

## 4.9 River Discharge

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Rivers are impacted by changes in climate, most notably changes in rainfall patterns but also temperature. Conversely, rivers play an important role in regional and local climate. Changes in the climate can cause alterations in the volume of water rivers carry, leading to droughts and floods which can have several social, economic and environmental impacts. Long-term, high-quality observations of river flows are necessary in order to understand the hydrological regime and to plan for water resource and flood management under changing climate conditions.



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**Map 4.2.** Location of river flow monitoring stations in the reference network.

### Measurements

River discharge or flow is measured and data collected by a number of agencies, including the EPA, the Office of Public Works, local authorities and the Electricity Supply Board (ESB). There are over 900 active river-flow meter stations in the country. Capitalising on this network, the EPA is completing the selection of high-quality reference hydrometric gauges that can be used for monitoring and detecting climate change signals. The stations identified include 35 from the Republic, and a further 8 in Northern Ireland from the UK Benchmark Network. The average record length of these stations is 40 years with a minimum of 28 and a maximum of 63 years.

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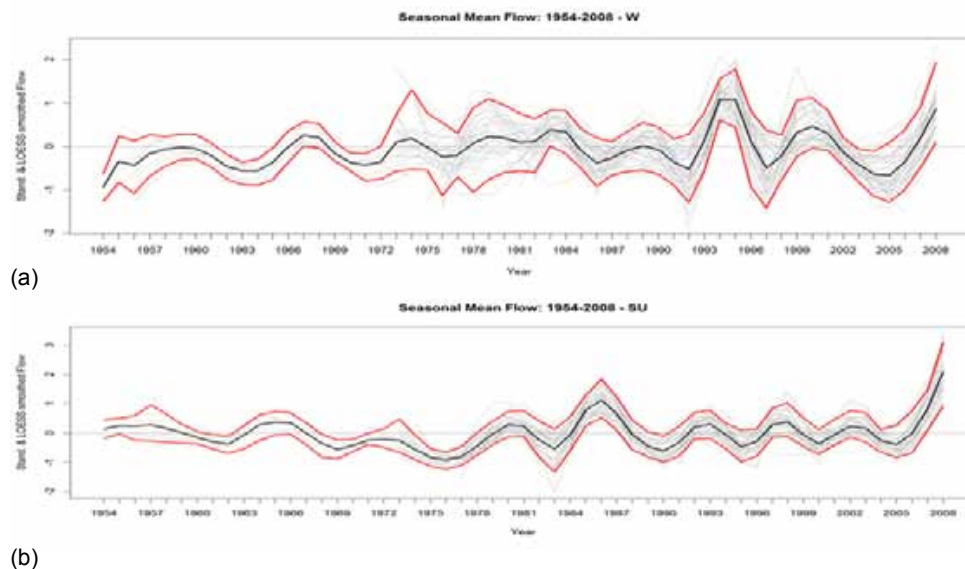
### Time-series and Trends

Recent analysis of flows from the reference network, carried out for the EPA, indicates that trends in mean flows are highly complex and subject to large variability, with trends derived highly dependent on the time period analysed – making it difficult to extract climate change signals. Nonetheless, analysis of longer records of annual mean flows shows a tendency for increasing flows. In [Fig. 4.17](#) the black line represents the standardised seasonal mean flow for winter (a) and summer (b) for the period 1954 to 2008. The zero line represents the average flow for the total period. The light grey lines show the flows at each of the reference stations while the red lines represent the envelope encompassing 95% of the values. This seasonal analysis indicates that summer mean flows are dominated by increasing trends while there is a tendency for increases in winter mean flow for longer record stations. Annual and winter high flows are also dominated by increasing trends.

### Maintaining the Observations

Formal recognition of the reference river-flow monitoring network has been given as part of the recent review of hydrometric stations where climate change monitoring is seen as a primary purpose for the sites identified. It is crucial that the maintenance of river flow stations and the collection and processing of data are ensured through continued investment in the reference sites. This will enable basic information needs for water resource and flood management and environmental reporting in addition to climate change monitoring to be met. A long-term strategy should be developed for the maintenance and upgrade of the reference network as well as regular analyses of the data collected.

'It is crucial that the maintenance of river flow stations and the collection and processing of data is ensured via continued investment in the reference sites.'



**Figure 4.17.** Seasonal mean flows for winter (a) and summer (b) from river flow meters in the reference network (1954–2008).

### Further Information and Data Sources

EPA (Environmental Protection Agency) (2011)  
*Review of the EPA Hydrometric Programme*. EPA,  
Johnstown Castle Estate, Co. Wexford, Ireland.

Murphy, C., Hall, J., Harrigan, S. and Wilby, R.L.  
(2012a) *HydroDetect: the identification and  
assessment of climate change indicators from an  
Irish Reference Network of River Flow stations*.  
Environmental Research Centre Report, EPA,  
Wexford, Ireland. (Submitted)

Murphy, C., Hall, J., Harrigan, S. and Wilby, R.L.  
(2012b) Evaluating long-term trends in mean- and  
high- river flows using a network of reference  
stations in Ireland, *Hydrological Sciences*  
(Submitted).

Nasr, A.E. and Bruen, M. (Under preparation) *Climate  
Change Indicators in the 7-day Sustained Low  
Flow (7SLF) series of Irish Rivers*. Environmental  
Research Centre Report, EPA, Johnstown Castle  
Estate, Co. Wexford, Ireland.

Register of hydrometric stations: [http://www.epa.ie/  
whatwedo/monitoring/water/hydrometrics/network/](http://www.epa.ie/whatwedo/monitoring/water/hydrometrics/network/)

EPA's Hydronet website to access a range of  
hydrometric data: <http://hydronet.epa.ie/>

Information on flows at stations operated by the  
Office of Public Works may be accessed at:  
<http://www.opw.ie/hydro/home.asp>.

Flood hazard maps and reports can be downloaded  
from the Office of Public Works:  
<http://www.floodmaps.ie/>

Retrieval of river and lake levels from satellite  
altimetry: [http://tethys.eaprs.cse.dmu.ac.uk/  
RiverLake/shared/main](http://tethys.eaprs.cse.dmu.ac.uk/RiverLake/shared/main)

The Global Runoff Data Centre, a repository for  
the world's river discharge data and associated  
metadata: <http://www.bafg.de/GRDC/>