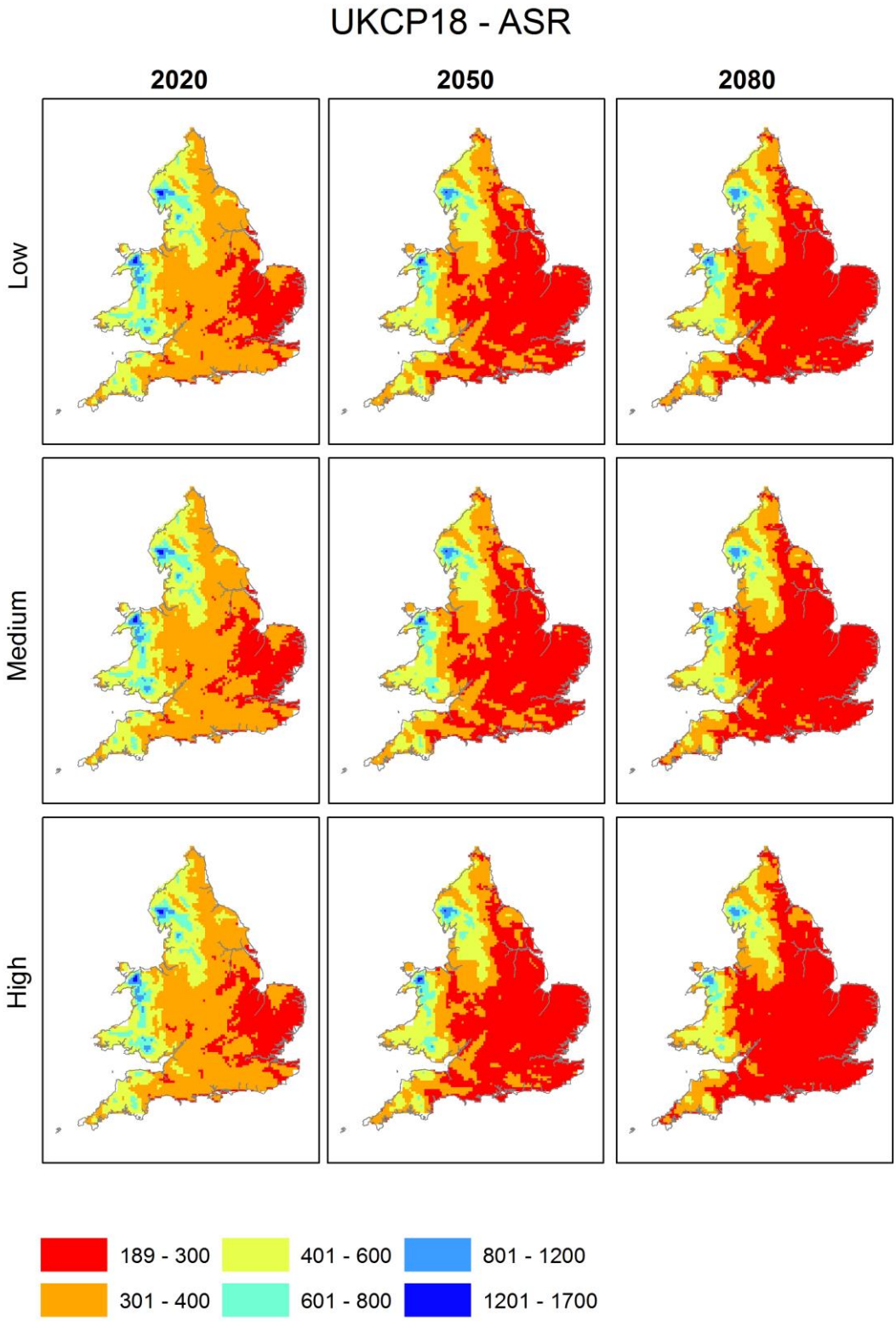
Ffigur 1 UKCP09 - Glawiad Cyfartalog Blynyddol 5km



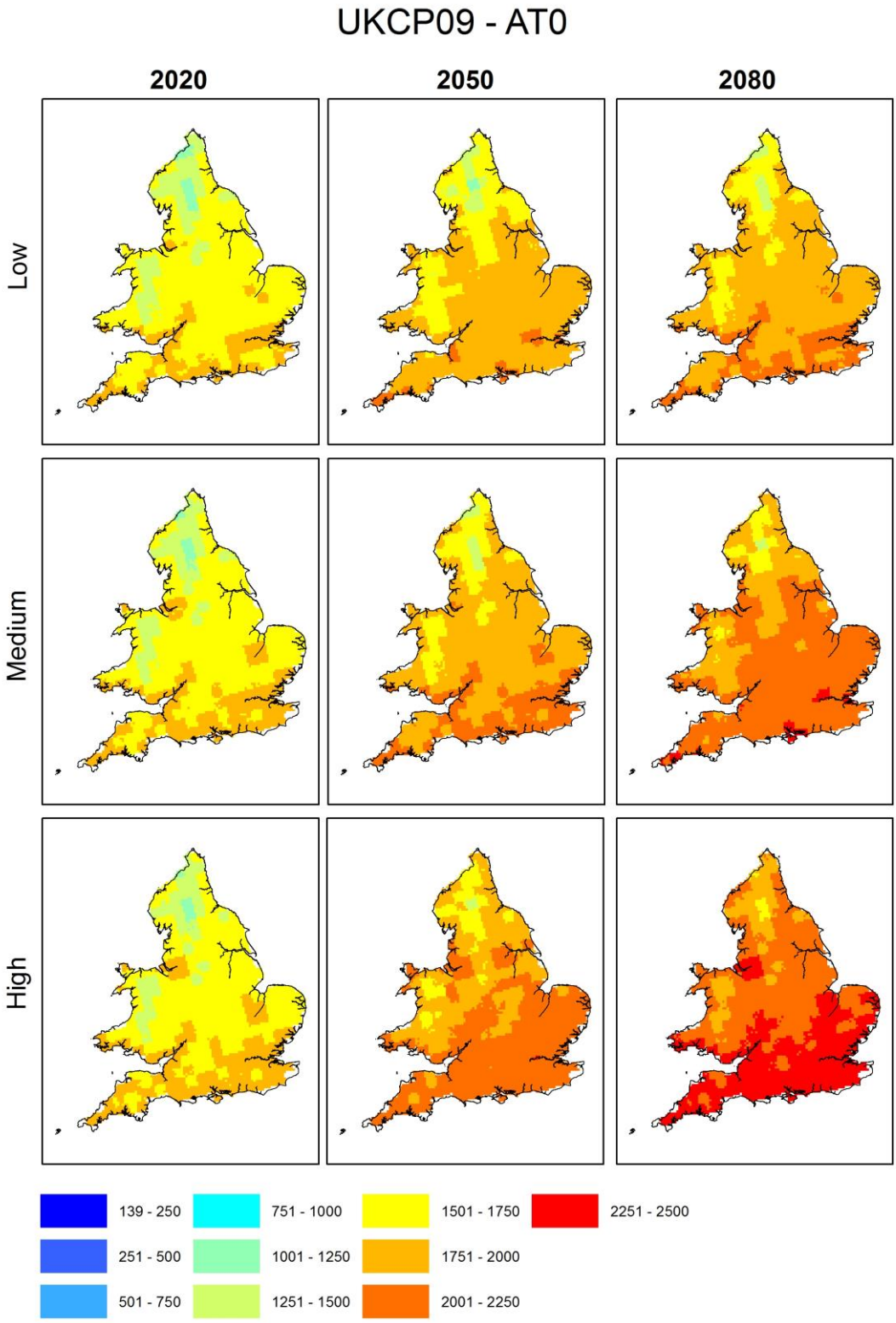
Ffigur 2 UKCP18 - Glawiad Cyfartalog Blynyddol 5km



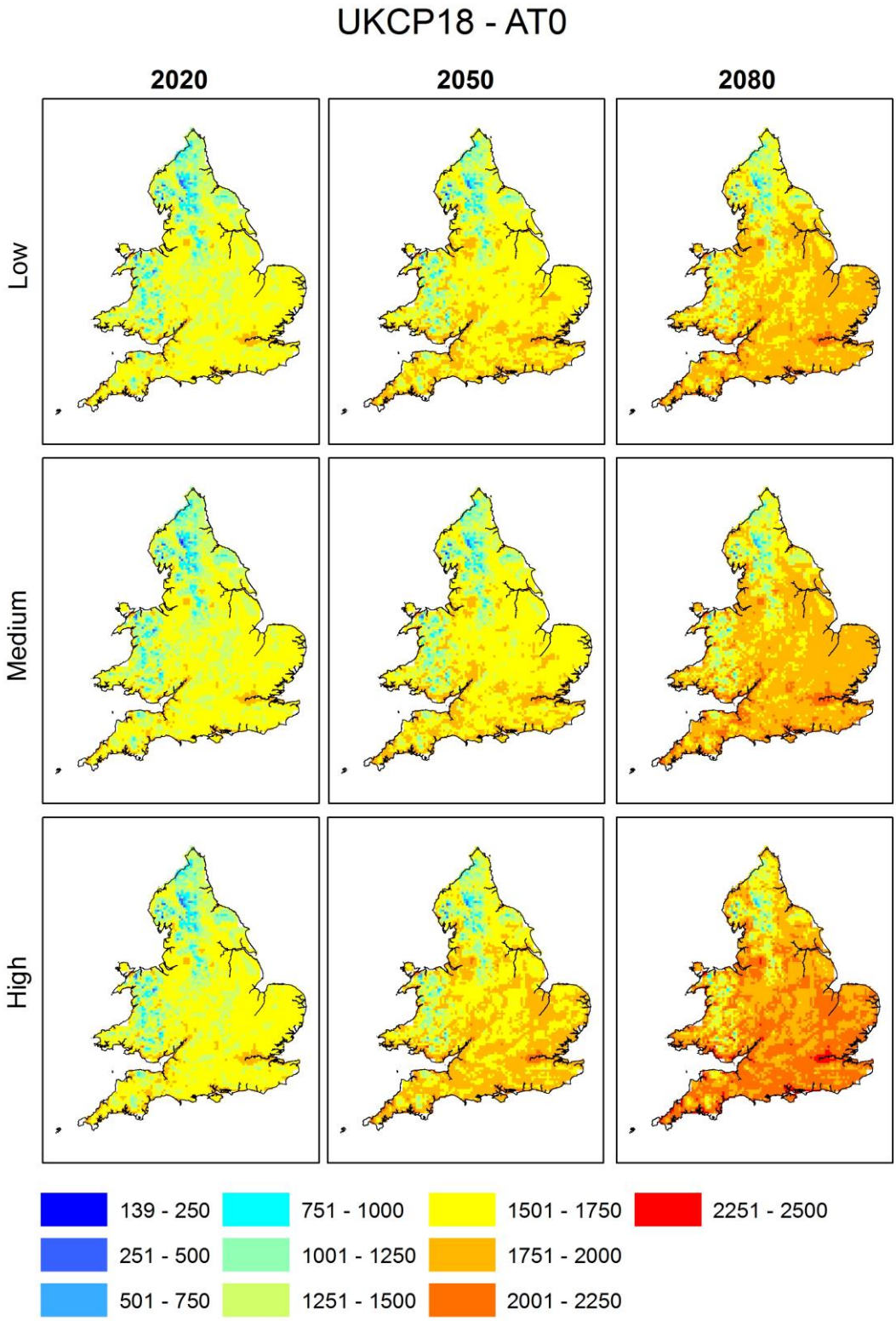
Ffigur 3 UKCP09 - Glawiad Haf Blynyddol 5km



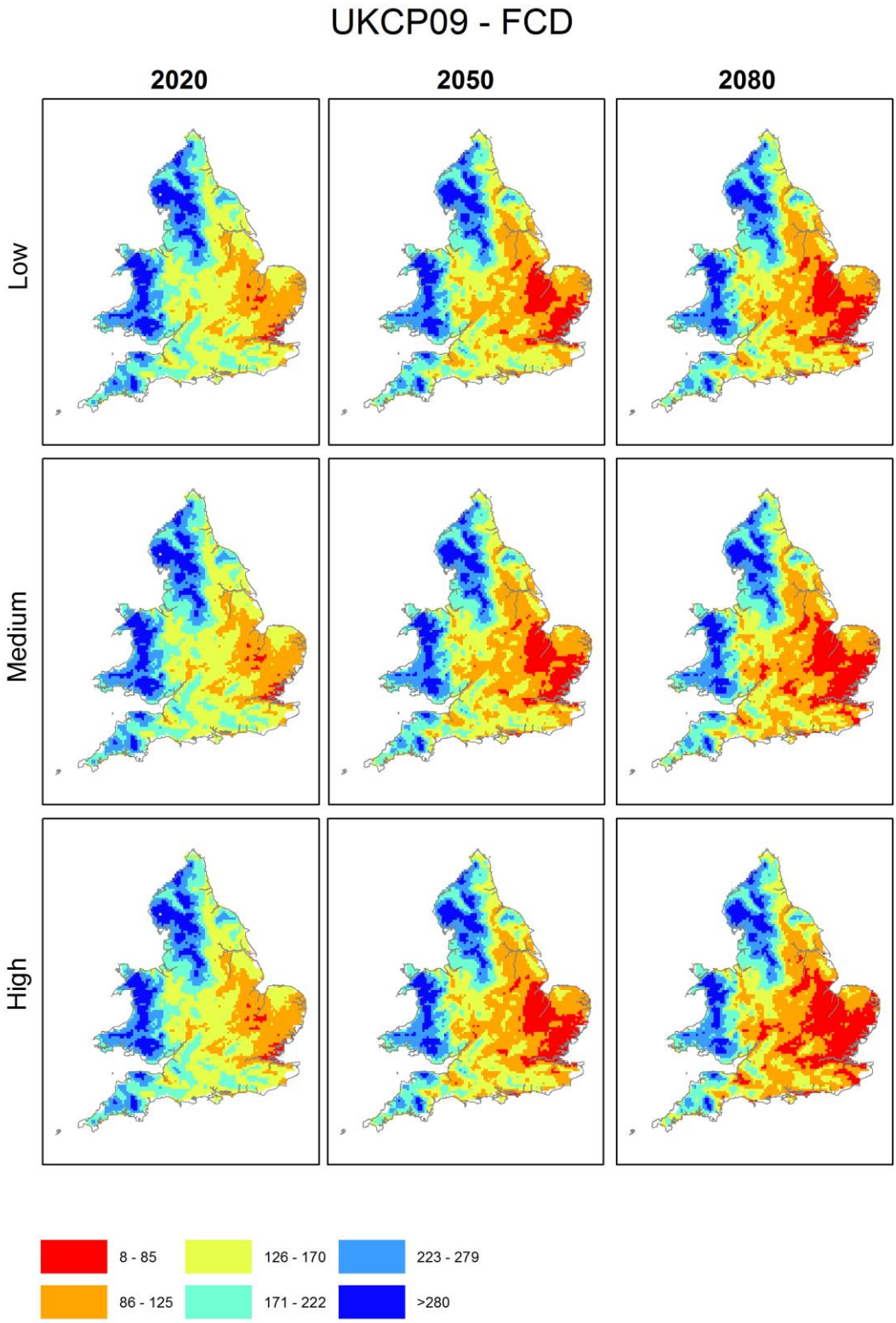
Ffigur 4 UKCP18 - Glawiad Haf Blynyddol 5km



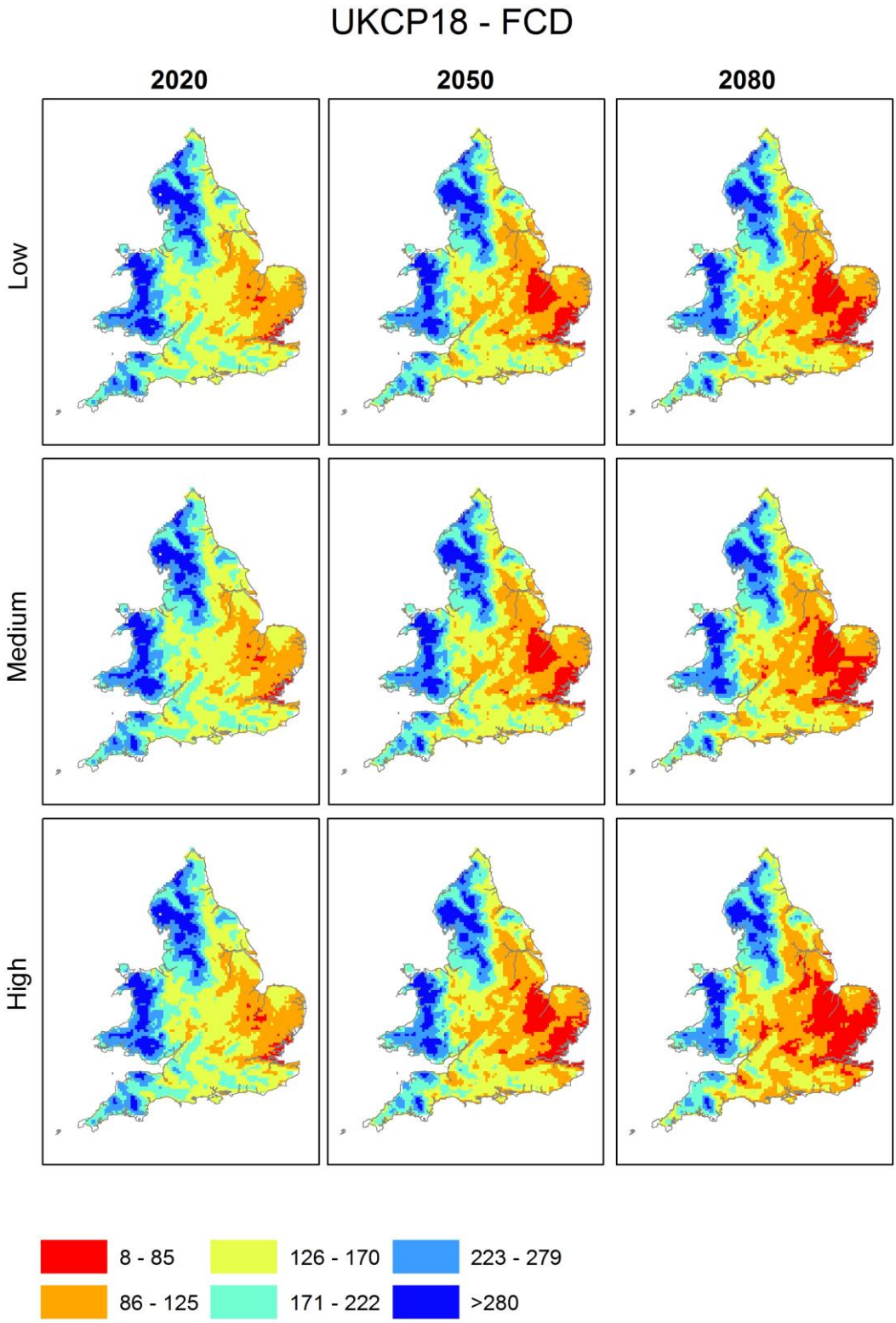
Ffigur 5 UKCP09 - Tymheredd Cronedig uwchben 0° 5km



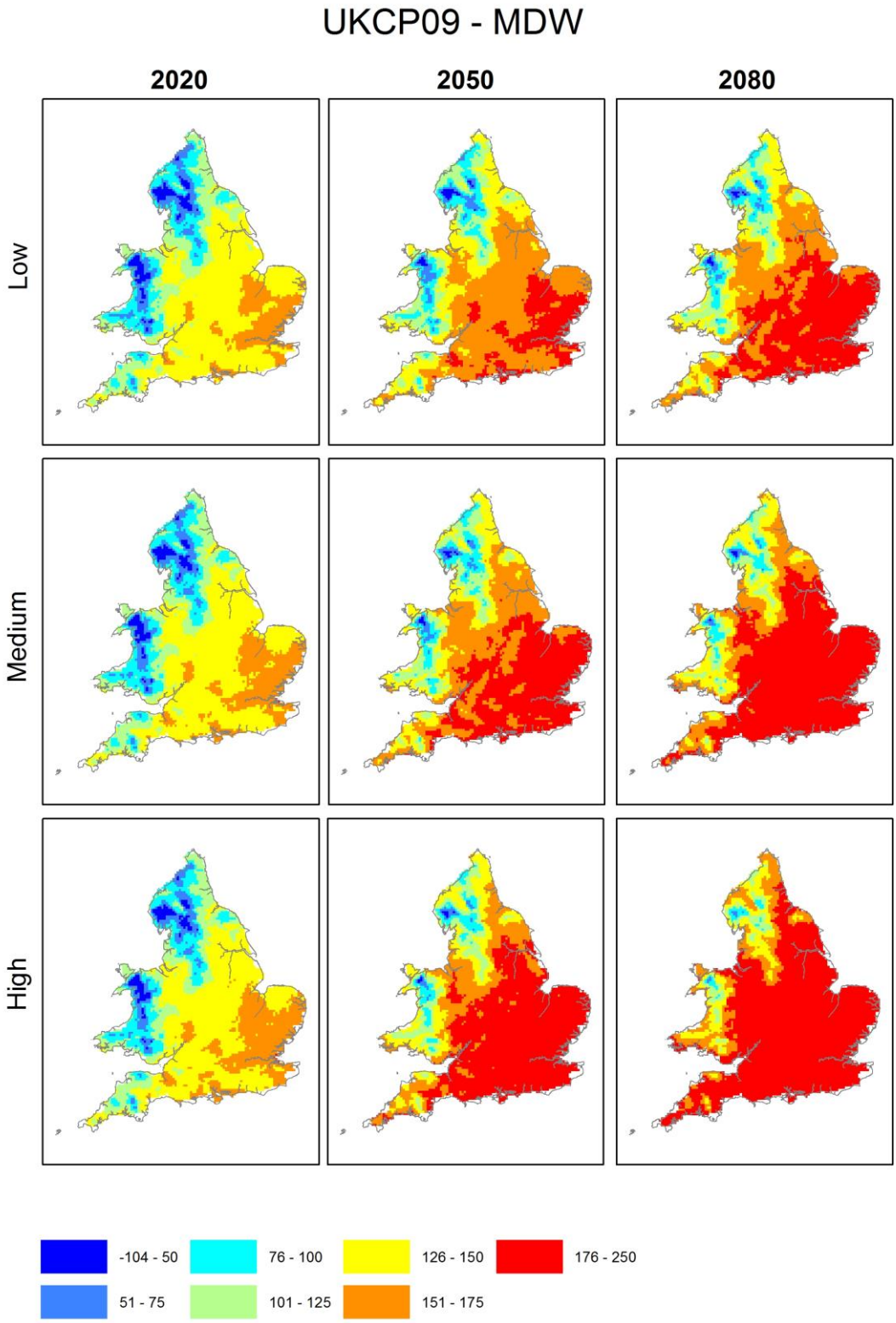
Ffigur 6 UKCP18 - Tymheredd Cronedig uwchben 0° 5km



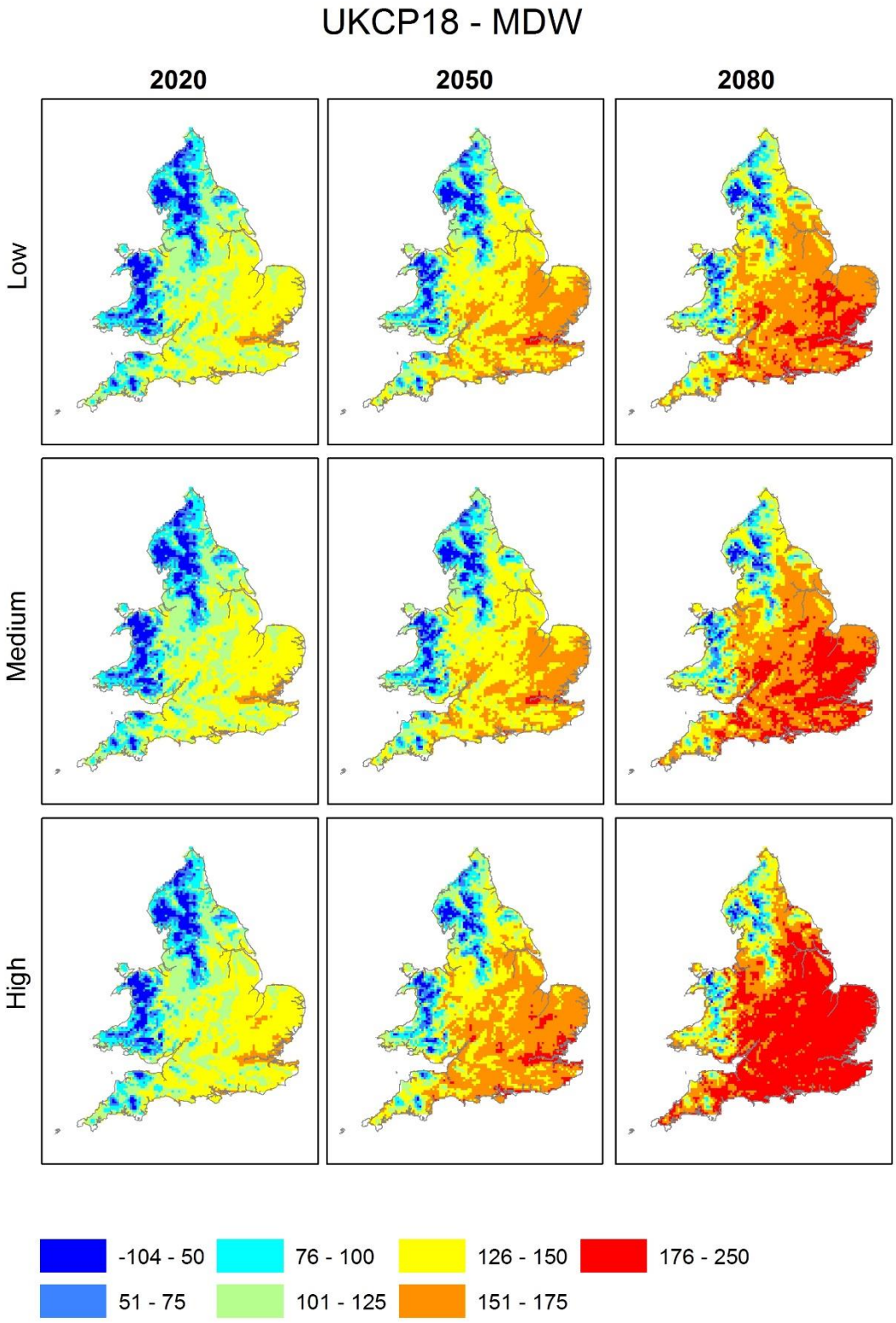
Ffigur 7 UKCP09 - Dyddiau Capasiti Cae 5km



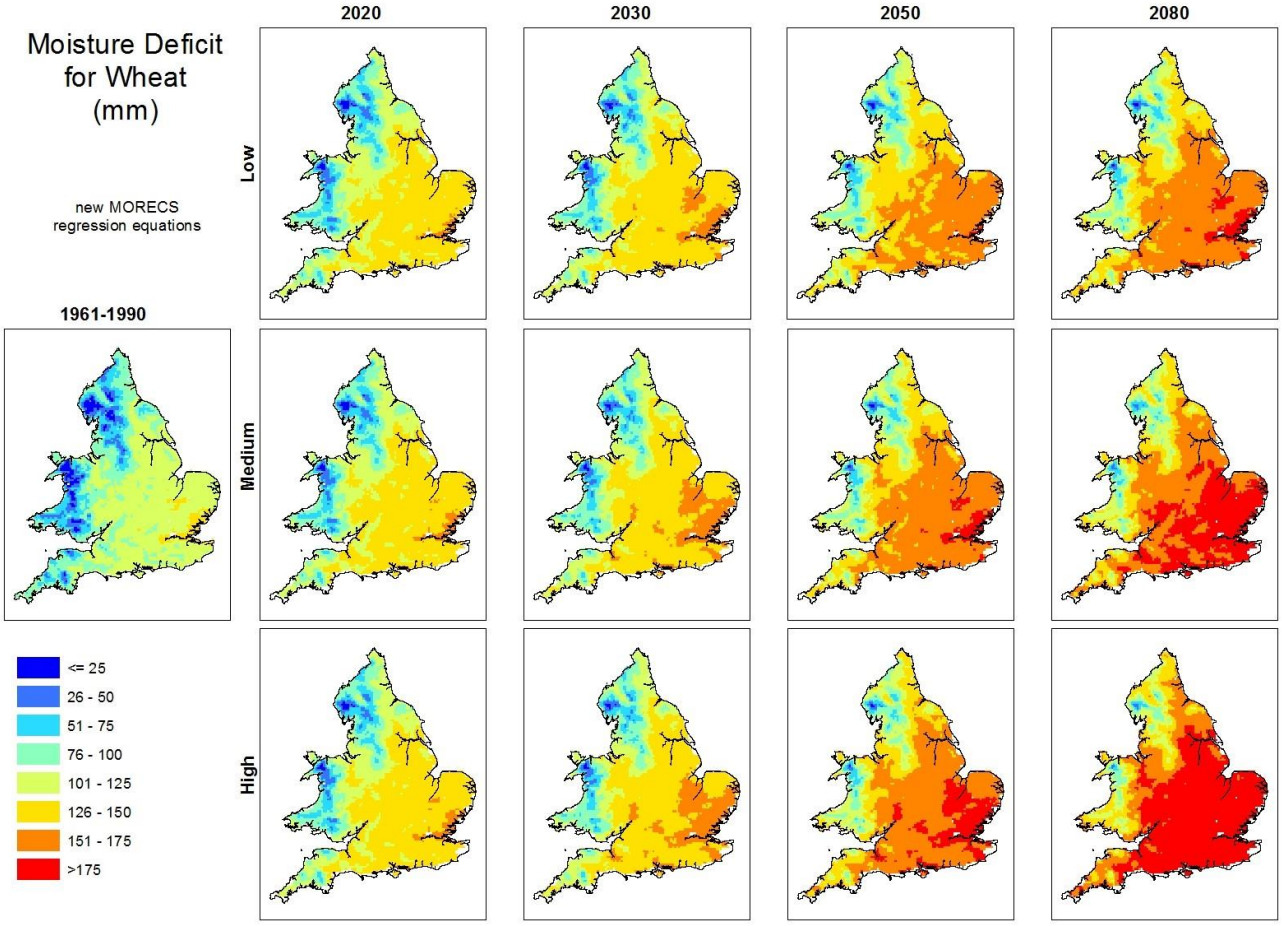
Ffigur 8 UKCP18 - Dyddiau Capasiti Cae 5km



Ffigur 9 UKCP09 - Diffyg Lleithder ar gyfer Gwenith 5km

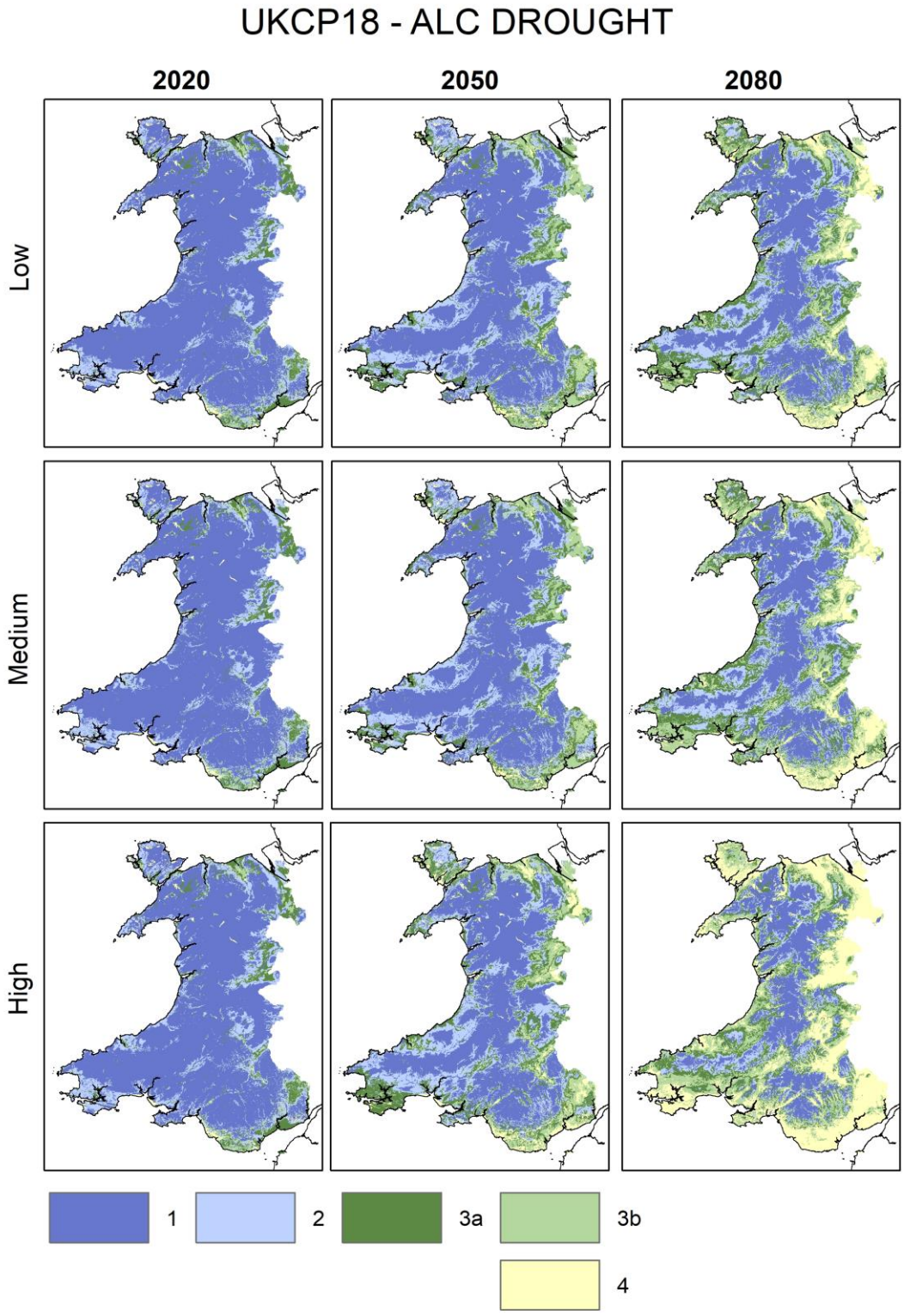


Ffigur 10 UKCP18 - Diffyg Lleithder ar gyfer Gwenith 5km

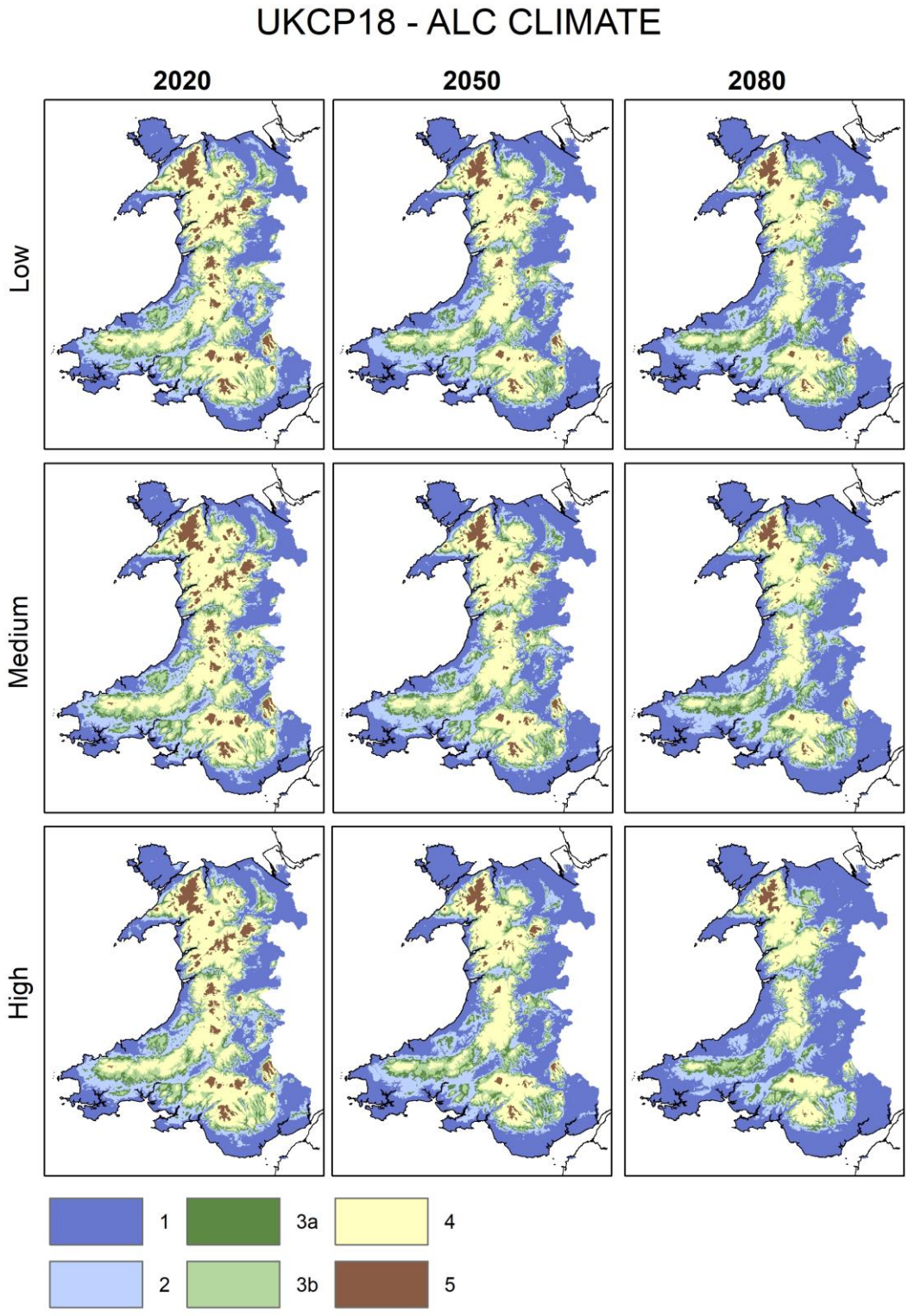


Ffigur 11 UKCP09 - Diffyg Lleithder ar gyfer Gwenith (gan ddefnyddio hafaliad MORECS) 5km

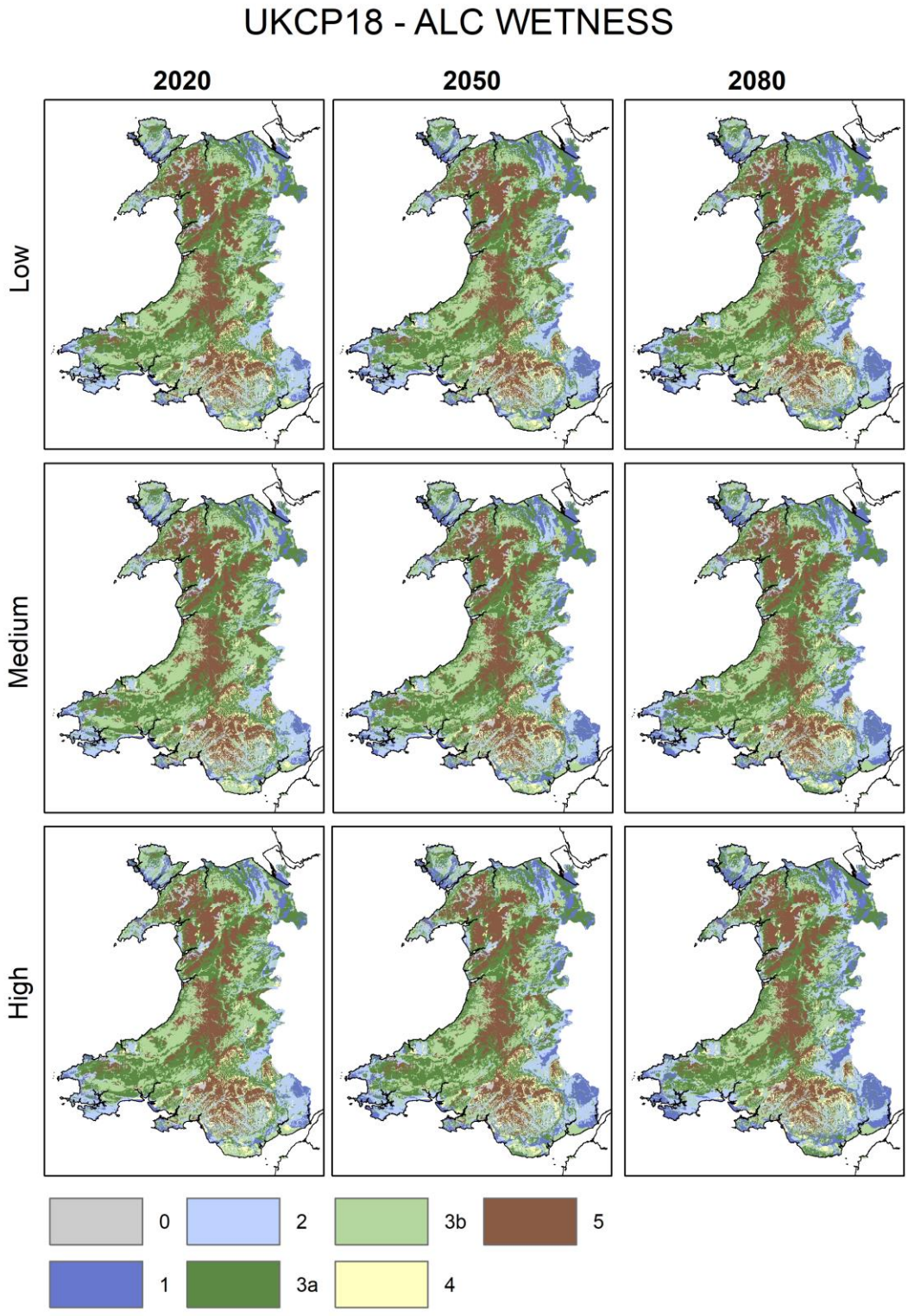
4 ATODIAD 2 – Rhagfynegiadau Dosbarthiad Tir Amaethyddol Newydd gan ddefnyddio Senarios Hinsawdd



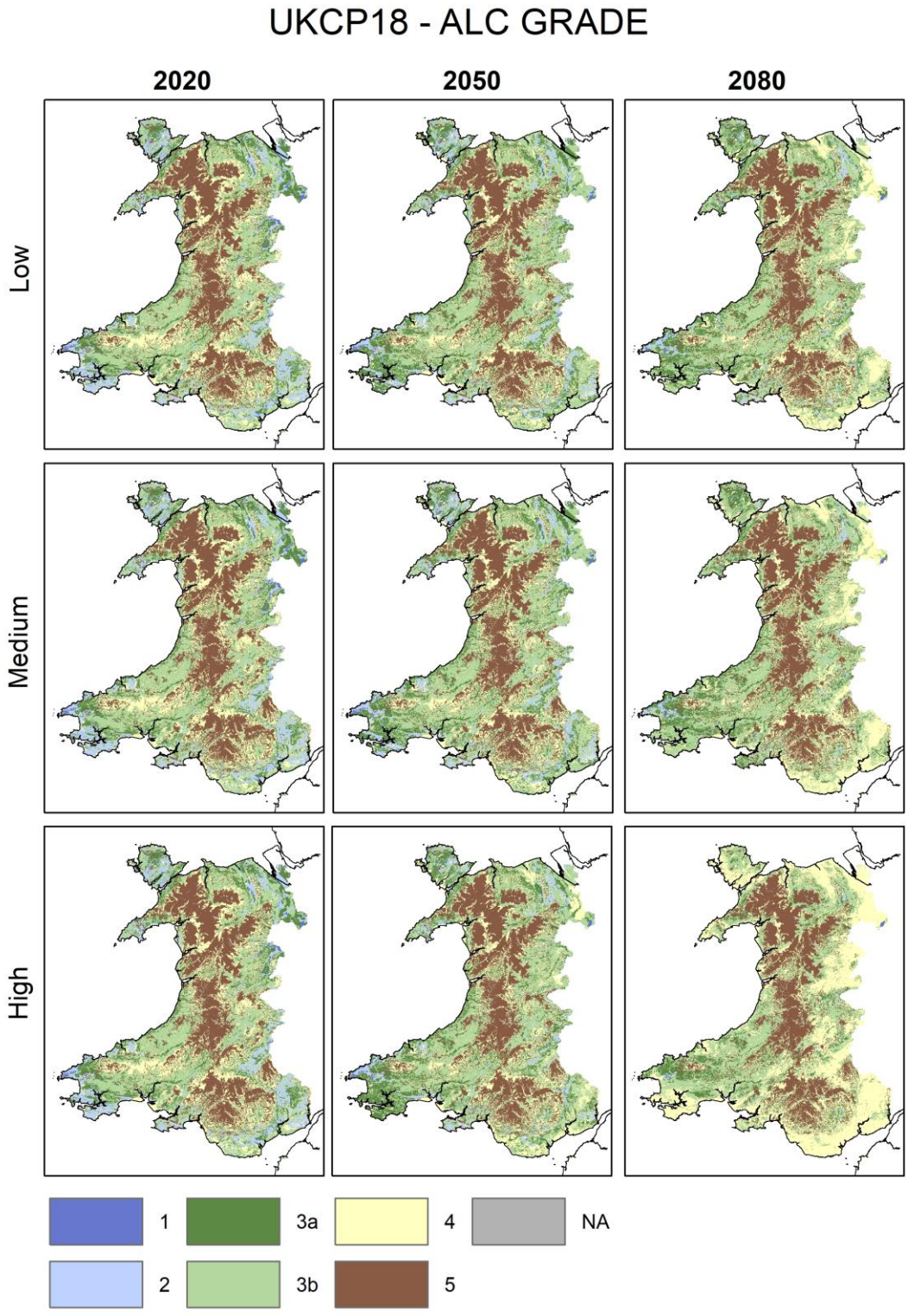
Ffigur 12 Dosbarthiad Tir Amaethyddol wedi'i ddosbarthu yn ôl Sychder ar gyfer senarios hinsawdd UKCP18



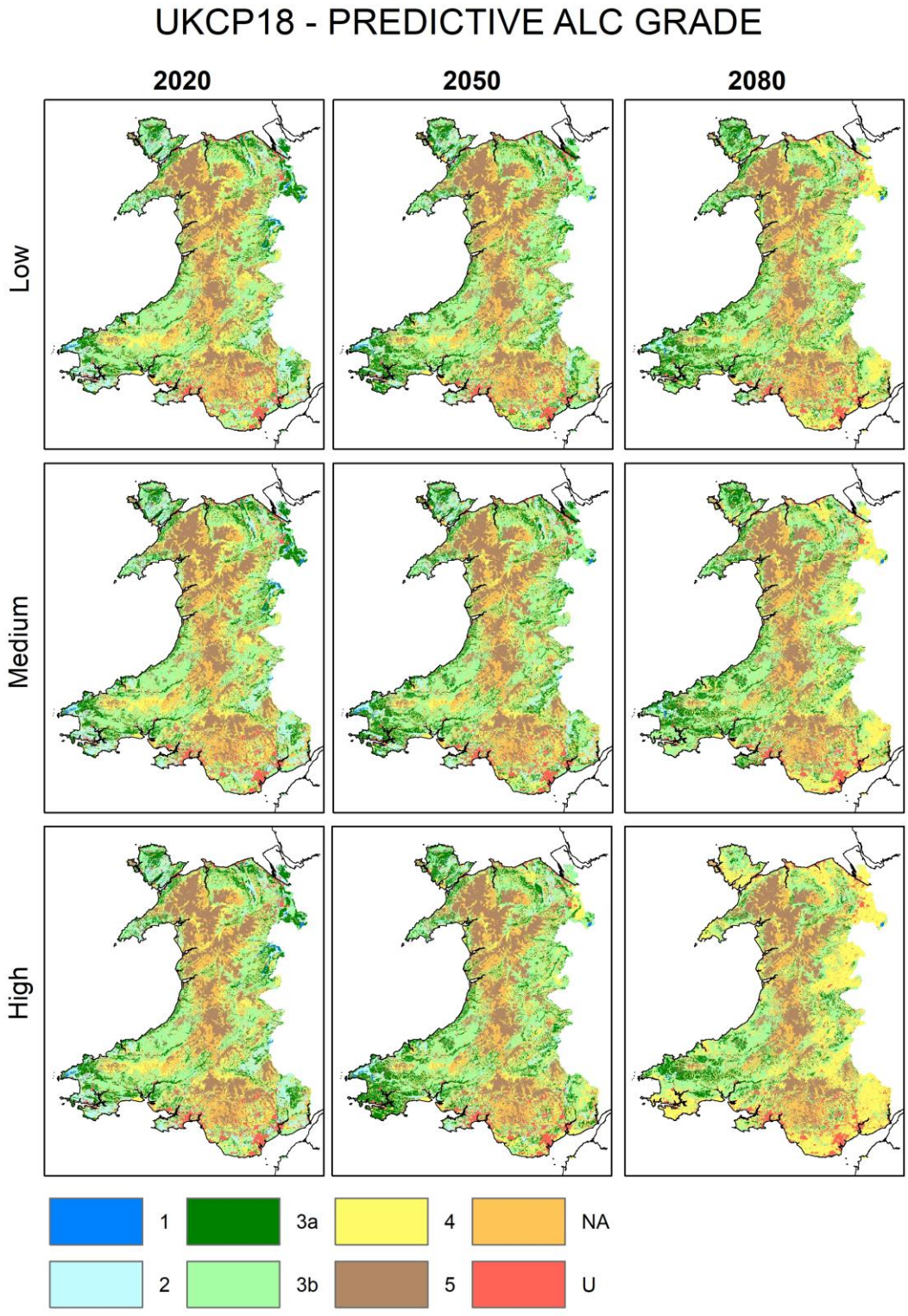
Ffigur 13 Dosbarthiad Tir Amaethyddol wedi'i ddosbarthu yn ôl Hinsawdd ar gyfer senarios hinsawdd UKCP18



Ffigur 14 Dosbarthiad Tir Amaethyddol wedi'i ddosbarthu yn ôl Gwlybaniaeth ar gyfer senarios hinsawdd UKCP18



Ffigur 15 Graddfa Dosbarthiad Tir Amaethyddol (yn ôl Hinsawdd, gwlybaniaeth, sychder, llethr, dyfnder, gwead) ar gyfer senarios hinsawdd UKCP18



Ffigur 16 Gradd Dosbarthiad Tir Amaethyddol ragfynegol ar gyfer senarios hinsawdd UKCP18

5 APPENDIX 3 Code

5.1 Perl Script to generate SQL insert script from CSV files

```
#!/usr/bin/perl
#####
#  CAK 03/07/2019
# Call as 'perl UKCP18import.pl'
###

while ($f=<*.csv>) {
  chop ($f);chop ($f);chop ($f);chop ($f);
  open (OUTFILE, ">cr_UKCP18_$f.sql");
  printf OUTFILE "DROP TABLE UKCP18_$f;\n";
  printf OUTFILE "CREATE TABLE UKCP18_$f\n";
  printf OUTFILE "(  GRID5K NUMBER(7,0) PRIMARY KEY,\n";
  printf OUTFILE "   UNIQUEID NUMBER(7,0),\n";
  printf OUTFILE "   EASTING NUMBER(7,0),\n";
  printf OUTFILE "   NORTHING NUMBER(7,0),\n";
  printf OUTFILE "   ALT NUMBER(11,4),\n";
  printf OUTFILE "   AT0 NUMBER(11,4),\n";
  printf OUTFILE "   ATS NUMBER(11,4),\n";
  printf OUTFILE "   AAR NUMBER(11,4),\n";
  printf OUTFILE "   ASR NUMBER(11,4),\n";
  printf OUTFILE "   AWR NUMBER(11,4),\n";
  printf OUTFILE "   FCD NUMBER(11,4),\n";
  printf OUTFILE "   MDW NUMBER(11,4),\n";
  printf OUTFILE "   MDP NUMBER(11,4)\n";
  printf OUTFILE ");\n";

  open (INFILE, $f.".csv");
  print "Processing: ".$f."\n";
  $line=1;
  while (<INFILE>) {
    chop();
    ($unq,$id25,$alt,$east,$north,$at0,$ats,$aar,$asr,$awr,$fcd,$mdw,$mdp) = split(/,/);
    if ($line>1) {
      print OUTFILE "INSERT INTO UKCP18_$f VALUES
(",int($north/5000)*140+int($east/5000),",",$unq,",",$east,",",$north,",",$alt,",",$at0,",",$ats,",",$aar,
",",$asr,",",$awr,",",$fcd,",",$mdw,",",$mdp,");\n";
    }
    $line=2;
  }
  close INFILE;
  print OUTFILE "COMMIT;\n";
  close OUTFILE;
}


# <EOF: ADASimport.pl>
```

5.2 Filling in missing 5k Climate data

```
##
## Fix missing UKCP09 climate data based on relationship with original ALC climate data
##      Data added flagged as SIMULATED
##
INSERT INTO UKCP09_2020L  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
1393.09190674181+0.000131190796215384*a.EAST+-0.00048743358796038*a.NORTH+-
0.292265845695883*a.alt+0.278036959260663*a.AT0,
NULL,
0.958037366952496*a.AAR+24.9559280355484,
0.806985325370179*a.ASR+39.9493091707204,
0.954480880838771*a.FCD+0.208583853948141,
0.919519376040438*a.MDMWHT+43.4036903603249,
1.02582524936117*a.MDMPOT+46.2327794668448,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2020L b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2020M  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
1426.22079691693+0.000132166248344868*a.EAST+-0.000493615602005055*a.NORTH+-
0.302205326534303*a.alt+0.268793410999338*a.AT0,
NULL,
0.958621784593174*a.AAR+24.545351099484,
0.805958274818238*a.ASR+39.5689543200518,
0.955424480962178*a.FCD+-0.210017994287028,
0.921829543289826*a.MDMWHT+45.1310344257577,
1.02862473015132*a.MDMPOT+48.7012888918977,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2020M b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2020H  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
1962.27275753293+-1.82756705483264E-06*a.EAST+-0.000618690406187118*a.NORTH+-0.524439786152989*a.alt+-
0.0478440782202294*a.AT0,
NULL,
0.958918713338102*a.AAR+24.3144034645044,
0.805439481962427*a.ASR+39.3750610129121,
0.955937416254484*a.FCD+-0.432932956302523,
0.923227703197371*a.MDMWHT+46.248860437607,
1.03032946102801*a.MDMPOT+50.299171448462,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2020H b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2050L  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2101.34934400592+0.000036271219872662*a.EAST+-0.000674082724971551*a.NORTH+-0.514253064843534*a.alt+-
0.0525032277339388*a.AT0,
NULL,
0.966998619831461*a.AAR+0.0868015502245498,
0.733595192098534*a.ASR+27.0561706479633,
1.02328387547926*a.FCD+-30.6777669790383,
0.953000209090015*a.MDMWHT+65.9672414925365,
1.06551708836548*a.MDMPOT+77.3372020727928,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2050L b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2050M  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2190.114743069+4.80498774294724E-05*a.EAST+-0.000684617580159193*a.NORTH+-0.507384357083268*a.alt+-
0.0547588944157172*a.AT0,
NULL,
0.973870809295639*a.AAR+-2.78678664192535,
0.727498969741274*a.ASR+24.5233866307909,
1.03189349237101*a.FCD+-34.3212173654116,
0.966327334115834*a.MDMWHT+74.7098500346177,
1.08145017417674*a.MDMPOT+89.8331339380641,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2050M b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2050H  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2269.44918653473+5.85564995356258E-05*a.EAST+-0.000694042115942008*a.NORTH+-0.501231234761646*a.alt+-
0.0567679670041373*a.AT0,
NULL,
0.979277455275475*a.AAR+-4.8293724874253,
0.723291621280475*a.ASR+22.7316155554972,
1.03810031134864*a.FCD+-36.933151276748,
0.977336786660974*a.MDMWHT+82.3802303127805,
```

```
1.094697589526 71*a.MDMPOT+100.804754444756,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2050H b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2080L  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2185.78851983508+2.22495642335761E-05*a.EAST+-0.000678106819468988*a.NORTH+-0.511479655053184*a.alt+-
0.0528924672894483*a.AT0,
NULL,
0.967319672899706*a.AAR+1.58954140491164,
0.72129151808287*a.ASR+22.4105960107094,
1.0374419607202*a.FCD+-37.6243094702619,
0.961578758193276*a.MDMWHT+76.2143540336445,
1.0745755127863*a.MDMPOT+91.6768238118788,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2080L b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2080M  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2326.525889237+4.09139902402952E-05*a.EAST+-0.000694780399756904*a.NORTH+-0.500585947911159*a.alt+-
0.0564801670693741*a.AT0,
NULL,
0.983270401821108*a.AAR+-3.7953696241857,
0.708112057355095*a.ASR+17.3709594407282,
1.05694823837538*a.FCD+-45.94479307844,
0.984983856710847*a.MDMWHT+90.5366818876459,
1.10229172722669*a.MDMPOT+112.10334437122,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2080M b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP09_2080H  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2489.36086118063+6.23894659400134E-05*a.EAST+-0.000714068577352197*a.NORTH+-0.487950677793219*a.alt+-
0.0606151646608422*a.AT0,
NULL,
1.00470294300612*a.AAR+-9.17310160739896,
0.695597054404259*a.ASR+12.1090935811924,
1.07811436699852*a.FCD+-54.8111316146557,
1.01142182639598*a.MDMWHT+106.834634507446,
1.13365729909777*a.MDMPOT+135.38491351112,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp09_2080H b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;

##
## Fix missing UKCP18 climate data based on relationship with original ALC climate data
##      Data added flagged as SIMULATED
##


INSERT INTO UKCP18_2020L  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
-
4687.12716985912+0.00073151133726957*a.EAST+0.00117106420934636*a.NORTH+3.1903356048658*a.alt+3.832124690
37943*a.AT0,
NULL,
0.95915569288944*a.AAR+22.5672159696991,
0.803406321732999*a.ASR+42.5912797995866,NULL,
0.953428494692034*a.FCD+0.674081053650838,
1.0114953866724*a.MDMWHT+21.5357702026589,
1.1281196267639*a.MDMPOT+19.0906737727394,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2020L b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2020M  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
-
4745.5566380634+0.000735423584905908*a.EAST+0.00118861072493228*a.NORTH+3.22760263594665*a.alt+3.864328301
6891*a.AT0,
NULL,
0.958882062924229*a.AAR+22.9031386143549,
0.80407367658498*a.ASR+42.7773648404594,NULL,
0.952685635282963*a.FCD+0.971583416740856,
1.01061350990511*a.MDMWHT+21.1588812597067,
1.12707636197815*a.MDMPOT+18.5490254772314,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2020M b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2020H  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
```

```
2006.96376650764+-0.000300265412054946*a.EAST+-0.000528205379104034*a.NORTH+-1.00567037017496*a.alt+-
0.0981974831674906*a.AT0,
NULL,
0.960517176391054*a.AAR+21.667774616123,
0.800083577392312*a.ASR+42.4295535371003,NULL,
0.954979618164793*a.FCD+-0.0493119584967019,
1.013610718348 79*a.MDMWHT+23.1525520937097,
1.13074861232473*a.MDMPOT+21.3667423272147,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2020H b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2050L  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2107.45906053048+-0.000272756671418667*a.EAST+-0.000567323274577673*a.NORTH+-0.997779499597726*a.alt+-
0.104190501772524*a.AT0,
NULL,
0.962417259968935*a.AAR+1.16054885730603,
0.716765151600857*a.ASR+40.7806904929014,NULL,
1.00163348139292*a.FCD+-23.5678746197645,
1.02925862646088*a.MDMWHT+37.9328068367727,
1.15160227792899*a.MDMPOT+41.089864295277,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2050L b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2050M  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2098.59760455249+-0.00028222401958206 54*a.EAST+-0.000560708190622203*a.NORTH+-0.998074024473188*a.alt+-
0.103545202396738*a.AT0,
NULL,
0.962727454588418*a.AAR+0.59278314469077,
0.717075785615016*a.ASR+41.028588692947,NULL,
1.00134735367805*a.FCD+-23.4067653960543,
1.02681576757869*a.MDMWHT+36.963427538783,
1.14857443139973*a.MDMPOT+39.6725102204528,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2050M b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2050H  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2182.55392757313+-0.000254565781899658*a.EAST+-0.000589605899477144*a.NORTH+-0.992617361404445*a.alt+-
0.1068234075003*a.AT0,
NULL,
0.96960609161941*a.AAR+-5.31355113081554,
0.702628669456201*a.ASR+38.769186611435,NULL,
1.01563269304392*a.FCD+-29.6320627066284,
1.04478013164826*a.MDMWHT+46.407340832275,
1.17065576102314*a.MDMPOT+53.134433710209,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2050H b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2080L  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2248.9951326464+-0.000269242559495039*a.EAST+-0.000615403627046473*a.NORTH+-0.994939060333789*a.alt+-
0.105860013148755*a.AT0,
NULL,
0.981897985120499*a.AAR+-8.56545564645194,
0.688484002536322*a.ASR+37.8749255299599,NULL,
1.01822889958045*a.FCD+-32.2681521283491,
1.03853210997128*a.MDMWHT+55.2380461534964,
1.16258345981899*a.MDMPOT+65.096220691332,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2080L b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2080M  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2298.33019295387+-0.000266126007992345*a.EAST+-0.000625098237713046*a.NORTH+-0.992139424847234*a.alt+-
0.107161861989518*a.AT0,
NULL,
0.985999721441057*a.AAR+-12.1338219464658,
0.680327657636142*a.ASR+36.8706324339647,NULL,
1.02706402938029*a.FCD+-36.0569415493447,
1.04643214023296*a.MDMWHT+60.4175108648075,
1.17224947029709*a.MDMPOT+72.422480323851,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2080M b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
INSERT INTO UKCP18_2080H  SELECT a.id_5k, trunc(a.north/1000)*1000+trunc(a.east/1000),
a.east+2500,a.north+2500,a.alt,
2444.48895682927+-0.00022485726461786*a.EAST+-0.000673833288150932*a.NORTH+-0.983681399130201*a.alt+-
0.11256791817782*a.AT0,
NULL,
```

```
0.999434858576552*a.AAR+-23.3043656241349,
0.651543812889636*a.ASR+34.4820643959113,NULL,
1.05392354850122*a.FCD+-48.5339142617406,
1.07484327662706*a.MDMWHT+76.9306987394013,
1.20760579008171*a.MDMPOT+95.8023033036339,'Y'
FROM landis.alc_climate_5k a, metoffice.ukcp18_2080H b
WHERE a.id_5k =b.grid5k(+) and b.grid5k is null;
```

5.3 Interpolating 5k Climate data to 50m

```
## Interp_Scenario.sql
### &1 = 50km Sheet XXYY where XX = 100km square i.e. SH and YY = NE,NW,SE,SW
### &2 = year and scenario [2020L,2020M,2020H,2050L,2050M,2050H,2080L,2080M,2080H]
### &3 = UKCP - 09 or 18
### &4 = name of tablespace in Oracle system (AGROCLIM,METOFFICE…)

DROP TABLE "ALC"."ALC_CLIMATE_50M_&1&2&3";
CREATE TABLE "ALC"."ALC_CLIMATE_50M_&1&2&3"
(   "POINTID" NUMBER(12,0) PRIMARY KEY,
    "EAST50" NUMBER(8,0),
    "NORTH50" NUMBER(8,0),
    "AAR" NUMBER,
    "LR_AAR" NUMBER,
    "ASR" NUMBER,
    "LR_ASR" NUMBER,
    "AT0" NUMBER,
    "ATS" NUMBER,
    "MDMWHT" NUMBER,
    "MDMPOT" NUMBER,
    "FCD" NUMBER)
    TABLESPACE &4;
ALTER TABLE "ALC"."ALC_CLIMATE_50M_&1&2&3" NOLOGGING;

DECLARE
    CURSOR points50m IS SELECT a.POINTID, a.EAST50, a.NORTH50, a.ALTITUDE FROM ALC.ALC_CLIMATE_50M_&1 a;
    scenario varchar2(8);
    AAR_S number;
    LR_AAR_S number;
    ASR_S number;
    LR_ASR_S number;
    AT0_S number;
    ATS_S number;
    FCD_S number;
    MDMWHT_S number;
    MDMPOT_S number;
    emin number;
    emax number;
    nmin number;
    nmax number;
    Ct_nw number;
    Ct_sw number;
    Ct_se number;
    Ct_ne number;
    alt_nw number;
    alt_sw number;
    alt_se number;
    alt_ne number;
    aar_nw number :=0;
    aar_sw number :=0;
    aar_se number :=0;
    aar_ne number :=0;
    aara_nw number;
    aara_sw number;
    aara_se number;
    aara_ne number;
    ASR_nw number :=0;
    ASR_sw number :=0;
    ASR_se number :=0;
    ASR_ne number :=0;
    ASRa_nw number;
    ASRa_sw number;
    ASRa_se number;
    ASRa_ne number;
    AT0_nw number :=0;
    AT0_sw number :=0;
    AT0_se number :=0;
    AT0_ne number :=0;
    AT0a_nw number;
    AT0a_sw number;
    AT0a_se number;
```

```
    AT0a_ne number;
    FCD_nw number :=0;
    FCD_sw number :=0;
    FCD_se number :=0;
    FCD_ne number :=0;
    FCDa_nw number;
    FCDa_sw number;
    FCDa_se number;
    FCDa_ne number;
    lr_nw number;
    lr_sw number;
    lr_se number;
    lr_ne number;
    lrs_nw number;
    lrs_sw number;
    lrs_se number;
    lrs_ne number;
    MDMw_nw number;
    MDMw_sw number;
    MDMw_se number;
    MDMw_ne number;
    mdw_nw number;
    mdw_sw number;
    mdw_se number;
    mdw_ne number;
    MDMp_nw number;
    MDMp_sw number;
    MDMp_se number;
    MDMp_ne number;
    mdp_nw number;
    mdp_sw number;
    mdp_se number;
    mdp_ne number;
    dsg_nw number;
    dsg_sw number;
    dsg_se number;
    dsg_ne number;
    Wg_nw number;
    Wg_sw number;
    Wg_se number;
    Wg_ne number;
    Wp_nw number;
    Wp_sw number;
    Wp_se number;
    Wp_ne number;
    Cp_nw number;
    Cp_sw number;
    Cp_se number;
    Cp_ne number;
    Cw_nw number;
    Cw_sw number;
    Cw_se number;
    Cw_ne number;
    Wt number;
    sqlstring varchar2(4000);
BEGIN

    FOR pt IN points50m LOOP
        emin := trunc((pt.EAST50+2500)/5000)*5000 - 2500;
        emax := emin+5000;
        nmin := trunc((pt.NORTH50+2500)/5000)*5000 - 2500;
        nmax := nmin+5000;
        scenario := '&3'||'_'||'&2';

        BEGIN
          sqlstring := 'SELECT 1, a.alt, a.aar, b.lr_aar, a.asr,b.lr_asr, a.AT0, a.FCD, a.MDW, a.MDP
                        FROM metoffice.UKCP'||scenario||' a, Landis.alc_climate_5k b
                        WHERE b.id_5k=a.grid5k and a.easting=:east and a.northing=:north';
          EXECUTE IMMEDIATE sqlstring
                  INTO ct_nw, alt_nw, aar_nw, lr_nw, asr_nw, lrs_nw, at0_nw,  fcd_nw, mdw_nw, mdp_nw
                  USING emin, nmax;
          EXCEPTION
             WHEN NO_DATA_FOUND then Ct_nw :=0;  alt_nw :=0; aar_nw :=0;lr_nw :=0;  asr_nw :=0;
                       lrs_nw:=0; at0_nw:=0;  fcd_nw:=0; mdw_nw:=0; mdp_nw :=0;
        END;
```

```
BEGIN
  sqlstring := 'SELECT 1, a.alt, a.aar, b.lr_aar, a.asr,b.lr_asr, a.AT0, a.FCD, a.MDW, a.MDP
               FROM metoffice.UKCP'||scenario||' a, landis.alc_climate_5k b
               WHERE b.id_5k=a.grid5k and a.easting=:east and a.northing=:north';
  EXECUTE IMMEDIATE sqlstring
          INTO ct_ne,  alt_ne, aar_ne, lr_ne, asr_ne, lrs_ne, at0_ne, fcd_ne, mdw_ne, mdp_ne
          USING emax, nmax;
  EXCEPTION
     WHEN NO_DATA_FOUND then Ct_ne :=0;  alt_ne :=0; aar_ne :=0;lr_ne :=0;  asr_ne :=0;
                             lrs_ne:=0; at0_ne:=0; fcd_ne:=0; mdw_ne:=0; mdp_ne :=0;
END;
BEGIN
  sqlstring := 'SELECT 1, a.alt, a.aar, b.lr_aar, a.asr,b.lr_asr, a.AT0, a.FCD, a.MDW, a.MDP
               FROM metoffice.UKCP'||scenario||' a, landis.alc_climate_5k b
               WHERE b.id_5k=a.grid5k and a.easting=:east and a.northing=:north';
  EXECUTE IMMEDIATE sqlstring
          INTO ct_sw,  alt_sw, aar_sw, lr_sw, asr_sw, lrs_sw, at0_sw, fcd_sw, mdw_sw, mdp_sw
          USING emin, nmin;
  EXCEPTION
     WHEN NO_DATA_FOUND then Ct_sw :=0;  alt_sw :=0; aar_sw :=0;lr_sw :=0;  asr_sw :=0;
      lrs_sw:=0; at0_sw:=0; fcd_sw:=0; mdw_sw:=0; mdp_sw :=0;
END;
 BEGIN
  sqlstring := 'SELECT 1, a.alt, a.aar, b.lr_aar, a.asr,b.lr_asr, a.AT0, a.FCD, a.MDW, a.MDP
               FROM metoffice.UKCP'||scenario||' a, landis.alc_climate_5k b
               WHERE b.id_5k=a.grid5k and a.easting=:east and a.northing=:north';
  EXECUTE IMMEDIATE sqlstring
          INTO ct_se,  alt_se, aar_se, lr_se, asr_se, lrs_se, at0_se, fcd_se, mdw_se, mdp_se
          USING emax, nmin;
  EXCEPTION
     when NO_DATA_FOUND then Ct_se :=0;  alt_se :=0; aar_se :=0;lr_se :=0;  asr_se :=0;
                             lrs_se:=0; at0_se:=0; fcd_se:=0; mdw_se:=0; mdp_se :=0;
END;

Cp_nw := -0.09*(lr_nw*(pt.ALTITUDE- alt_nw))+0.12*(1.14*(alt_nw-pt.ALTITUDE));
Cp_sw := -0.09*(lr_sw*(pt.ALTITUDE- alt_sw))+0.12*(1.14*(alt_sw-pt.ALTITUDE));
Cp_se := -0.09*(lr_se*(pt.ALTITUDE- alt_se))+0.12*(1.14*(alt_se-pt.ALTITUDE));
Cp_ne := -0.09*(lr_ne*(pt.ALTITUDE- alt_ne))+0.12*(1.14*(alt_ne-pt.ALTITUDE));
cw_nw := -0.07*(lr_nw*(pt.ALTITUDE- alt_nw))+0.09*(1.14*(alt_nw-pt.ALTITUDE));
cw_sw := -0.07*(lr_sw*(pt.ALTITUDE- alt_sw))+0.09*(1.14*(alt_sw-pt.ALTITUDE));
cw_se := -0.07*(lr_se*(pt.ALTITUDE- alt_se))+0.09*(1.14*(alt_se-pt.ALTITUDE));
cw_ne := -0.07*(lr_ne*(pt.ALTITUDE- alt_ne))+0.09*(1.14*(alt_ne-pt.ALTITUDE));

AARa_nw := aar_nw + lr_nw * (pt.ALTITUDE- alt_nw);
AARa_sw := aar_sw + lr_sw * (pt.ALTITUDE- alt_sw);
AARa_se := aar_se + lr_se * (pt.ALTITUDE- alt_se);
AARa_ne := aar_ne + lr_ne * (pt.ALTITUDE- alt_ne);
ASRa_nw := ASR_nw + lrs_nw * (pt.ALTITUDE- alt_nw);
ASRa_sw := ASR_sw + lrs_sw * (pt.ALTITUDE- alt_sw);
ASRa_se := ASR_se + lrs_se * (pt.ALTITUDE- alt_se);
ASRa_ne := ASR_ne + lrs_ne * (pt.ALTITUDE- alt_ne);
AT0a_nw := AT0_nw + (1.14 * (alt_nw - pt.ALTITUDE));
AT0a_sw := AT0_sw + (1.14 * (alt_sw - pt.ALTITUDE));
AT0a_se := AT0_se + (1.14 * (alt_se - pt.ALTITUDE));
AT0a_ne := AT0_ne + (1.14 * (alt_ne - pt.ALTITUDE));
FCDa_nw := FCD_nw + 0.1446*(lr_nw * (pt.ALTITUDE- alt_nw));
FCDa_sw := FCD_sw + 0.1446*(lr_sw * (pt.ALTITUDE- alt_sw));
FCDa_se := FCD_se + 0.1446*(lr_se * (pt.ALTITUDE- alt_se));
FCDa_ne := FCD_ne + 0.1446*(lr_ne * (pt.ALTITUDE- alt_ne));
MDMw_nw := mdw_nw+cw_nw;
MDMw_sw := mdw_sw+cw_sw;
MDMw_se := mdw_se+cw_se;
MDMw_ne := mdw_ne+cw_ne;
MDMp_nw := mdp_nw+Cp_nw;
MDMp_sw := mdp_sw+Cp_sw;
MDMp_se := mdp_se+Cp_se;
MDMp_ne := mdp_ne+Cp_ne;
dsg_nw := sqrt(power((emin-pt.EAST50),2) + power((nmax-pt.NORTH50),2));
dsg_sw := sqrt(power((emin-pt.EAST50),2) + power((nmin-pt.NORTH50),2));
dsg_se := sqrt(power((emax-pt.EAST50),2) + power((nmin-pt.NORTH50),2));
dsg_ne := sqrt(power((emax-pt.EAST50),2) + power((nmax-pt.NORTH50),2));
if ((dsg_nw = 0) and (ct_nw >0)) then
    wg_nw := 1;
elsif (((pt.EAST50=emax) or (pt.NORTH50=nmin)) or (ct_nw = 0)) then
    wg_nw := 0;
```

```
        else
            wg_nw := power(1/dsg_nw,2);
        end if;
        if((dsg_sw = 0) and (ct_sw >0)) then
            wg_sw := 1;
        elsif (((pt.EAST50=emax) or (pt.NORTH50=nmax)) or (ct_sw =0)) then
            wg_sw := 0;
        else
            wg_sw := power(1/dsg_sw,2);
        end if;
        if((dsg_se = 0) and (ct_se >0))then
            wg_se := 1;
        elsif (((pt.EAST50=emin) or (pt.NORTH50=nmax)) or (ct_se =0)) then
            wg_se := 0;
        else
            wg_se := power(1/dsg_se,2);
        end if;
        if((dsg_ne = 0) and (ct_ne >0)) then
            wg_ne := 1;
        elsif (((pt.EAST50=emin) or (pt.NORTH50=nmin)) or (Ct_ne =0)) then
            wg_ne := 0;
        else
            wg_ne := power(1/dsg_ne,2);
        end if;

        Wt := wg_nw + wg_sw + wg_se + wg_ne;
        If Wt > 0 then
            Wp_nw := wg_nw/Wt;
            Wp_sw := wg_sw/Wt;
            Wp_se := wg_se/Wt;
            Wp_ne := wg_ne/Wt;
            AAR_S := AARa_nw*Wp_nw + AARa_sw*Wp_sw + AARa_se*Wp_se + AARa_ne*Wp_ne;
            LR_AAR_S := LR_nw*Wp_nw + LR_sw*Wp_sw + LR_se*Wp_se + LR_ne*Wp_ne;
            ASR_S := ASRa_nw*Wp_nw + ASRa_sw*Wp_sw + ASRa_se*Wp_se + ASRa_ne*Wp_ne;
            LR_ASR_S := LRS_nw*Wp_nw + LRS_sw*Wp_sw + LRS_se*Wp_se + LRS_ne*Wp_ne;
            AT0_S := AT0a_nw*Wp_nw + AT0a_sw*Wp_sw + AT0a_se*Wp_se + AT0a_ne*Wp_ne;
            MDMWHT_S := MDMw_nw*Wp_nw + MDMw_sw*Wp_sw + MDMw_se*Wp_se + MDMw_ne*Wp_ne;
            MDMPOT_S := MDMp_nw*Wp_nw + MDMp_sw*Wp_sw + MDMp_se*Wp_se + MDMp_ne*Wp_ne;
            FCD_S := FCDa_nw*Wp_nw + FCDa_sw*Wp_sw + FCDa_se*Wp_se + FCDa_ne*Wp_ne;
        ELSE
            AAR_S :=null;
            LR_AAR_S :=null;
            ASR_S :=null;
            LR_ASR_S := null;
            AT0_S :=null;
            FCD_S :=null;
            MDMWHT_S :=null;
            MDMPOT_S :=null;
        end if;
        IF AT0_S is null THEN
            ATS_S := null;
        ELSE
            ATS_S := 611 + (1.11*AT0_S) + (0.042*pt.EAST50/100);
        END IF;
        IF FCD_S > 365 THEN
            FCD_S := 365;
        END IF;
        IF MDMWHT_S < 0 THEN
            MDMWHT_S := 0;
        END IF;
        IF MDMPOT_S < 0 THEN
            MDMPOT_S := 0;
        END IF;
        INSERT INTO "ALC"."ALC_CLIMATE_50M_&1&2&3" VALUES
(pt.POINTID,pt.EAST50,pt.NORTH50,AAR_S,LR_AAR_S,ASR_S,LR_ASR_S,AT0_S,ATS_S,MDMWHT_S,MDMPOT_S,FCD_S);
        COMMIT;
    END LOOP;
END;
```

5.4 Creating ALC grades for climate scenarios

```
## cr_ALC_GRADE_SERIES_CLIMATE

##

### &1 = 50km Sheet XXYY where XX = 100km square i.e. SH and YY = NE,NW,SE,SW

### &2 = year and scenario [2020L,2020M,2020H,2050L,2050M,2050H,2080L,2080M,2080H] + UKCP - 09 or 18


### i.e. @cr_ALC_GRADE_SERIES_CLIMATE SHNW 2020L18


DROP TABLE ALC_SERIES_50M_&1&2;

CREATE TABLE ALC_SERIES_50M_&1&2 NOLOGGING AS

select a.pointid, a.east50, a.north50,

substr('  ',1,2) ALC_GRADE,

substr('  ',1,2) PREDICTIVE,

substr(metoffice.ln$ALCGRADE(a.AAR, A.AT0),1,2) ALC_CLIMATE,

ALC.LN$alcwetness(d.wc_code, c.texture, a.fcd, c.organic) ALC_WETNESS,

METOFFICE.LN$ALCDROUGHT(DECODE(b.ROCKY_PHASE,1,c.APWHT*20/decode(c.drock,999,150,0,20,c.drock),c.APWHT),
a.MDMWHT, DECODE(b.ROCKY_PHASE,1,c.APPOT*20/decode(c.drock,999,150,0,20,c.drock),c.APPOT), a.MDMPOT)
ALC_DROUGHT,

d.wc_code WC,

round(a.fcd,0) FCD

FROM ALC.ALC_CLIMATE_50M_&1&2 a, ALC.ALC_CLIMATE_50M_&1 b, ALC.WELSH_SERIES_PROPERTIES c,
ALC.WELSH_SERIES_FCZONE d

WHERE a.pointid=b.pointid and b.series=c.series AND b.series=d.series and
d.fc_code=landis.ln$fc_zone(a.fcd);

alter table ALC.ALC_SERIES_50M_&1&2 NOLOGGING;

alter table ALC.ALC_SERIES_50M_&1&2 add constraint PK_ALC_SERIES_&1&2 primary key("POINTID");

update ALC.ALC_SERIES_50M_&1&2 a set alc_grade = (select
ln$ALClimit(a.ALC_CLIMATE,a.ALC_WETNESS,a.ALC_DROUGHT,b.ALC_SLOPE, b.ALC_DEPTH, b.ALC_STONES, b.ALC_OTHER)
from ALC.ALC_SERIES_50M_&1 b where a.pointid=b.pointid);

update ALC.ALC_SERIES_50M_&1&2 a set predictive = (select
ln$ALCpredictive(a.ALC_CLIMATE,a.ALC_WETNESS,a.ALC_DROUGHT,b.ALC_SLOPE, b.ALC_DEPTH, b.ALC_STONES,
b.ALC_OTHER,b.ROCK,b.EXPOSURE,b.NONAGRIC) from ALC.ALC_SERIES_50M_&1 b where a.pointid=b.pointid);

alter table ALC.ALC_SERIES_50M_&1&2 LOGGING;

commit;

/
```