

Indicator name			Version
CRS34 Number of registrations for flood warnings/alerts			July 2018
Indicator type:	Risk/opportunity	Impact	Action
			X
SCCAP Theme	SCCAP Objective	CCRA risk/opportunity	
Climate Ready Society	<p>S2: Increase the awareness of the impacts of climate change to enable people to adapt to future extreme weather events</p> <p>S3: Support our health service and emergency responders to enable them to respond effectively to the increased pressures associated with a changing climate</p>	<p>FL1: Number of people at significant risk of flooding</p> <p>FL2: Vulnerable people at significant risk of flooding</p>	

At a glance

- Registered users of the flood alert/warning service provided by SEPA and the Met Office are well above the targets set by SEPA for public access in 2011.
- The number of registered users has steadily increased along with the utilisation of other SEPA flood warning information sources.
- Analysis shows that 82% of recipients of Floodline messages report taking preparatory action as a result.
- SEPA continue to refine service provision in line with the Flood Warning Strategy developed in line with their public duties as a Category 1 Responder.

Latest Figure	Trend
Total number of individual Floodline registrations: 27,224 (June 2018) Registrations for flood warnings: 17,929 Registrations for flood alert ⁵ : 16,325 ¹	Increasing

¹ Some customers sign up to receive both alerts *and* flood warnings, or to receive warnings from multiple areas

Why is this indicator important?

Since the early 1960s, average annual rainfall has increased by 27% across Scotland, varying considerably between regions and seasons. Winter rainfall has increased most, especially in the North (51%) and West (45%) compared with the East (24%). A trend of increasing heavy rainfall in winter is also apparent; in particular, North and West Scotland have seen an increase of more than eight days. The patterns of change are broadly similar to those for total precipitation with a strong east-west gradient in winter months. Most of the west has seen an increase of more than five days of heavy rainfall in winter. Changes in summer months are small but some northern areas have become drier. For the year as a whole, most western parts of Scotland have become wetter while there has been much less of an increase in eastern parts (SNIFFER, 2014).

The awareness raising envisaged by Objective 2 of the Scottish Climate Change Adaptation Programme (SCCAP) is intended to increase resilience and reduce the physical, economic and psychological impacts from the projected increased flood risks. The Scottish Environment Protection Agency (SEPA) and the Met Office collate hydrological data from 250 rainfall, river and coastal monitoring stations used to predict the likelihood and timing of flooding events (Scottish Flood Forecasting Service). This information provides Category 1 and Category 2 Responders (UK Government, 2004) with better indications of flood risk.

SEPA have identified the locations most at risk from flooding and developed enhanced coastal and river forecasting capabilities based on a network of monitoring stations. There are 269 of these Flood Warning Areas which can provide advance notice of flooding in these specific risk areas via the warning service: *Floodline*² (SEPA, 2015). As well as the more targeted flood warnings available to people in those localities, more general Flood Alerts are available which provide flood messages for a larger geographical area (19 in total).

The effectiveness of this service depends on *uptake*, i.e. the number of people signing up to receive flood warnings and alerts by phone. It is particularly important that the uptake is high in those areas at significant risk of flooding. However, it should also be noted that, during flood events, far greater numbers access SEPA's flood warning services and products digitally, via both SEPA's own website and also partner information channels (e.g. Met Office, local authorities and the BBC). Therefore, consideration of Floodline registration figures alone does not fully reflect the number of people who utilise SEPA's flood information services and who take preparatory action as a result.

Related indicators:

BB1 Property at risk of flooding (residential)

BB3 Property at risk of flooding (non-residential)

What is happening now?

As of June 2018, there were 27,224 individual users of Floodline services³. This represents an increase of nearly 4,000 users since December 2015. The number of registrations for flood warnings in June

² Floodline: <http://www.sepa.org.uk/environment/water/flooding/floodline/>

³ Data provided directly from SEPA.

2018 was 17,929, and the number of registrations for more general flood alerts was 16,325. Whilst the total number of sign-ups to the service stands at 34,254 it should be noted that some users sign up for both warnings and alerts and a small number of users also sign up for warnings from multiple areas.

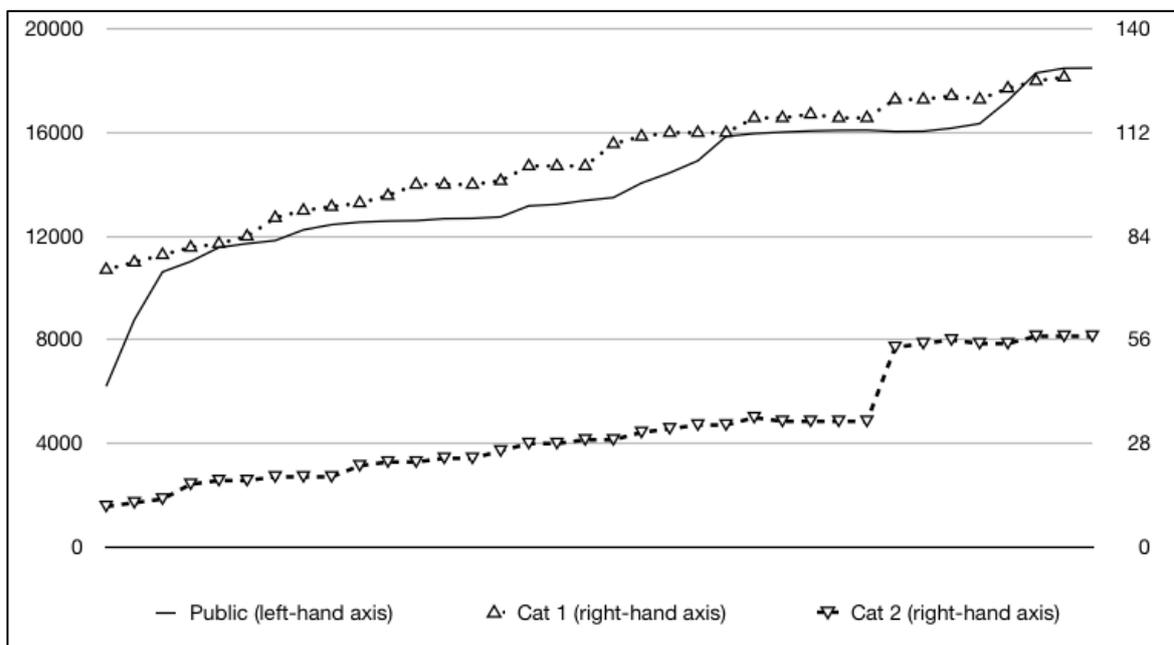
A report by CREW⁴ (Geddes *et al*, 2017) investigating the effectiveness of the Floodline service, found that 82% of those who received messages from the service reported taking preparation action in response (e.g. charging mobile phones, checking transport/ access issues, moving documents, vehicles, and/or livestock).

The likelihood of taking action in response to receiving Floodline messages was also found to be linked to previous experience of flood events, educational level and satisfaction with the Floodline service (Geddes *et al*, 2017).

What has happened in the past?

Floodline was introduced in 2001 to provide a national passive flood warning information system. In 2006, SEPA introduced the Flood Early Warning System (FEWS) and new flood warning schemes for the Clyde, Kelvin and Irvine catchments.

In 2011, the introduction of the *Floodline* direct warning service in Scotland provided an active dissemination system for the public. Category 1 and Category 2 Responders also have access and are identified separately.⁵ Uptake rose by 85% in the first four years to December 2015 (Figure 1).



source: SEPA personal communication

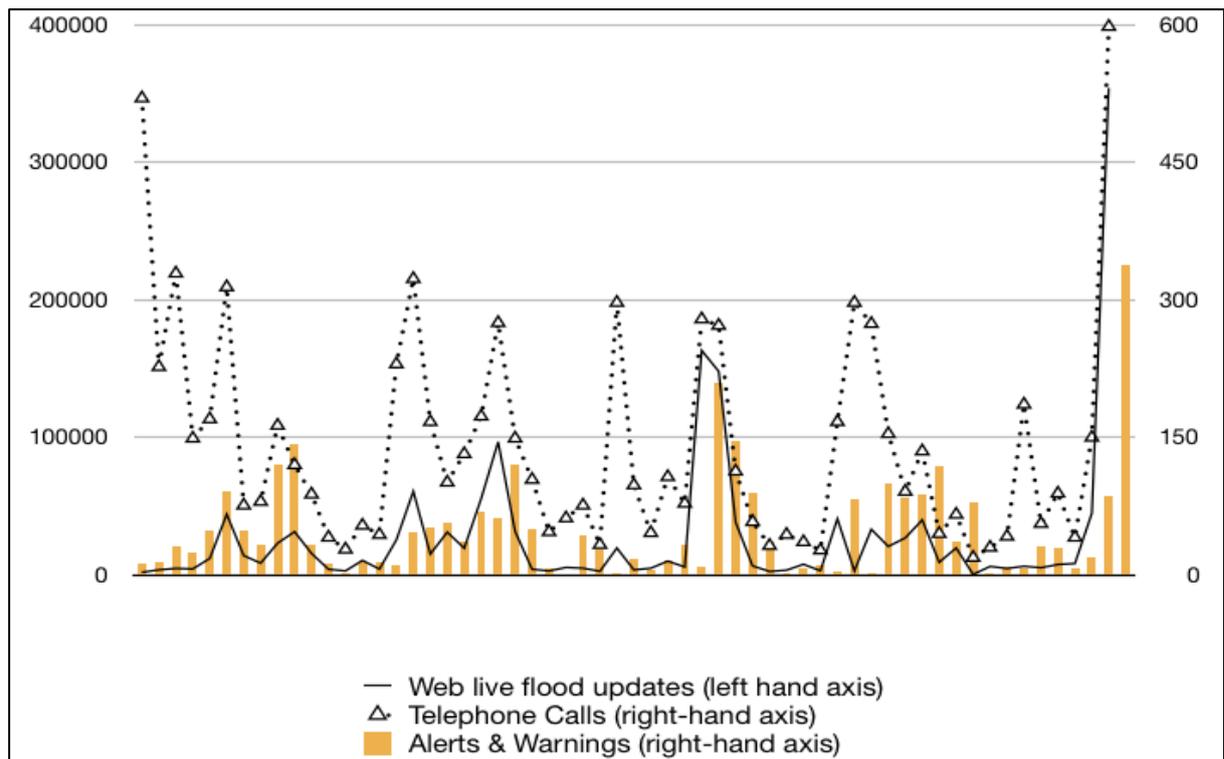
Figure 1 Floodline uptake March 2011 – December 2015

⁴ Scotland’s Centre of Expertise for Waters

⁵ Category 1 and Category 2 Responders also have access to the Scottish Flood Forecasting Service run by SEPA and the Met Office: <http://www.metoffice.gov.uk/publicsector/devolved/scotland-flood-forecasting-service>

Floodline can also be accessed on-line and via the phone (Figure 2). During the period March 2011-December 2015, in response to over 8,902 alerts (3,773) and warnings (5,125 plus 4 severe flood warnings) (Figure 3), there were a total of 1,587,417 web page hits and 18,475 phone calls handled by either the Interactive Voice Recording (IVR) system (10,255) or the Floodline service (8,202).

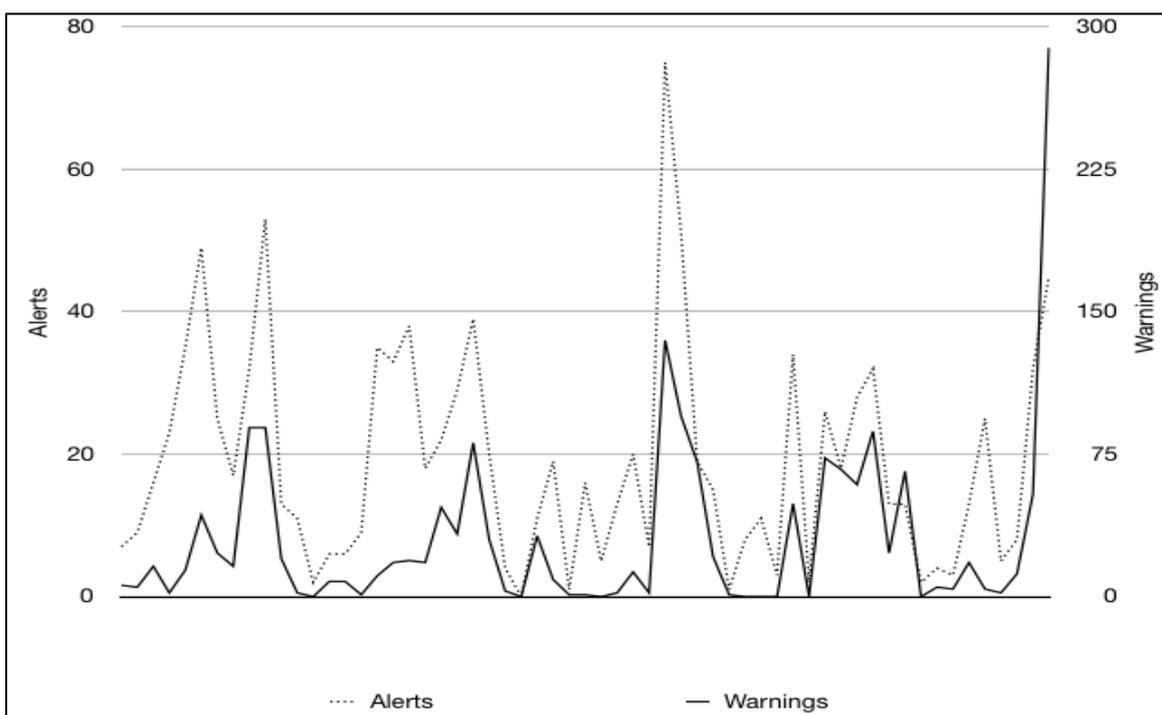
During Storm Desmond in December 2015, the Floodline website received over 100,000 user sessions (250,000 page views) exceeding the previous record of 95,000 in August 2014. 550 new people registered for the service. The water level web page alone was viewed over 100,000 times and 64 notifications of flooding were notified through 'Report a Flood', a feature added recently⁶. At the height of the event 15 Alerts and 75 Warnings had been issued (including 2 Severe, the first time since the launch of the system that this level of risk had been identified). Over 70,000 messages were sent via a variety of channels (email, fax, pager, SMS and voice messages).



source: SEPA personal communication

Figure 2 Floodline Access March 2011-December 2015

⁶ Report a Flood: <http://www.floodlinescotland.org.uk/report-a-flood>



source: SEPA personal communication

Figure 3 Alerts and Warnings issued March 2011 – December 2015

What is projected to happen in the future?

In February 2017 SEPA published their plans for the delivery of the flood warning service for the next five years (SEPA, 2017). The Framework is structured around three main aims:

Aim 1- Maintenance of existing and delivery of new flood warning schemes

As part of this aim, fourteen new flood warning schemes have been identified for operational delivery by 2021 (Figure 4)

Aim 2- Development and innovation

Building on their partnership with the Met Office, SEPA aim to utilise new data sources to improve forecasting ability and communication of risk and uncertainty. It is intended that new hazard maps will enable more real time flood mapping which can support decision making during flood events

Aim 3- Engagement with partners and customers

In partnership with local authorities and Scottish Water, SEPA aim to increase flood risk awareness campaigns , with priority in areas with new and existing Flood Warning Areas. They also aim to widen their partnerships to include organisations already active at community level.

The Framework also includes key measures for the success of the service e.g:

- Timely delivery of new flood warning schemes
- Annual customer survey and customer feedback analysis

- Analysis of lessons learnt from significant flood events and exercises

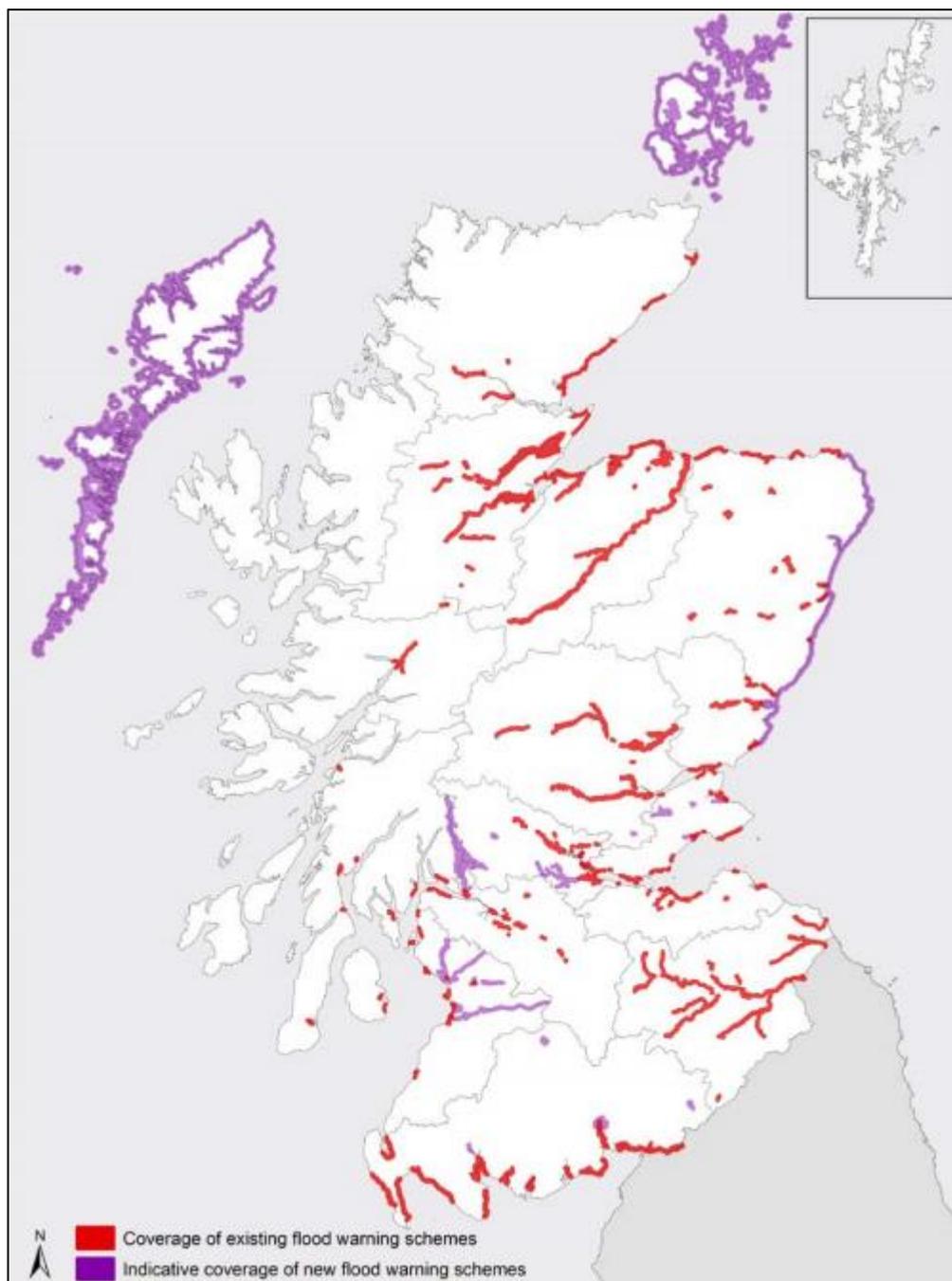


Figure 4 Location of existing and new flood warning schemes (SEPA, 2017)

CREW's report (Geddes *et al*, 2017) on the effectiveness of the Floodline service included a number of recommendations to improve the service in the future, including:

- Provide a more effective information portal which combines information from disparate sources which many users also access in response to warnings and alerts (e.g. flood forecasting, monitoring and local authority feeds);

- Review flood warning message content to improve specificity regarding expected severity and extent;
- Examine the potential to provide more tailored content that is more geographically specific than currently available;
- Continue to develop awareness of the service, but also improve clarity regarding what the service does and does not provide;
- Introduce a 'no warning' message type to provide reassurance to customers in areas not expected to be affected.

Patterns of change

Uptake in Flood Warning Areas is particularly important, and of the registered users in December 2015, 16,673 were located within one of the 269 FWAs located in 15 Flood Alert Areas (FAAs) (Table 1). However, this aggregated data conceals a wide range of uptake across the individual FWAs from 0% - no registrations in Hunters Grove (Argyll & Bute FAA) or Skelmorlie (Ayrshire & Arran FAA), for example - to 663%⁷ in the Shawlands, Langside and Cathcart FWA in the West Central FAA, as a result of changed boundaries⁸.

In December 2015 it was estimated that 66,482 properties were at risk of flooding across all FAAs. The number of registered users shown in Table 1 suggests around 25% (range 17% to 38%) of those properties were signed up for the service. However, the data cannot be disaggregated to individual properties so this is likely to be an over-estimation. Additionally, people following flooding alerts and warnings on social media (Twitter, Facebook, etc.) would not be included in the Floodline registration count. These users are not tracked currently and therefore no data are available.

⁷ Registration levels over 100% can occur as a result of (a) the number of properties within FWAs being adjusted as is the case here or (b) people registering for flood warnings out of interest while not actually owning a property there.

⁸ The Shawlands, Langside and Cathcart FWA in the West Central FAA saw the number of properties within the FWA fall from 5706, of which 797 were registered, to 100 although 663 users are still registered.

Table 1 Registrations per Flood Alert Area, December 2015

Flood Alert Area (FAA)	FWAs	Customers per FAA	Properties at risk per FAA	Percentage registered
Aberdeenshire and Aberdeen City	21	1,565	4,174	37%
Argyll & Bute	10	340	1,945	17%
Ayrshire & Arran	14	634	3,641	17%
Caithness & Sutherland	6	191	775	25%
Central	16	1,075	4,067	26%
Dumfries & Galloway	13	330	1,760	19%
Dundee & Angus	11	540	3,186	17%
Easter Ross & Great Glen	25	1,223	5,985	20%
Edinburgh & Lothians	20	2,552	12,482	20%
Fife	15	458	2,212	21%
Findhorn, Nairn Moray & Speyside	30	1,985	5,175	38%
Orkney				
Scottish Borders	30	1,849	5,676	33%
Shetland				
Wester Ross				
Skye & Lochaber	5	300	1,176	26%
Tayside	29	1,872	7,368	25%
West Central Scotland	24	1,759	6,860	26%
Western Isles				
Total	269	16,673	66,482	25%

Interpretation of indicator trends

Limitations

1. Data Quality issues (Dec 2015)

- a) The number of properties at risk reported through the FWA dataset differs from the dataset used for the baseline appraisal. The *Identified Number of Properties in the FWA* appears to overestimate the numbers of properties at risk from a 1 in 10 year return value but underestimates for the 1 in 50 and 1 in 200 year return values, significantly for the latter.

However, the FWA dataset and the baseline dataset have different purposes and have been created differently. The appraisal dataset is used by SEPA as the basis for the published figures of number of properties at risk, Annual Average Damages etc. The flood warning dataset is used specifically for flood warnings. Warning areas have been created based on historical flooding, detailed modelling where this is available and, originally, the old indicative flood map (IFM). An exercise is being undertaken to update the warning areas to take account of the hazard mapping rather than the IFM. The baseline dataset comes from strategic level modelling and mapping.

- b) Improved mapping techniques and customer feedback can result in boundary changes where the corresponding increase or decrease in the number of properties included in a FWTA may result in anomalies if the number of registered users in those properties is not adjusted to take account of those changes.

- c) People can register for flood warnings in 'areas of interest' without necessarily being resident in those areas leading to an overstatement of the level of uptake for the area in question.
- d) Floodline web statistics for April, July and August 2015 are unreliable due to changes in the HTK pages, the Floodline platform.⁹

References

Geddes, A., Cranston, M., Ambler, A. and Black, A.R. (2017) *Assessing the effectiveness of Scotland's public flood warning service: Summary report CRW2016_12*. Available online at: <http://www.crew.ac.uk/publications>

SEPA (2010) Statement of Intent for Implementing Flood Warning Duties under the Flood Risk Management Scotland Act.

SEPA (2015) *Your Guide to Using the Flood Guidance Statement*, available at: http://www.sepa.org.uk/media/149570/sffs_fgs_user_guide_2015.pdf

SEPA (2017) *Flood Warning Development Framework 2017-2021*. Available online at: <https://www.sepa.org.uk/media/219818/sepa-flood-warning-development-framework-2017-2021.pdf>

SNIFFER (2014) *Scotland's Climate Trends Handbook*, available at: http://www.environment.scotland.gov.uk/climate_trends_handbook/index.html

UK Government (2004) *Civil Contingencies Act*, available at: http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga_20040036_en.pdf

Further information

National Flood Risk Management Strategy datasheets for LPDs, available at: <http://apps.sepa.org.uk/FRMStrategies/index.html>

Acknowledgements

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Elliot Robertson, Flood Risk Management, SEPA

⁹ HTK marketing and software development www.htk.co.uk

Appendix One: Indicator metadata and methodology

Table 1: Indicator metadata

	Metadata
Title of the indicator	CRS34 - number of registrations for flood warnings/alerts
Indicator contact: Organisation or individual/s responsible for the indicator	ClimateXChange
Indicator data source	SEPA personal communications based on Floodline usage statistics
Data link: URL for retrieving the indicator primary indicator data.	<i>Ad hoc data extracts, the most recent being June 2018.</i>

Table 2: Indicator data

	Indicator data
Temporal coverage: Start and end dates, identifying any significant data gaps.	March 2011 – June 2018
Frequency of updates: Planned or potential updates	Quarterly (in principle, other commitments permitting)
Spatial coverage: Maximum area for which data is available	Scotland
Uncertainties: Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	Data quality issues exist – see <i>Limitations</i> . A number of FWAs do not fall within the PVAs and the LPD datasheets only refer to the PVAs. Consequently, there are 214 FWAs identified in the LPD Datasheets while the FWA Registration data contain 269.
Spatial resolution: Scale/unit for which data is collected	Flood Warning Area
Categorical resolution: Potential for disaggregation of data into categories	Flood Alert Area (FAA) Flood Warning Area (FWA) Local Plan District (LPD) should also be possible although the mapping between FWAs and LPDs is not straightforward – see National Flood Risk Assessment Strategies.

Data accessibility: Restrictions on usage, relevant terms & conditions	Application to SEPA
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Table 3 Contributing data sources

Contributing data sources
Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.
Floodline’s Direct Warning Service. Flood Risk Management baseline appraisal

Table 4 Indicator methodology

Indicator methodology
The methodology used to create the indicator data
Simple statistical analyses of flood alert/warning data provided by SEPA.