

APPENDIX A: SUPPORTING DATASETS

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A.1 Hazard: Coastal, fluvial, surface water and groundwater

The input data sets relating to present and, where available, future coastal, fluvial, surface water and groundwater hazards are summarised in Table A1-1 together with the supporting ancillary data in Table A1-2.

Table A1-1 Hazard data: All sources of flooding

Sources	England and Wales	Scotland	Northern Ireland
Fluvial	<p><i>Including the performance of defences:</i></p> <p>Environment Agency Product: Risk of Flooding from Rivers and the Sea - Detailed Dec 2014</p> <p><i>Excluding defences</i></p> <p>England Flood Zones polygons for 0.1% (FZ 3), 1% (FZ 2)</p>	<p>SEPA national fluvial flood map on a variable 5m/10m/20m resolution grid.</p> <p>6 annual exceedance probabilities up to the 0.1% probability. year return period plus 3.3% and 0.5% probabilities with climate change.</p> <p>Assumes defences – where present – perform perfectly up to their standard of protection. The 0.1% AEP map is undefended.</p>	<p>Rivers Agency composite flood map; gives extents for 0.1%, 1% and 10% everywhere, more return periods in detailed modelling (higher risk) areas</p> <p>Undefended flood map, extent for 1% probability only</p> <p>1% extent for climate change</p>
Coastal		<p>SEPA national coastal flood map, extents for 0.1%, 0.5% and 10% from GIS/topography method.</p>	<p>Rivers Agency national flood map, extents for 0.1%, 0.5% and 10%</p> <p>0.5% extent for climate change</p>
Surface Water	<p>uFMfSW (updated Flood Map for Surface Water), 2m resolution grid, including building footprints, for 0.1%, 1% and 3.3% probabilities</p>	<p>SEPA national surface water flood map, extents for 0.5% and 10% probabilities from direct rainfall and local sewer model outputs</p>	<p>Rivers Agency composite flood map; extents for 0.1%, 0.5% and 3.3%</p> <p>Some extents for climate change available</p>
Groundwater	<p>BGS groundwater susceptibility map (MacDonald et al, 2008)</p>		<p>A simplified analysis completed by BGS for this project</p>

Table A1-2 Ancillary data

	England and Wales	Scotland	Northern Ireland
River and Coastal Assets	<p>From latest NaFRA analysis or AIMS:</p> <p><i>Spatial data</i></p> <ul style="list-style-type: none"> • Location • Condition Grade • Standard of Protection • RASP Type <p>Coastal extreme water levels from SC060064/TR2 <i>Coastal flood boundary conditions for UK mainland and islands</i></p> <p>Coastal defence toe level (extracted from a pre release version of the CDL)</p> <p>Note: the Continuous Defence Line (CDL) and other data from the State of the Nation 2015 update was not available at time of developing the FFE. The only exception is coastal toe levels provided in July 2015.</p>	<p>From the asset register / database</p> <ul style="list-style-type: none"> • Location • Standard of Protection • Areas benefiting from defences (or equivalent) <p>The Scottish Government suggests that some of these data are unlikely to be up to date but it is assumed to be so here.</p>	<p>From the asset register / database</p> <p><i>Spatial data</i></p> <ul style="list-style-type: none"> • Location • Condition Grade • Standard of Protection • Areas benefiting from defences (or equivalent)
Validation datasets	<p>Hourly rainfall figures for 2007 used in validation of the FFE results (received from Chris Kilsby 25/9/14)</p> <p>FEH DDF parameters for representative locations – to be used in validation (provided within the team)</p>	None requested	Counts of flooded properties and estimated return period for 2012 Belfast Floods
General information on flood areas	<p>Detailed River Network (received)</p> <p>Coastline</p> <p>Flood Areas</p> <p>Flood Risk Management Systems</p>	<p>Detailed River Network</p> <p>Coastline</p>	<p>Detailed River Network</p> <p>Coastline</p>
Postcodes	OS CodePoint data (open data set downloaded 10/10/14)		Not needed as all NI data is spatial – therefore postcodes not needed.
OS data	<p>Mastermap (received 27/10/14)</p> <p>Road and Railway network (Strategic, Meridian or District to be downloaded direct from OS)</p> <p>(open data set downloaded 4/12/14)</p>		<p>OSNI Large Scale Vector data - buildings</p> <p>OSNI Pointer (i.e. address layer information to differentiate residential and non-residential)</p> <p>OSNI roads and railways</p>

A.2 Property: Residential and non-residential

The datasets used to support the property based risk metrics are listed in Table A2-1

Table A2-1 Property related metrics and data sources.

Risk Metric		Data sources			
Type	Metrics	England	Wales	Scotland	Northern Ireland
Property residential	Counts per probability band; annual average	National Receptor Dataset (NRD, 29/10/14)		Receptor data as used in NFRA and Flood Risk Management Strategies based on Scottish Property Dataset (SPD) approx. 29/01/2015	OSNI Buildings (Dec 2014)
	Deprived areas: counts per probability band; annual average	The English Index of Multiple Deprivation, 2010 The Welsh Index of Multiple Deprivation 2011		The Scottish Index of Multiple Deprivation 2012	Northern Ireland Multiple Deprivation Measure 2010
Property non-residential	Counts per probability bands; annual average	National Receptor Dataset (NRD, October 2014)		Receptor data as used in NFRA and Flood Risk Management Strategies based on Scottish Property Dataset (SPD) approx. 29/01/2015	OSNI Buildings (Dec 2014)
Economic damages residential	Expected Annual Damages (EAD)	WAAD (Weighted Annual Average Damages) tables per property from MCM 2010			
	Expected Annual Damages (EAD) – deprived areas	WAAD (Weighted Annual Average Damages) tables per property from MCM 2010			
	Risk profile	Average damage per inundation event calculated from WAAD			
Economic damages non-residential	Expected Annual Damages (EAD)	Floor areas from footprint in OS Mastermap/OSNI Large Scale Vector WAAD tables per unit floor area from MCM 2010			
	Risk profile	Average damage per inundation event calculated from WAAD			
Economic damages - total	Direct and indirect damages	Total residential and non-residential damages, with multiplier for indirect damages of 1.7 based on LTIS outputs			

A.3 People: Number, deprivation and household occupancy

The datasets used to support the people based risk metrics are listed in Table A3-1

Table A3-1 People related metrics and data sources

Metric	Data sources			
	England	Wales	Scotland	Northern Ireland
Annual average people affected	2011 census table QS406 household size			2011 census table KS403 household size
Total counts in probability bands				
Annual average people affected in deprived areas	The English Index of Multiple Deprivation, 2010	The Welsh Index of Multiple Deprivation 2011	The Scottish Index of Multiple Deprivation 2012	Northern Ireland Multiple Deprivation Measure 2010
Total counts in probability bands – deprived areas				

A.4 Natural capital

The sources of the data used to determine the location of Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Ramsar sites are summarised in the below.

Table A4-1 Natural environment data

Wide UK	Description
Special Protection Areas (SPAs)	Downloaded from Joint Nature Conservation Council (JNCC) - 17/11/2014
Special Areas of Conservation (SACs)	Downloaded from Joint Nature Conservation Council (JNCC) - 17/11/2014
Ramsar	Downloaded from Joint Nature Conservation Council (JNCC) - 02/01/2015

A.5 Agriculture

The sources of data used to determine the location of the Best and Most Versatile Land (BMV) and Not-Best and Most Versatile land are as follows:

- **England** – the Strategic Land Cover Map developed by Natural England, where ‘best and most versatile’ agricultural land taken as ALC Grades 1, 2 and 3a.
- **Wales** - DEFRA’s Agricultural Land Classification (ALC), 1988 is used, with Grades 1-3 used to identified BMV land (Grade 3a is also included in BMV description but this is not included in the ALC, hence Grades 1-3 will be used)
- **Scotland** - the Macaulay Land Use Research Institute’s Land Capability Classification for Agriculture is used (based upon the ALC 1981 and LCM2007), with Classes 1-3 identified as BMV land.
- **Northern Ireland** – the Agri-Food and Biosciences Institute agricultural land classification map is used with classes 2 and 3A identified as BMV (there is no class 1 land in Northern Ireland).

A.6 Important infrastructure systems

The data sources used to support the infrastructure risk metrics are listed in the following table.

Table A6-1 Infrastructure risk metrics and data sources

Type	Infrastructure	England	Wales	Scotland	Northern Ireland
Water infrastructure	Wastewater and cleanwater treatment sites	Clean water treatment works (OS MasterMap)	NRD (England and Wales)	Scottish Property Data Set (SPDS) Note: SEPA have not that this dataset is known to be incomplete/not suitable to be used to identify individual infrastructure assets.	NIW Corporate Asset Register (CAR)- List of Facilities (15/12/2014) – known to be incomplete
		Wastewater treatment works (estimated from Environment Agency licenced discharge consent dataset by ASC, 2014)			
Transport infrastructure	Railway station sites	From OS Vectormap data			Acquired 13/11/14 from spatialNI geoportal – but trams etc and excludes usage
	Major roads	From National Receptor Database (NRD), with 'major' defined as motorway or trunk road			Acquired 13/11/14 from spatialNI geoportal
	Railway lines	From Network Rail data			Acquired 13/11/14 from spatialNI geoportal
Energy infrastructure	Power stations and transmission substations	As geo-coded for CCRA1		Scottish Property Data Set (SPDS) Note: SEPA have not that this dataset is known to be incomplete/not suitable to be used to identify individual infrastructure assets.	From Northern Ireland Electricity dataset
		Distribution substations: from Energy Network Association (minimum 5000 customers) (received 1/12/14 – covers all GB)			

Table A6-1 Infrastructure risk metrics and data sources (continued)

Type	Infrastructure	England	Wales	Scotland	Northern Ireland
Social Infra.	Care Homes	Care Quality Commission: Registered care homes (November 2013) (downloaded 28/10/14 – England only)	NRD (England and Wales)	Scottish Property Data Set (SPDS) Note: SEPA have not that this dataset is known to be incomplete/not suitable to be used to identify individual care homes.	Acquired 13/11/14 from spatialNI geoportal
	GP surgeries	From Health England	Scottish Property Data Set (SPDS)	Downloaded 17/11/14 - NINIS	GP surgeries
	Schools	Dfe: 2013 Performance Statistics Spine Data (School location), 2013 School census (number of pupils) (downloaded 29/9/14 – England Only)	NRD (England and Wales)	Scottish Property Data Set (SPDS) Note: SEPA have not that this dataset is known to be incomplete/not suitable to be used to identify individual schools.	Acquired 13/11/14 from spatialNI geoportal
Emergency Services	Police, ambulance, fire stations	OSMM: Emergency Services locations (October 2013)			Fire stations - spatialNI geoportal Acquired 13/11/14 Ambulance, Police - spatialNI geoportal Acquired 13/11/14
	Hospitals	Health and Social Care Information Centre (2012/13) – from ASC 2014		Scottish Property Data Set (SPDS)	Downloaded 17/11/14 - NINIS
Waste	Landfill sites (authorised and currently regulated)	From Environment Agency datashare 'Permitted Waste Sites - Authorised Landfill Site Boundaries'		From the Repomaster_SV_Landfill_Sites_Operational dataset provided by SEPA. The layer contains all SEPA licences granted by SEPA and operational in 2011 when the dataset was created.	From DOE NI EA Pollution prevention control permits (current as October_2014)

A.7 Population change data sources

Population projections have been downloaded from the respective government websites:

- England: <http://ons.gov.uk/ons/taxonomy/index.html?nscl=Sub-national+Population+Projections>
- Wales: <https://statswales.wales.gov.uk/Catalogue/Population-and-Migration/Population>
- Northern Ireland: <http://www.nisra.gov.uk/demography/default.asp47.htm>
- Scotland: <http://gro-scotland.gov.uk/statistics/theme/population/projections/index.html>

These data have then been extrapolated by HR Wallingford for use across the CCRA2017 (see Appendix B).

A.8 Climate change data sources

The sources of data used in determining future climates are set out in Table A8-1. The method of interpolation to the CCRA 2017 scenarios are set out in Appendix C.

Table A8-1 Sources of climate change data

Climate change indicator	England and Wales	Scotland	Northern Ireland
Coastal floods Relative sea level rise	UKCP09 and Environment Agency Report (Environment Agency, 2011)	UKCP09 and CREW (2014)	UKCP09
Fluvial floods Changes in peak river flows	Environment Agency Report (Environment Agency, 2011) Work Package D (H++)	SEPA (2014) that translates the CEH (2011) into a guidance/overview document for FRM stakeholders. Work Package D (H++) of the CCRA 2017	RPS(2009) Work Package D (H++)
Surface water floods Changes in intensity of short duration rainfall	Taken from UKWIR research into sub-daily rainfall and effects of climate change (UKWIR, 2015a&b)		
Groundwater floods Changes in groundwater flooding	BGS – Groundwater Susceptibility Model		

Notes:

UKCP09 downloaded from <http://ukclimateprojections.metoffice.gov.uk/21708> accessed 2015

A.9 References

CEH (2011) **An assessment of the vulnerability of Scotland’s river catchments and coasts to the impacts of climate change.** Work Package 1 Report.

CREW (2014). **Coastal Flooding in Scotland. A guidance document for coastal practitioners.**

http://www.crew.ac.uk/sites/www.crew.ac.uk/files/publications/coastal_flooding_in_scotland.pdf

Macdonald, D.M.J.; Bloomfield, J.P.; Hughes, A.G.; MacDonald, A.M.; Adams, B.; McKenzie, A.A.. (2008). **Improving the understanding of the risk from groundwater flooding in the UK.** In: FLOODrisk 2008, European Conference on Flood Risk Management, Oxford, UK, 30 Sept - 2 Oct 2008. The Netherlands, CRC Press.

RPS (2009). **Undefended Flood Plain Mapping With Climate Change Methodology** Work undertaken by RPS for the Rivers Agency.

SEPA (2014). **Flood Risk Management (Scotland) Act Workstream 11 – Flood Risk & Climate Change. Overview of CEH Report.** SEPA (In press)

UKWIR (2015a) **Rainfall Intensity for Sewer Design Final Report.** UKWIR Report 15/CL/10/16-1

UKWIR (2015b) **Rainfall Intensity for Sewer Design Guidance for Water Companies.** UKWIR Report 15/CL/10/16-2