



# **Communicating water availability to improve awareness and the implementation of water conservation measures in the Republic of Ireland**

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## Contents

EXECUTIVE SUMMARY .....	2
1. Introduction .....	1
1.1 Drought: Overview .....	1
1.1 Defining and assessing the 2018-2020 drought in Ireland and the UK.....	2
1.1.1 Drought in Ireland .....	2
1.2.2 Drought in the United Kingdom.....	3
1.3 Drought response approaches adopted in Ireland and the UK .....	3
2. Methodologies .....	6
2.1. Review methods.....	6
2.2 Data collection .....	6
2.2.1 Newspaper articles .....	6
2.2.2 Social media data .....	7
2.2.3 Key stakeholder Interviews.....	7
2.3 Data analysis .....	8
3. Analysis and discussion .....	9
3.1 Social media communication during the 2018-2020 drought in Ireland.....	9
3.2 Sentiment analysis of Irish Water Tweets .....	12
3.2.1 Irish Water Facebook Page .....	18
3.3. Newspaper coverage of drought events.....	21
3.3.1 Dominant Irish Newspaper framing.....	23
3.3.2 Organisational type of typological frame .....	25
4. Conclusion and points for policy recommendations .....	27
References .....	30

## EXECUTIVE SUMMARY

Drought is a complex weather occurrence triggered by changes in the hydrological cycle resulting in a significant impact on water availability, water supply, infrastructure, morbidity, mortality and food production. Drought can be classified in different ways, including meteorological, agricultural, hydrological and socio-economical drought. Hydrological drought is related to erratic rainfall, which affects the amount of surface and underground water resources, thereby restricting water supply. Meteorological drought is also connected to a reduction in rainfall over a long period, while agricultural drought is linked to the depletion of soil nutrients, moisture and the overall yield of agricultural lands. Socio-economic drought also involves the effects that inadequate rainfall has on water-related activities like agriculture. It is regarded as the combined effect that meteorological, agricultural and hydrological drought have on human activities.

In 2018 and 2020, drought events in the Republic of Ireland and the United Kingdom significantly affected water resources, and predictions suggest more severe droughts are yet to come.

To ascertain how public communication on water availability and water conservation in the Republic of Ireland can be improved and lessons learnt from the 2018 and 2020 drought, social media (Twitter and Facebook) posts and comments were reviewed. In addition, newspaper articles from 2018 to 2020 on water conservation and drought events were analysed and six key stakeholders made up of journalists, political representatives and a water and communication expert interviewed. Our analysis indicates that Irish newspapers' coverage of drought and water availability increased in 2018 but dropped in 2020 primarily due to competing interest in the COVID-19 pandemic. Despite this, The Irish Times, The Irish Independent and The Irish Examiner were amongst those newspapers that carried the greatest number of stories on drought events on water resources. Uncertainty and risk was also identified as the prevalent frame newspapers used in the

coverage of drought events. Irish Water engaged the public on Twitter more than Facebook despite Facebook being the popular social media platform in the Republic of Ireland. Some organisations involved in the water sector were also found to have maintained a different focus or silence during drought periods, leaving Irish Water as the principal communicator on water conservation and public awareness creation during periods of drought. Although the messages contained in Irish Water's communication on droughts were positive, its engagement with the public on social media was low.

Our findings further reveal an unexpected silence among political parties in relation to water resources during periods of drought. As part of lessons learnt from previous drought events, the Republic of Ireland has created accessible information platforms, but while these platforms help bridge the information and data gap on water resources and droughts' impact on their availability, a comprehensive national drought information management system is lacking. Also, unlike the UK, where different plans and legislative instruments exist to protect the water sector against events like drought, this study found drought inadequately discussed under sectoral plans like biodiversity and climate action, making it difficult to have a strategic plan in dealing with droughts impact on water resources in Ireland.

In its recommendations, this study proposes a consolidated national drought information system to coordinate, monitor, forecast, and help plan and inform the general public, stakeholders, and policymakers and the media on drought events and their impact on water resources. It is recommended that An Fóram Uisce take a proactive lead on national stakeholder engagement on drought and its impact on water resources. An evaluation of Irish Water's communication in relation to water conservation and availability to enhance public engagement towards behavioural changes before, during and after drought events was also proposed.

This study's overall findings can help bridge the knowledge gap in communicating drought and

water conservation measures to the public and provides An Fóram Uisce with empirical findings to strengthen their decision-making regarding water conservation and awareness among stakeholders. Future research should

analyse how the media's (e.g. press releases, social media, reports, television, radio stations and advertisement etc.) coverage of water availability can influence consumer's behaviour regarding water consumption.

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*“...however, the main feature of the weather, along with the sunshine, has been the absence of rain, which has given us drought. The main consequences of this are for our water supplies, for water quality and inland fisheries, for wildlife and fires and for agriculture. Probably the single biggest challenge arising from the drought conditions for the coming weeks, if not months, will be maintaining drinking water supply across the country”.*

*Eoghan Murphy, Deputy Minister for Housing, Planning and Local Government during Dáil Éireann debate, 12 /07/ 2018*

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## 1. Introduction

The impact of climate change is moving the narrative on water availability, even in countries with extensive wetland coverage and high rainfall. According to the World Economic Forum (2020), climate-related risk remains a global threat to humanity. Within the Republic of Ireland, the water resource sector is regarded as one prone to climate risk (Flood et al., 2020). Consequently, communicating the impact of weather effect, such as drought, on water resource management and supply is paramount in complementing water conservation efforts during drought periods, and in influencing behavioural changes, climate policies, adoption, and mitigation measures. However, drought communication in the Republic of Ireland has had issues for many reasons, including the communication approach by various stakeholders, public perception of water resources, and the level of public knowledge and awareness on factors that jointly influence water supply. This study assesses communication on water availability during the 2018 and 2020 droughts in the Republic of Ireland. This is of importance as drought frequency and the impacts on water resources are set to increase in years ahead (Flood et al., 2020).

### 1.1 Drought: Overview

Drought is a complex weather occurrence triggered by changes in the hydrological cycle resulting in significant impacts across sectors including water supply, infrastructure, and food production and impacting on morbidity and mortality (King-Okumu, 2019; Overpeck, 2003). Although starting as a slow-onset hazard, the complexity of drought can concurrently grow to affect towns, regions, countries and even continents at different degrees, time and spatial scale (Murphy & Noone, 2020). Drought can be classified in different ways, including meteorological, agricultural, hydrological and socio-economical drought (King-Okumu, 2019). Meteorological drought is connected to a reduction in rainfall over a long period, while agricultural drought is linked to the depletion of soil nutrients, moisture and the overall yield of agricultural lands (King-Okumu, 2019). Hydrological drought is also related to erratic rainfall, which affects the amount of surface and underground water resources, thereby restricting water supply. Although hydrological drought can delay meteorological and agricultural drought, depending on catchment characteristics, it can last longer even after agricultural and meteorological droughts have ended (Murphy & Noone, 2020). Socio-economic drought also involves the effects that inadequate rainfall has on water-related activities like agriculture. It is regarded as the combined effect that meteorological, agricultural and hydrological drought have on human activities (King-Okumu, 2019).

There is currently no universally accepted methodology in determining when, how and the extent to which a drought's impact may be measured because monitoring the hydrological cycle requires different indicators and indices to establish the extent and nature of a drought (Falzoi et al., 2019; Slette et al., 2019). Nevertheless, different tools and methods are used locally, regionally, and globally to analyse droughts impacts especially on water availability in

Europe and many other parts of the world, notably Brazil, USA, South Africa, and Australia (European Union, 2010; Moglia, Cook, & Tapsuwan, 2018; Muller, 2018). The European Union uses Projection of Economic Impacts of Climate change in Sectors of the European Union based on Bottom-up Analysis (PESETA IV) to provide a quantitative assessment of drought and its economic impact using river streamflow rather than just meteorological indicators (Cammalleri et al., 2020). Long term hydrological droughts are also monitored through the Gravity Recovery, and Climate Experiment (GRACE) managed by the Copernicus Global Drought Observatory (GDO), to detect anomalies in hydrological cycles and total water shortages across temporal and spatial scales (Global Drought Observatory, 2020). The European Drought Observatory also analyses soil moisture, precipitation and fractions of Absorbed Photosynthetically Active Radiation (fAPAR) through Combined Drought Indicator (CDI) to spot potential drought locations, soil moisture levels and locations recovering from previous droughts (European Drought Observatory, 2020). Other countries, development agencies and multi-national institutions like the United Nations (UN), World Meteorological Organization and the United Nations Convention to Combat Desertification (UNCCD) have joined forces to develop and support drought impact assessments among countries (King-Okumu, 2019).

## **1.1 Defining and assessing the 2018-2020 drought in the Republic of Ireland and the United Kingdom**

### **1.1.1 Drought in the Republic of Ireland**

Drought in the Republic of Ireland (ROI) can be classified as a period of 15 days or more for which no one day records 0.2 mm or more of rain (Murphy & Noone, 2020). The country has experienced drought conditions since 1850 which culminates into about 45 droughts in its history of which, twenty-two (22) were short term (less than 10 months), 19 medium-term (10 to 20 months), and 4 long term droughts (over 20 months) (Falzoi et al., 2019). However, the drought of 2018 stands out because of its severity. A preliminary synoptic report from Met Eireann in 2018 showed 15 meteorological stations recording heatwaves from 24<sup>th</sup> June to 4<sup>th</sup> July 2018 (Met Eireann, 2018). Temperatures in places like Mayo, Galway, Clare, Tipperary and Roscommon rose to about 30°C with only 109.5mm of summer rainfall recorded in Cork Airport, thereby making 2018 the driest summer on record in 56 years (Met Eireann, 2018; Quinlan, 2018). According to Quinlan (2018), water levels were so low in the summer of 2018 that one could walk across the channels of River Nore and River Barrow. Although not all river flows fell to their lowest levels, as in the case in the summers of 1970, record low water level records were documented for many rivers (Quinlan, 2018). A water conservation order (hosepipe ban) was subsequently implemented from 6 July 2018 to 31 July 2018 for domestic public water supplies and commercial premises for non-commercial activities due to the prolonged drought conditions and its impact on water supply levels.

In 2020, 31 dry periods were recorded across the ROI from 18<sup>th</sup> March 2020 to 28<sup>th</sup> April 2020 (Met Éireann, 2020). On 22<sup>nd</sup> April 2020, Met Eireann confirmed dry spells conditions across

many parts of the country as a result of a combination of stress on available water resources and limited rainfall (Ryan & Grant, 2020). A water conservation order (hosepipe ban) was implemented from 9<sup>th</sup> June 2020 to 8<sup>th</sup> July 2020 to ensure continuous water supply; simultaneously, COVID-19 protocols demanded regular handwashing under clean flowing water to break transmission and promote hygiene. According to Irish Water, it recorded over 20% national increase in domestic water usage during the COVID-19 pandemic in 2020 while approximately 98 drinking water schemes were also either in drought or at risk of drought before the conservation order was implemented (Irish Water, 2020b, 2020c). Though two periods of heavy rainfall broke these dry spells across the North-Eastern parts of the country, the Agriculture and Food Development Authority (Teagasc) estimated that the effect of the drought may have impacted agricultural outputs with an estimated reduction in grains output from 2.3 million tonnes to about 1.9 million tonnes (Met Éireann, 2020; Teagasc, 2020).

### **1.2.2 Drought in the United Kingdom**

The 2018 and 2020 drought events in the United Kingdom (UK) is assessed in this section because of the shared drought frequency, meteorological and environmental conditions between Ireland the UK (Murphy et al., 2020). The United Kingdom (UK) has been experiencing drought conditions since 1893 (Bryan et al., 2019).

In 2018, the Meteorological Office of the UK reported that 2008-2017 was a period with long spells of warm temperatures with an increase of 0.8°C above the previous average records of 1961-1990 (Met Office, 2018). Warm temperatures increased from to 13 days from 5.3 days previously recorded between 1961-1990, thereby making the summer of 2018, the joint warmest in the history of UK (Met Office, 2018).

In the spring of 2020, dry weather conditions during a period when the COVID 19 pandemic was on the rise resulted in intense pressure on water resources, especially in the North and Western parts of the UK, with reductions in water flow recorded in some catchments such as Cumbria (Government of UK, 2020; Turner, 2020). An estimated 626.2 hours of bright sunshine was recorded in the UK, making Spring 2020 one of the sunniest on record in the UK, overtaking the 555 hours recorded in 1948 (Schultz & Tandon, 2020). During this same period, the country received less than 50% of its average spring rainfall, thereby forcing the government to communicate several drought interventions on how to conserve water, including the installation of water butts to capture rainwater and a stop on using water hose in gardens (Government of UK, 2020; Jones, 2020).

### **1.3 Drought response approaches adopted in the Republic of Ireland and the United Kingdom**

The severity of drought events over time has influenced the adaptation of various actions and strategies towards building resilience to increased frequency of drought. Table 1 provides an overview of some specific actions taken by the Republic of Ireland (ROI) and the United Kingdom (UK) as part of lessons learned from various drought events to mitigate the impact of

drought on water resources. The ROI and the UK have a history of shared drought events and environmental characteristics (Murphy et al., 2020). Studies have also identified an increasing drought trend in the British and Irish Isles (Vicente-Serrano et al., 2020); thus, both countries are found to implement similar drought awareness and communication approaches. Similar measures and actions have also been taken across Europe. For example, the DriDanube project involving 10 European countries (i.e. Austria, Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Montenegro, Romania, Serbia, Slovakia, Slovenia), provides insights into the development of drought through its Drought Watch platform. There is also a public engagement and delivery of early awareness of drought and water-related learning curriculums to schools as part of the DriDanube (Gregor et al., 2019). Bulgaria, the Czech Republic, Hungary, Lithuania, Moldova, Poland, Romania, Slovakia, Slovenia and Ukraine have also developed an Integrated Drought Management Programme for Central and Eastern Europe (IDMP CEE) to raise public awareness and understanding of drought and to encourage public participation in reducing drought risk (Melvyn, 2019).

Table 1: Approaches adopted to mitigate droughts impact on water resources in Ireland and UK

The Republic of Ireland	United Kingdom
<ul style="list-style-type: none"> <li>• Irish Water’s National Water Resources Plan (NWRP) identifies and assesses water resources and droughts impacts on their availability (Irish Water, 2020a).</li> <li>• National hydrometric bulletin developed by EPA promotes access to environmental information<sup>1</sup>.</li> <li>• <i>EPA maps</i><sup>2</sup> managed by the EPA provide information on hydrogeological status, risk and the status of all water bodies.</li> <li>• The Office of Public Works (OPW) webpage offers information on development works and upgrades along with the latest information on water levels from across several gauges in the country<sup>3</sup>.</li> <li>• <i>Catchments.ie</i><sup>4</sup> provides information on all waterbodies in the Republic of Ireland and encourages people to value their water bodies and the environment through story sharing and profiling of environmentally</li> </ul>	<ul style="list-style-type: none"> <li>• A number of environmental laws and legislation that helps in monitoring, reporting and implementing actions to mitigate droughts impact on people, business, the environment and water resources (e.g. National Drought Plan, 2012, Flood and Water Management Act, 2010) (Environment Agency, 2012; Environmental Protection Agency, 2017).</li> <li>• Farmers encouraged to form water abstractor groups to enhance relationships with the Environmental Agency and promote sustainable farming and water management (Environmental Protection Agency, 2017; Melvyn, 2019).</li> <li>• Environmental Information Platform<sup>5</sup> managed by the UK Centre for Ecology &amp; Hydrology (UKCEH), provides information on drought in the UK by allowing a user to explore over 50 years of drought statistics, rainfall patterns and water resources.</li> </ul>

<sup>1</sup>National Hydrometric Bulletins <https://www.epa.ie/water/wm/hydrometrics/bulletins/>

<sup>2</sup> EPA Maps <https://gis.epa.ie/EPAMaps/Water>

<sup>3</sup> Public Works Office <https://waterlevel.ie/>

<sup>4</sup>Catchment.IE <https://www.catchments.ie/>

<sup>5</sup>Environmental Information Platform <https://eip.ceh.ac.uk/>

<p>related programmes and projects across catchments.</p> <ul style="list-style-type: none"> <li>• Public campaigns and community awareness on water quality improvement and biodiversity by the EPA catchment Unit (EPA Catchments Unit, 2020).</li> <li>• Irish Research Council Coalesce funding stream supporting research to understand drought pattern and conditions in Ireland. Irish Water also commissioned a research in 2018 with the Irish Climate Analysis and Research Units (ICARUS) under the Climate Sensitive Catchments Project to understand catchment characteristics (Irish Water, 2020a).</li> <li>• The Catchment Unit of the EPA during the COVID-19 pandemic (April to July 2020) delivered a series of online training and communications to support communities to undertake activities to improve water quality.</li> </ul>	<ul style="list-style-type: none"> <li>• Information on future hydrological conditions across the UK provided through a hydrological outlook webpage managed by the UKCEH<sup>6</sup>.</li> <li>• £12 million committed towards a five year (2013–2018) interdisciplinary research project by the Natural Environment Research Council of UK on drought and water scarcity (UKRI, 2018). <i>About drought</i><sup>7</sup> is a dedicated website developed from the research funding to provide information on drought and water scarcity in the UK.</li> <li>• Greater emphasis on drought communication, community engagement, awareness creation and campaigning on the adaptation of conservation measures at home and business (Lange, Bendall, &amp; Williams, 2019; Ofwat, 2018).</li> </ul>
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<sup>6</sup>Hydrological Outlook <http://www.hydotuk.net/>

<sup>7</sup>About Drought <https://aboutdrought.info/>

## 2. Methodologies

### 2.1. Review methods

The study used a mix method approach to explore the progress and challenges in communicating water availability in the Republic of Ireland (ROI) by reviewing the social media posts ( i.e. Twitter and Facebook) of Irish Water and collating newspaper articles, comments from consumers and key stakeholder interviews. The analysis of social media posts and news articles aimed to identify trends, frames, and communication styles, especially during periods of extreme weather conditions in the country (Culloty et al., 2019; Wagner & Payne, 2017). The communication of some selected institutions that have a role in water and/or the overall environmental sector were also reviewed (Table 2).

### 2.2 Data collection

#### 2.2.1 Newspaper articles

The search term “climate change” AND “water resources” OR “drought” OR “Water Conservation” was used to collect relevant newspaper publications from January 01, 2018, to December 31, 2020, using the LexisNexis database. Over nine thousand articles relating to Ireland were found in the database, but the search keys narrowed them down to 268 to fit the study’s search terms (Figure 1).

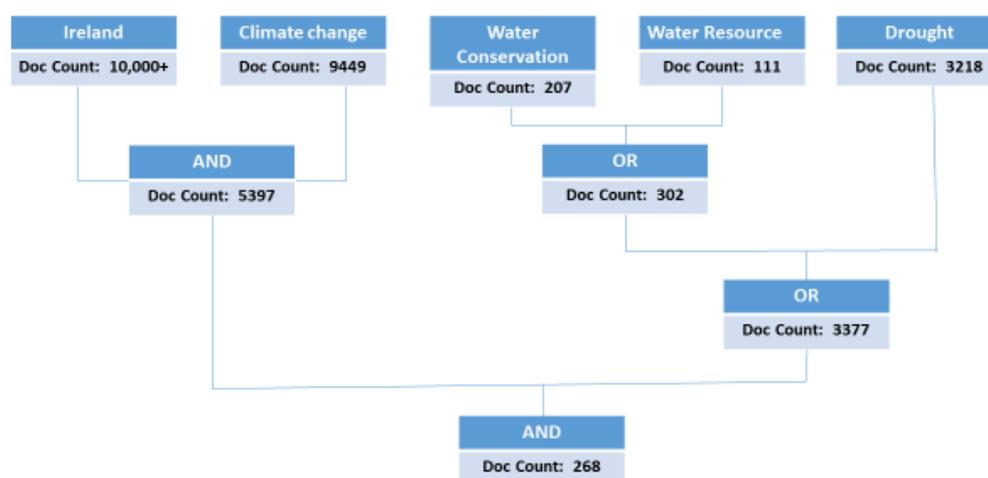


Figure 1: Newspaper search results using LexisNexis

The content of all 268 articles was analysed and filtered accordingly. Ninety-six articles were filtered out as they were out of scope either geographically or in terms of content, in some cases despite the headline suggesting relevancy. Some articles were filtered out because they had less than 100 words or their content was heavily focused outside of the Republic of Ireland

(ROI). For example, the Belfast Telegraph reports were Northern Ireland centred. Duplicates or articles of very high similarities were also removed. The final 172 articles adequately reflected this study's search terms (Appendix 1).

### 2.2.2 Social media data

According to a 2020 Information and Communications Technology (ICT) household survey by the Central Statistical Office (CSO), eight in every ten people in the ROI use the internet on a daily basis (Central Statistics Office, 2020). Facebook remains the most popular social media platform, with in excess of 3.5 million users, of which approximately 24.8% are between the ages of 25 to 34 years (Central Statistics Office, 2020; Tankovska, 2021). The study therefore focused only on Facebook and Twitter given that between them they attract 90% of social media users in the ROI as of 2020 (GlobalStats, 2020) (Figure 2).

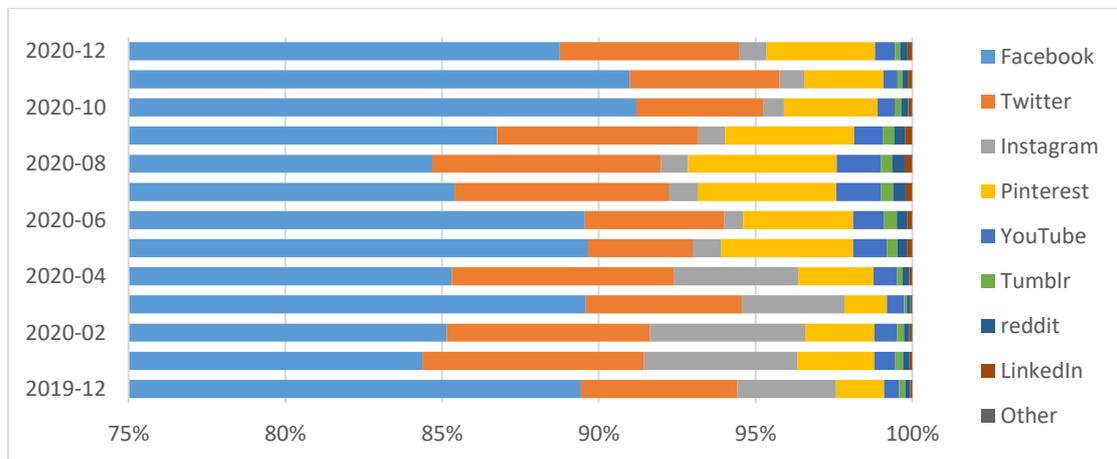


Figure 2: Social Media statistics in Ireland by share of platform in 2020

A total of 1627 tweets containing hashtags and keywords from 2018 to 2020 were collected from Irish Water’s official handle (@IrishWater) using the open-source software *vicinitas*. Emphasis was placed on Irish Water because it is the only public water and wastewater provider in the Republic of Ireland (Irish Water, 2018).

Tweets from other institutions with a direct and indirect interest in water resources and the environment, including An Foram Uisce, EPA Ireland, Sustainable Water Network (SWAN) and research/academic institutions, were collated. Facebook post and comments during the drought in 2020 were also sampled from Irish Water’s Facebook page.

### 2.2.3 Key stakeholder Interviews

Six key stakeholders comprising four journalists, a political representative and a researcher with experience in the Irish and UK water sector were interviewed as they had written extensively and worked on water issues in the ROI. Irish Water declined an interview and instead supplied a written response to a set of interview questions through its communication unit.

### 2.3 Data analysis

Azure machine learning was used in performing the sentiment analysis of tweets, while figures in this study were plotted using Microsoft Excel. A Word-Cloud showing the most frequent words in Irish water tweets and popular hashtags and external links was constructed using Nvivo version 12 pro (Figure 5). All the software used for this study was open-source to allow for easy replication with the exception of Nvivo 12 pro, the use of which was provided under licences by Dundalk Institute of Technology.

### 3. Analysis and discussion

#### 3.1 Social media communication during the 2018-2020 drought in the Republic of Ireland

Although Irish water and several other institutions like the Commission for Regulation of Utilities (CRU), Local Authority Waters Programme (LAWPRO), An Fóram Uisce, and Sustainable Water Network (SWAN) use different communication platforms to communicate to the public, there was more engagement via Twitter than other social media platforms. Each institution aims to improve the water sector either directly or indirectly; however, an examination of their posts, particularly during the 2020 drought period, reveals different interest and focus on what was communicated (Table 2). For example, a preliminary assessment of the social media pages of the Department of Housing, Local Government and Heritage (DHLGH) - one of its roles is to provide a framework for the sustainable management of water resources from source to sea - although they have a social media presence, they did not post to Facebook or Tweet in relation to water conservation efforts during the peak of the 2020 drought in the ROI. The Commission for the Regulation of Utilities (CRU), which also serves as Ireland's independent energy and water regulator, despite a series of educational videos on YouTube, predominantly focused its social media engagement on energy savings than on water. The CRU had no direct Facebook or Twitter posts relating to the 2020 drought on water except for two retweets from Irish Water on water conservation. The Local Authority Water and Communities Office (LAWPRO), mandated to work with local authorities and state agencies to meet obligations under the EU Water Framework Directive (60/EC/2000) for implementation of River Basin Management Plans in Ireland, was also silent on social media regarding water conservation and drought conditions in 2020. Most of these institutions commonly communicate on the economic (investment, leakages, savings and infrastructural challenges), quality issues (supply, pollution, waste disposals) and legislation (policies and adopted strategies) in the water sector, but unexpectedly remained silent on social media during the period of drought. This left Irish Water primarily alone in communicating on water conservation during the drought. However, these institutions are expected to complement the efforts of Irish Water in raising awareness and engaging consumers to take action. With the exception of the Environmental Protection Agency (EPA), National Federation of Group Water Schemes (NFGWS), Teagasc, Met Éireann, DCU Water Institute and An Fóram Uisce, there was - no strong support and collaboration in communicating water scarcity and availability during the 2020 drought in ROI.

Table 2: Preliminary observation of communication during 2020 drought among some institutions

Institution	Role	Communication Channels	Observation
<p>Department of Housing, Local Government and Heritage (DHLGH)</p> <p><a href="https://www.housing.gov.ie/">https://www.housing.gov.ie/</a></p>	<p>Provides a framework for the sustainable management of water resources from source to sea</p>	<p>Website. Circulars. Facebook. Twitter.</p>	<p>Regular engagements and shares information from across different sectors</p> <p>A significant social media engagement on energy, housing and heritage related issues but no direct post or tweet on water conservation or drought in 2020</p> <p>Communication centred largely on water quality and legislations.</p>
<p>Commission for the Regulation of Utilities (CRU)</p> <p><a href="https://www.cru.ie">https://www.cru.ie</a></p>	<p>The Commission for Regulation of Utilities (CRU) is Ireland's independent energy and water regulator by protecting the interests of customers by monitoring the performance of utilities</p>	<p>LinkedIn. YouTube. Twitter. Mailing lists. Publications.</p>	<p>Education videos on YouTube on energy savings.</p> <p>No frequent tweets.</p> <p>Social media post are heavily focused on energy savings than water.</p> <p>No direct statement on 2020 drought and water conservation.</p> <p>One LinkedIn post since 2020.</p> <p>Communication centred largely on service delivery, savings and quality and legislations.</p>
<p>Irish Water</p> <p><a href="https://www.water.ie/">https://www.water.ie/</a></p>	<p>Water and wastewater services to houses and businesses connected to the public water system</p>	<p>Website YouTube Facebook Email Campaigns</p>	<p>Frequent updates on Facebook and Twitter on water conservation and drought, water quality</p> <p>Press releases on water conservation triggered by droughts.</p> <p>Communication centred largely on quality service delivery, economics and legislation.</p>
<p>Environmental Protection Agency (EPA) of Ireland</p> <p><a href="https://www.epa.ie/">https://www.epa.ie/</a></p>	<p>The Environmental Protection Agency is at the front line of environmental protection and policing. We ensure that Ireland's environment is protected, and we monitor changes in environmental trends to detect early warning signs of neglect or deterioration</p>	<p>SlideShare YouTube Instagram Facebook Twitter LinkedIn Mailing lists.</p>	<p>The EPA has numerous publications on water quality, drought, and extreme weather occurrence and its impact on Ireland's water resources.</p> <p>EPA Catchment Unit on LinkedIn has been giving regular updates on EPA activities.</p> <p>Regular posts on all 5 Twitter accounts.</p> <p>The EPA's Facebook account has no content.</p> <p>Communication centred largely on policy and research.</p>
<p>Local Authority Water and Communities Office (LAWPRO)</p> <p><a href="http://watersandcommunities.ie/">http://watersandcommunities.ie/</a></p>	<p>The programme is a shared service working with Local Authorities and State agencies to meet obligations under the EU Water Framework Directive for the development and implementation of River Basin Management Plans in Ireland.</p>	<p>Facebook Twitter Mailing lists.</p>	<p>Makes frequent tweets but silent on the drought and water conservation in 2020</p> <p>Less posts on Facebook</p> <p>Communication centred largely on quality and community engagements</p>

<p>Sustainable Water Network (SWAN)</p> <p><a href="http://www.swanireland.ie/">http://www.swanireland.ie/</a></p>	<p>SWAN is a network of Ireland's leading environmental organisation's working to ensure that new Water Framework Directive water management plans provide this protection</p>	<p>Facebook Twitter Newsletter Publication</p>	<p>Less post on Facebook compared to Twitter.</p> <p>No Facebook post on water conservation and drought but shares and retweets on other water-related issues in Ireland.</p> <p>Publication on COVID-19 and water quality</p> <p>Communication centred largely on quality and legislation.</p>
<p>Academic Institutions</p> <p>Dublin City University <a href="https://dcuwater.ie/">https://dcuwater.ie/</a></p> <p>Dundalk Institute of Technology <a href="https://www.dkit.ie/centre-freshwater-environmental-studies">https://www.dkit.ie/centre-freshwater-environmental-studies</a></p> <p>University College Cork <a href="https://www.ucc.ie/en/eri/">https://www.ucc.ie/en/eri/</a></p>	<p>Dublin City University Water Institute (DCU-Water Institute)</p> <p>Dundalk Institute of Technology – Centre for Freshwater and Environmental Studies (DKIT-CFES)</p> <p>University College of Cork-Environmental Research Institute (ERI-Cork)</p>	<p>Website Twitter</p>	<p>DCU has a regular update on Twitter on water quality, conservation, and factors that impact the resources' quality.</p> <p>DKIT -CFES does Tweet regularly but few posts on either conservation or drought.</p> <p>ERI-Cork, although frequently posts was silent on water conservation and drought.</p> <p>Communication centred largely on research and legislation.</p>
<p>An Fórum Uisce <a href="https://thewaterforum.ie/">https://thewaterforum.ie/</a></p>	<p>To provide a platform for public engagement on all matters relating to water as an environmental, social and economic resource. The Water Forum provides an opportunity for stakeholders to debate and analyse a range of issues with regard to water quality, rural water concerns, issues affecting customers of Irish Water and the implementation of the Water Framework Directive and the River Basin Management Plan for Ireland 2018-2021.</p>	<p>Press releases. Twitter. Website Email subscription.</p>	<p>An Fórum Uisce frequently communicates on water resources across Ireland through press statements. It released a statement on the water conservation order by Irish water during the 2020 drought</p> <p>Water Forum tweets and publishes on water conservation and drought.</p> <p>It also retweets and shares other external information relating to drought and water quality issues.</p> <p>Communication centred largely on legislation, quality and economics.</p>
<p>National Federation of Group Water Schemes (NFGWS)</p> <p><a href="https://nfgws.ie/">https://nfgws.ie/</a></p>	<p>NFGWS is the representative and negotiating organization for community-owned Rural Water Supplies in Ireland.</p>	<p>Newsletters. Press releases. Twitter. Facebook. Instagram, YouTube LinkedIn Mailing lists.</p>	<p>Less posts than other organisations on social media because it joined recently. The NFGWS Twitter account was created in September 2020, and Facebook on November 18, 2020.</p> <p>However, it communicated the impact of the 2020 drought on water resources through its newsletters and annual reports.</p> <p>Communication centred largely on community engagements, quality and legislation.</p>

<p>Irish Farmers' Association <a href="https://www.ifa.ie/">https://www.ifa.ie/</a></p>	<p>The IFA is Ireland's largest representative farming organisation. Representing Irish farmers at home and in Europe, lobbying and campaigning for improved conditions and incomes for farm families</p>	<p>Irish Famers Journal Facebook Twitter Mailing lists.</p>	<p>Regular updates on Twitter and Facebook, especially on COVID-19 and its impact to members.</p> <p>IFA website and the Farmers Journal have publications on the impacts of drought on food production, but these reports and documents tended not to reference directly the link to water resources and conservation.</p> <p>Communication centred largely on economics and legislation.</p>
<p>Teagasc <a href="https://www.teagasc.ie/">https://www.teagasc.ie/</a></p>	<p>Teagasc is the semi-state authority in the Republic of Ireland responsible for research and development, training and advisory services in the agri-food sector</p>	<p>Publications Facebook Twitter YouTube LinkedIn Mailing lists.</p>	<p>Teagasc had a series of publications on the 2020 drought and its impact on tillage, feeding of animals and agriculture as a whole.</p> <p>The 5 Twitter and 3 Facebook accounts of Teagasc regularly communicate on water and agricultural issues. Teagasc Environment does tweet on water quality, climate change and biodiversity protection.</p> <p>Communication centred largely on quality, economics and legislation.</p>
<p>Met Éireann <a href="https://www.met.ie/">https://www.met.ie/</a></p>	<p>Met Éireann, Ireland's National Meteorological Service, is a line division of the Department of Housing, Planning and Local Government and is the leading provider of weather information and related services in the State.</p>	<p>Facebook Twitter YouTube LinkedIn Website Mobile Application (accessible on Playstore and iOS store)</p>	<p>Regular weather forecast and updates on Twitter and Facebook</p> <p>Interactive and regularly updated website.</p> <p>The YouTube channel has a few educational videos on climate science. The comment session is however, turned off.</p> <p>The last post on LinkedIn was June 2020</p> <p>Communication centred largely on quality service delivery, community engagements.</p>

### 3.2 Sentiment analysis of Irish Water Tweets

A number of studies have assessed water and climate change communication using sentiment analysis to gain insights into public opinion, reviews, news publications, social media posts and comments because sentiments have implications on how communication is received and acted upon (Culloty et al., 2019; Quinn et al., 2016). Following this format, this study analysed the tweets from Irish Water and some of the comments made by Irish Water's followers. In addition, Facebook posts made by Irish Water during the drought periods in 2018 and 2020 were analysed. Using the Azure learning machine, the sentiment analysis of 1671 tweets by Irish Water (@IrishWater) between 2018 to 2020 were categorised into three groups - positive, neutral and negative on a scale of 0% -100%. Of these, 781 (n=63.35%) of the tweets were generally positive, 575 (15.81%) were negative and 375 were neutral (20.85%) (Figure 3). The sentiment score of tweets from other institutions also shows a similar trend in positive, negative, and neutral scores (Figure 4). There are however some variations in the time frame on data collected from these institutions because some Twitter accounts were created after 2018. The number of available tweets within the period under consideration and *vicinitas* limit of 3200 tweets per account also accounted for the variation.

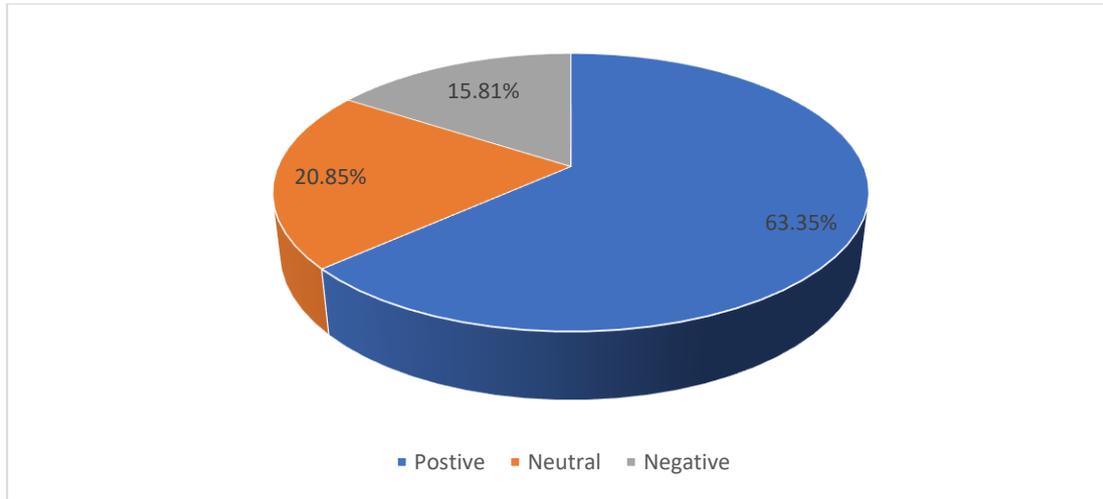


Figure 3: A Sentiment score of Irish Water Tweets from 2018-2020

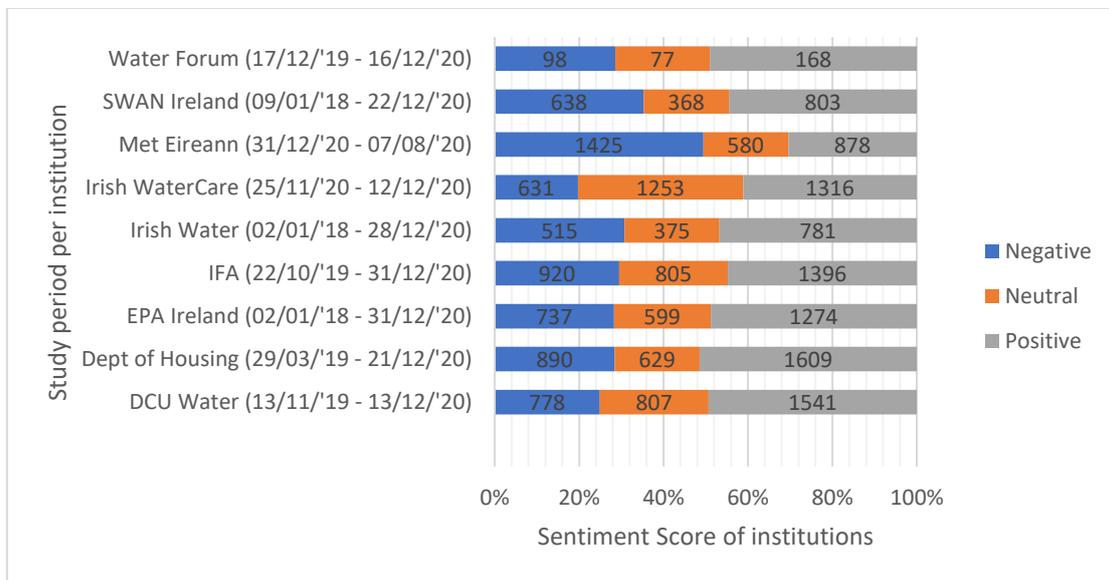


Figure 4: Sentiment Score of some selected institutions in Ireland

Table 3 indicates that most of the negative sentiments in Irish Water's tweets were due to external factors like droughts and storms, which the utility has limited control over. In contrast, the positive and neutral sentiments stemmed mainly from campaigns and initiatives that Irish Water was involved in to promote water quality and conservation measures.

Table 3 Exemplar tweets with their sentimental score

Tweets	Sentiment	Score (%)
Yesterday we launched the Irish Water Certified Water Stewardship Programme to provide training and support for business customers. See <a href="https://t.co/BglRXSsD80">https://t.co/BglRXSsD80</a> for more on the launch and find out how to make a pledge, get training or become a water steward for your business. <a href="https://t.co/cddWcc0qKM">https://t.co/cddWcc0qKM</a>	Positive	86%
As part of our National Leakage Programme works will start in Athlone on Monday 12 February. These works will reduce leakage levels, improve water quality & provide a more reliable service for customers. For more check out <a href="https://t.co/nEnHPXtR8J">https://t.co/nEnHPXtR8J</a> #IrishWater	Positive	70%

Normal water supply resumes on Inis Oirr following the lifting of night time water restrictions with immediate effect. Restrictions were lifted as the rainfall of the past six weeks ensures a continuous supply into the autumn. See <a href="https://t.co/JdY3T8zIXm">https://t.co/JdY3T8zIXm</a> for more. @GalwayCoCo	Neutral	49%
RT @ervia : Irish Water introduced a national, long term approach to the planning & development of water services. This ensures that a systematic approach is applied to the operation and maintenance of our water and wastewater networks. Find out more at <a href="https://t.co/AyCPtcKUzY">https://t.co/AyCPtcKUzY</a> #lastword	Neutral	57%
A Boil Water Notice has been put in place with immediate effect for all customers served by the Wexford Town Public Water Scheme as a precaution due to a deterioration in the quality of raw water entering supply. See affected areas and more at <a href="https://t.co/KFOpPrNViZ">https://t.co/KFOpPrNViZ</a> . <a href="https://t.co/S5kYEOZ1iE">https://t.co/S5kYEOZ1iE</a>	Negative	25%
A power outage, due to storm Eleanor, has impacted the water treatment plant in Kiltimagh resulting in a loss of water supply for customers. See <a href="https://t.co/mGVUcvkjvU">https://t.co/mGVUcvkjvU</a> for more #IrishWater #stormeleanornegative	Negative	12.03%

Although most of Irish Water’s tweets have been positive, consumers' overall feedback shows levels of dissatisfaction. During the peak of the 2020 drought, consumers' reaction to the Utility’s messages on water conservation and water availability suggested that they were not favourably received by the public, judging from the comments posted on Twitter (Table 3). These comments and reactions suggest that Irish Water’s communication unit faces challenges from consumers in relation to the highly technical and engineering nature of its work (*Irish Water Pers. Comm*).

According to the Irish Water communication unit, it uses a 360 communication approach<sup>8</sup>, which utilises all available communication channels to ensure maximum traction and amplification of campaigns and key messages. It does this through media/public relations, internal communication, stakeholder engagements, and the use of both above the line (Press, radio, campaigns) and below the line (Website, digital and social media, direct mail/email) communication strategies to reach its customers. Over the years, the utility asserts that they have adopted creative advertisements, targeted messages and social and digital media leverage; nevertheless, it admits there are challenges. These challenges include difficulties in simplifying the highly technical and engineering nature of its work to the consumer and inadequate consumer engagement with the utility beyond services unless otherwise the consumer is affected. These challenges are evident from the comments and reactions on Twitter and Facebook between Irish Water and the public, particularly drought periods or intermittent supplies (*Irish Water Pers. Comm*).

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<sup>8</sup>360 communication approach is the articulated connection of efforts, actions, strategies and communication products, planned and developed by a company or entity, with the objective to add value to its brand or to consolidate its image among specific audiences or in society as a whole <https://race.agency/public-relations-brazil/what-is-360-communication-how-to-make-use/>

Table 4: Twitter comments posted in response to Irish Water’s tweets during the drought

Tweets	Comments
<p>Very low rainfall in recent months, and more water being used in our homes and gardens, is putting pressure on our capacity to supply enough treated water to meet demand around the country. We need to work together to #ConserveWater, while continuing to wash our hands. Jun 15, 2020 Likes 142. Retweet 42. Quote Tweets 22</p>	<p>No- you need to do a better job of managing Ireland’s most abundant resource It’s been pissing rain get your act together!! Fix the pipes or build more reservoirs. F 26 Should have used all that water metering money to fix the pipes. F 14 Easy to conserve water when some communities have been on a boil water notice since 31-10-2019. F 6 RT 1 Are the Data Centres going to be asked to cut back on their water usage? F 28, RT3</p>
<p>Water use at home increases during fine dry weather. Add bark or plant material to your flower beds, to avoid evaporation, so you can water less. We urgently need your help to #ConserveWater. Jun 15, 2020 Likes 87. Retweet 23. Quote tweets 10</p>	<p>Less tweety more fixy leaky leaky The dry spell is well n truly over now. The ban is obsolete They are, or were. They were doing about 1500 leak repairs per month. Don’t know if Covid affected that. Average leakage rate has dropped from 48% to 43%. Even lower in Dublin, I think. Yep . Wet winter wet spring with half the country under water and yet no water. Only in Ireland.</p>
<p>With very low rainfall and more water use at home, water supplies are under pressure. #ConserveWater and mend dripping taps and running toilets, and don’t use the garden hose. Jun 15, 2020 Likes 110. Retweet 30. Quote tweets 20</p>	<p>We got about a fortnight’s worth of rain tonight and overnight last night, so yiz are grand. Focus on fixing your leaks and maybe allow people to build harvesting systems on their homes and apartment complexes. F 19 RT 1 It has rained every day - since Monday June 15th - where I live (Co. Cavan). Today is the first remotely warm day for over a week. I haven’t needed to water anything in quite a while. Where the hell are you tweeting from? Mercury? F 8 Abolish Irish water</p>
<p>A National Water Conservation Order (hosepipe ban) will be in place from 9/06 - 21/07. The order is needed to safeguard supply for essential purposes due to increased domestic usage, increased demand as businesses reopen, and the widespread emergence of drought conditions. Jun 8, 2020 Likes 59. Retweet 43. Quote tweets 5</p>	<p>Lesson from COVID. Publishing data and telling the honest story kept the public onside. Why can’t Irish water publish daily metrics - consumption data, leaks fixed data, reservoir level data etc. You have this already so sharing it will make compliance better @eoghanymurphy F 6, RT 1 Rains year round and the country surrounded by water. Explain again why there is a ban? F 9 It hasn’t rained properly in 2 months. Can’t drink sea water. All they’re asking us to do is try conserve some water... F 7 Why did Irish water not take the opportunity to repair water leaks when the streets of cities and towns were empty. F 7</p>
<p>A National Water Conservation Order will be in place from 9/06 - 21/07. The order is needed to safeguard supply for essential purposes due to increased domestic usage, increased demand as businesses reopen &amp; the emergence of drought conditions. <a href="http://wtr.ie/2Xxv9jz">http://wtr.ie/2Xxv9jz</a> for more. Jun 8, 2020 Likes 20. Retweet 25. Quote tweets 6</p>	<p>How is there not a procedure in place to combat this? Do you liaise with @MetEireann? I wonder how many leaks are still out there. Thinking face How can IW be so inept. Businesses closed for months using NO water. How much rain fell all winter. Couple dry weeks and Ireland has a water shortage. We pay on the double for water via taxation, can you start providing a proper service please.</p>
<p>Water Conservation Order / hosepipe ban increasingly likely as demand for water soars and drought conditions prevail. This comes during the ongoing Covid-19 crisis when handwashing and hygiene remain critically important. See <a href="http://wtr.ie/3gl0Az4">http://wtr.ie/3gl0Az4</a> for more. Jun 1, 2020 Likes 11. Retweet 14. Quote tweets 2</p>	<p>You’re like a broken record at this stage - every year we get a bit of good weather you guys cry drought. Mentioning Covid-19 is laughable. Why not attempt to fix the problem? For those shouting about fixing leaks; yes you’re right but it takes a lot of time and money. The system is old and can’t be fixed quickly. A hosepipe ban should already be in force. Many of my neighbours try to conserve but today I saw one woman happily watering her garden with a hose. Ridiculous wastage.</p>
<p>In recent times we are each using 24 litres more water each day. Let’s work together to #ConserveWater. Place a basin in your sink when rinsing food to</p>	<p>Genuine question: is overall water usage up or down or about the same? Of course domestic use is way up since we’ve all being staying home. But pubs, restaurants, many shops, most offices etc closed and using virtually no water. So we’re saving there. F31</p>

<p>collect the water and use it for watering plants.  <i>May 25, 2020</i>  <i>Likes 332. Retweet 15. Quote tweets 15</i></p>	<p>Surely your not serious, were told to wash our hands, which results in hundreds of hand washes a week.  Then were told to work from home, eat and drink at home. So instead of patronising us for using water. Or pretending your offering advice, we. all know your pushing for W Charge <i>F5</i>  You've had 2 months to fix every leak in every road in Ireland without upsetting traffic. Fix your leaks! One hotel would use more water than my estate!  #fixyourleaks <i>F28</i>  Bridge view Park Cloverhill rd, D22 this evening fire hydrant fully open discharging thousand gallons water, no one in sight <i>F3</i>  This is the way to conserve water. Use a basin in the sink and keep the waste water for the plants etc.  A local cllr in Mullagh area in Co. Cavan informed a FB group, Tues night, that an IW engineer said the cause of a pressure loss (supply loss for some) was due to "heavy usage". Turns out it's actually a burst main. Funny how the default position is always to blame the end user. <i>F23</i></p>
<p>Water use at home has increased by an average of 20%. Let's work together to #ConserveWater. Taking a shorter shower can save 10 litres of water per minute.  <i>May 25, 2020</i>  <i>Likes 185. Retweet 85. Quote tweets 21</i></p>	<p>As we have been advised to thoroughly wash our hands for 20 seconds, this is hardly surprising. <i>F15</i>  Aw would u be quiet!You want us to conserve,the government wants us to wash our hands every half hour,theres the usual house hold usage on top of the fact for 2 months theres a massive increase in people staying home.Give it a rest!  Lets work together &amp; #beatthevirus. Gobshites! <i>F19</i>  How much has business usage decreased by? <i>F29</i>  Fix the ***** leaks, we've been locked down for the past 9 weeks you lot could have had the roads to yourselves to fix the ***** leaks!!!! <i>F14</i></p>
<p>With more of us at home, more water is being used, and with low rainfall over the last 2 months, this is putting pressure on our water supplies around the country. Let's work together to #ConserveWater, while continuing to wash our hands.  <i>May 25, 2020</i>  <i>Likes 133. Retweet 50. Quote tweets 15</i></p>	<p>From a street to 5 houses my and my neighbor's water comes true 1 pipe then it splits to all 5 houses more then 1 year ago I called council for bad water pressure and it leaks water on that pipe 1000 liters in hour it's more then 370.000L of water time to come and fix <i>F4</i>  There is a lot of misunderstanding just how much water an average house uses. I run a 7500litre rainwater collection tank for toilet flushing. Two adults one 11 yr old. Three weeks ago it had less than 300litres in. Really opens your eyes to water wastage v rainfall.</p>
<p>With people heeding advice &amp; staying at home during #Covid19, water use at home has increased by an average of 20%. We're urging people to choose "handwashing over powerwashing" and check out our tips to #ConserveWater that will not impact on hygiene.  <i>May 12, 2020</i>  <i>Likes 42. Retweet 35. Quote tweets 16</i></p>	<p>We are conserving all our water as it is brown and toxic. But hey, at least we are conserving water right? <i>F2</i>  Why are you not calling for rain water harvesting in all new buildings and retrofitting existing buildings?  Makes no sense to be flushing toilets with drinking water instead of captured rain.  But business use has dropped by 80%, did all that extra water just evaporate??  You cant collect it, you cant store it, you cant clean it ,what exactly can you do??  #scrapirishwater, 9 months rain ,80% drop in business use the past two months ,and you are still blaming the people</p>

*\*F= Favourite \*RT= Retweet \* some comments were not sampled because they contain offensive content.*

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*Some of the comments made by consumers confirm the Irish public's belief that Ireland is a wet country that does not suffer from water scarcity. As also started by some key informants, in spite of growing public awareness on climate awareness, there are a lot of people who are not able to connect drought/climate change to scarcity in water supply. "I do think that people understand that there is a link between climate change, and how water reacts to climate change, and how water levels react. The prediction is that we live drier, longer, hotter summers in the east, and more and more intense rainfall events in the West and in the winter across the country. So I think there is a growing awareness, I would say it's probably still at a fairly low-level people understand that climate change is happening, they understand that water is important. They probably haven't made that exact connection between water quality and demand" (RI 2).*

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A number of these comments had many Twitter reactions (i.e. quote tweet, likes and retweets) showing endorsement. These comments further reveal insufficient engagement between consumers and Irish Water in relation to the external factors that threaten water supplies, such as drought. Irish Water’s response rate to consumers’ comments was also found to be low. The limited responses and information on the utility’s activities and technical and engineering terms allow consumers to feed into information and thoughts that other users may share. The word frequency of Irish Water from 2018-2020 (Figure 5) revealed that some of the most occurring words and hashtags were supply (406), customers (286), repairs (118), burst (96) treatment (72), repair (69), completed (96), reduction (67), wastewater (61), boil (58), partnership, (47), disruptions (45), upgrade (36), conservation (20), tankers (17), replacement (16), environment (16), wipes (14), weather (8). Most of the frequent hashtags during same period included #ScienceWeek2020 (23), #thinkb4flush (17), #fixing leaks (67), #scienceweek (23), #conserveWater (22), #engineersweek (20), #IrishWater (19), #storyofwater (15), #believeinscience (15), #gswarerawards (5), #watersustainability (3), #thinkb4upour (3). Given that Irish Water tweets predominantly about water, the frequency of water (n=913) was not emphasised in analysis.

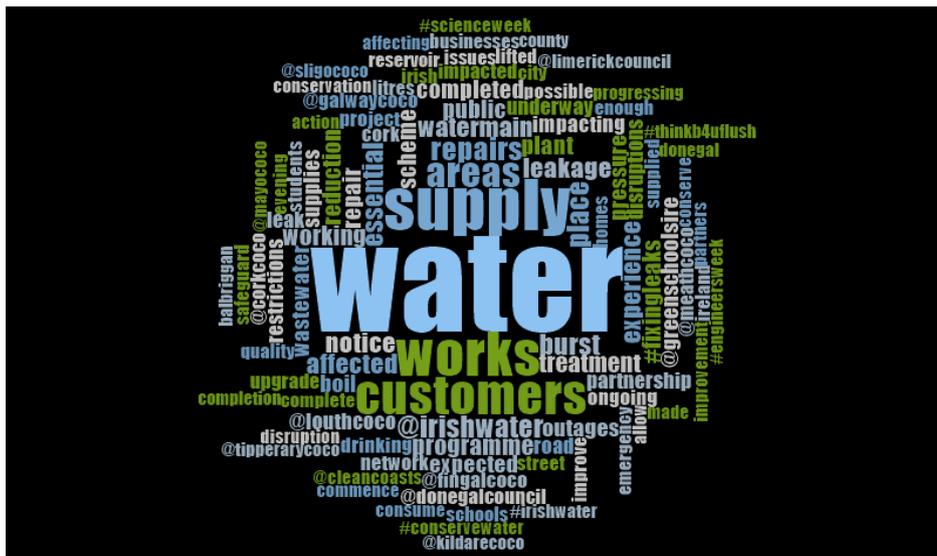


Figure 5 Frequency of words in Irish Water Tweets during drought (2018-2020)

The highest twitter mentions/tags were also @greenschoolsire (55), @louthcoco (48), @meathcoco (38), finhalcoco (38), @galwaycoco (36), @donegalcouncil (36), @corkcoco (35), @cleancoasts (24), @Limerickcouncil (21), @sligococo (19), @kildarecoco (18), @dublincity (15), @longfordcoco (14), @galwaycitycoco (13), @westmeathcoco (13), @countykerry (12), @offalycoco(12), @scienceierel(9), @warsprogramme (3). These represent the high degree of association between Irish Water and the local authorities, and also the green schools programme which Irish Water sponsors. There were also approximately 916 tweets that contained external links with some of the most commonly occurring links being <http://water.ie/reducingleaks> (20), <http://water.ie/reducingleaks> (9), <http://wtr.ie/Conserve> (17), <http://wtr.ie/StormEmma> (16), Events surrounding science week and green schools via

<https://greenschoolsireland.org> (17) and <http://water.ie/scienceweek> (9). RTE, LMFM and the Journal.ie also shared stories tweeted by Irish Water. All the twitter mentions and word frequency provides insights into Irish Water’s stakeholder engagement and challenges being addressed to improve sustainable water supply. Irish Water also has a second Twitter handle (IrishWaterCare @IWCare) dedicated to customer care. The handle contained some educational posts, videos and tweets on water conservation; nevertheless, customer engagement on that handle was also limited.

### 3.2.1 Irish Water Facebook Page

Irish Water had more engagement on Twitter than it did on Facebook, despite Facebook being the most popular social media platform in the ROI and also the platform through which most communities receive their trusted information on water availability (GlobalStats, 2020; Norton, 2019; Tankovska, 2021; Veerkamp et al., 2018). The public’s Facebook comments and reactions on the 2020 drought were, however, not different from that of Twitter (Table 5).

Table 5: Sampled Facebook post and comments from the public

Post	Comments
<p>Ireland’s much-loved celebrity chef and television personality, Neven Maguire launches the Think Before You Pour campaign. Neven is appealing to the public not to use their kitchen sink as a bin this festive season. Disposing of your fats, oils and greases (FOGs) in the bin, rather than pouring them down the sink, can have a hugely positive effect on our environment and wastewater system. The Think Before You Pour Christmas campaign is operated by @CleanCoasts in partnership with Irish Water. For more information and to be in with a chance to win a signed copy of Neven Maguire’s Perfect Irish Christmas Cookbook courtesy of Clean Coasts and Neven Maguire, check out the link below</p> <p><i>18<sup>th</sup> December 2020</i></p> <p><i>Likes 345. Comments 69. Shares 86</i></p>	<p>I don't use my dishwasher anymore. No grease leaves my house... roast duck fat used for roasties. Other warm fats soaked up in bread for the birds. Cold fats scrapped from plates, etc, spread on bread, again for the birds, sprinkled with birdseed.</p> <p>No binning, no waste. Only two of us.. I use a basin for kitchen wash up and watch the birds feasting while I wash up.. Everyone wins. L 4</p>
<p>Most leaks happen underground and aren't visible, resulting in precious water being lost. The national Leakage Reduction Programme in partnership with the Local Authorities works, to find and fix leaks. This is one way we are reducing leaks. The rate of leakage nationally in 2018 was 46% and we are on course to achieve a national leakage rate of 38% by 2021.</p> <p>#FixingLeaks</p> <p><i>August 18<sup>th</sup> 2020</i></p> <p><i>Likes 188. Comments 144. Shares 14</i></p>	<p>The biggest waste of money they do nothing, still putting fluoride (industrial waste to other countries but in Ireland were told its great for teeth L 12</p> <p>Some leaks are caused by Irish water workers, and not fixed for weeks. You should have seen the mess they left in our estate while installing meters L 13 (IW replied).</p> <p>There been a leak up the road from my house. I've living in the area for 17years and in that time I've lost count of how many times the road was dug up to fix the problem, but it's still not fixed, wonder what the problem is.....</p>

	<p>Phone local authorities, they say log it with Irish Water, but it's hard to log a problem if no one answers the phone...</p> <p>Some plan, now did I mention I've lived in the area for 17 years and the problem still exists....</p>
<p>42% of Ireland's drinking water is lost to leaks before it reaches your taps. But we're making progress to reduce leaks. In 2018 the rate of leakage nationally was 46%, by the end of 2019 it was 42% and we are on course to achieve a national leakage rate of 38% by 2021. Our national Leakage Reduction Programme teams are working with Local Authorities across the country to fix 1,500 leaks per month.</p> <p>#FixingLeaks August 10th 2020 Likes 180. Comments 146. Shares 16</p>	<p>HELLO... You are aware the country came out on mass to stop politicians privatizing our water supply's, the company was set up and is being run today against the wishes of the people of the Irish republic and should be shut down, I have raw sewage running from my kitchen tap and when i contacted the EPA to inform them I was told they would not entertain the matter unless i contacted (Irish water) first so the EPA are putting the life of me and my family at risk unless I contact (Irish water). L 17 (No response from Irish Water)</p> <p>We have reported a leak outside our house four times to be told one day there is not one there or that it has been fixed and case is closed and the next day that they couldn't check because there was a car in the way. There is a visible puddle of water on even the hottest days L 4 (IW replied)</p>
<p>This leak repair, carried out under the First Fix Free scheme, was recently completed in Laurel Park, Galway. We offer free leak investigations &amp; repairs where a constant flow is found on an external water supply pipe. See more on #FixingLeaks at <a href="http://www.water.ie/reducingleaks..">www.water.ie/reducingleaks..</a></p> <p>July 9, 2020 Likes 17, Comments 5, Shares 1</p>	<p>One i found a while back nice to see it done</p>
<p>Watch our documentary on The Story of Water in Ireland, airing Tuesday 7th July at 7pm on Virgin Media One. It reveals the full story behind the challenges facing the public water and wastewater network. #StoryOfWater</p> <p>July 2, 2020 Likes 39, Comments 19, Shares 8</p>	<p>They are going to tell us what we must do nothing about what they are not doing look around you how many people knows where there water comes from this is going to tell some of us thats fighting for years for clean water and we were laugh at now they are the same people that let it happen so now what they will tell you lets forgot the pass and move on now you are going to pay for your water make no mistake its sig by the dail don't let anyone say otherwise they all sig up a company has sig a deal to make sure you pay and you will because you were sold out in Europe and here by the same</p> <p>How much is this costing the hard pressed taxpayers?</p> <p>I think that is why it has been lifted! Surely with the amount of rain we get we could be harvesting it to see us through the drier months!</p>
<p>Listen back to Managing Director, Niall Gleeson, on Morning Ireland earlier discussing the lack of rainfall, increased water use at home and the need to conserve water where possible while continuing to wash our hands - <a href="https://www.rte.ie/radio/radioplayer/html5/#/radio1/21766956">https://www.rte.ie/radio/radioplayer/html5/#/radio1/21766956</a></p> <p>May 12, 2020 Likes 39, Comments 9, Shares 6</p>	<p>Yes water should be conserved, however turning it off without notice for the 4th day is a row is not good enough!!!</p> <p>How much has overall water consumption decreased since the closure of businesses and educational premises?</p>

<p>With people adhering to government advice and staying at home since mid-March in response to the Covid-19 crisis, there has been a significant increase in household water usage. We're urging the public to "choose hand-washing over power-washing" as water usage has increased by an average of 20% in homes across the country. Check out our helpful tips for ways we can all conserve water.</p> <p><i>May 12, 2020</i> <i>Likes 332, Comments 410, Shares 113</i></p>	<p>I don't believe this for a moment..... Unless leaks..... Businesses closed, hand washing cannot consume that much. However there is water pouring onto the side on the road just outside a house on the Annadale Rd., in Killorglin..... For weeks..... How many more?! L 88</p> <p>Water usage in residential homes was going to increase but surely this would be offset by the lack of usage in businesses including restaurants and schools where water usage should have reduced dramatically? This sounds more like using COVID-19 as an excuse for mismanagement of your infrastructure. L 131</p> <p>Fix the leaks in the system first then talk to us about conserving water. The wettest country in Europe and a few days of sunshine and we have a water shortage L 43</p> <p>Ye have got to be joking it was pouring rain up to few weeks ago, businesses closed so no usage there, FIX THE LEAKS. And ye all on huge salaries and bonuses there and guaranteed pensions L 33</p>
<p>Increased hand washing to prevent the spread of Coronavirus is putting extra demand on water supplies. As we work with our Local Authority partners to maintain supplies, we're asking the public to be mindful of ways to conserve water. Check out <a href="http://water.ie/conservation">http://water.ie/conservation</a> for helpful tips.</p> <p><i>March 19<sup>th</sup> 2020</i> <i>Likes 32, Comments 23, Shares 24</i></p>	<p>Broken pipe outside our house since last night phoned this morning at 8. am was told they would be with me within 4 hours now six in the evening water still running down the road , two old age pensioners in the house no water to wash or heat the house , now tell me how to save water and wash my hands . (IW replied)</p> <p>No water for the last few days, The whole road with no water. Got email this morning asking for my Eircode. Tried to phone the number given on the email, keeps cutting off. We cannot wash our hands or anything... is this the way to save water? Does this mean that we are allowed to go to family members' houses to wash ourselves? Thought we were to be in locked down.....Weekend is here and it looks like nobody is going to do anything..... 😊😊 (IW Replied)</p> <p>Water Supply off again 3rd time in a month, can't wash our hands, Rathanny ( IW Replied)</p>

\*L= Like \*IW= Irish Water

When compared to Twitter, the Facebook page contained fewer posts. On average, there was one post every 4 to 6 days. The last and first post between 2019 and 2020 occurred on 20<sup>th</sup> December 2019 and 20<sup>th</sup> January 2020. The utility did not make any posts to its followers to welcome in the New Year, with its first post of 2021 appearing on January 4<sup>th</sup>, after its last post on December 24<sup>th</sup> 2020. These periods may be regarded as festive periods, with a possible increase in domestic water usage, but the utility remained relatively silent.

A striking observation made on Irish Water's website shows that calls to report leakages, flooding, water quality issues and pollution were billed to the caller. This could deter some members of the public from reporting anomalies when identified. In addition, the YouTube comment section is closed, thereby limiting the public's ability to ask questions or make comments on videos shared by the utility. Target communication which offers the public a chance to interact and to have a say in conservation measures and actions were limited in the tweets and Facebook post of Irish Water. Irish Water's communication approach appears to suggest that the public's knowledge on water conservation and drought intensity is somewhat limited, but while the utility's communication approach may spread knowledge about drought,

it may not influence behavioural changes (Seyranian et al., 2015). Hence, instead of instructing people on what to do during periods of drought or water scarcity, it is constructive to tell them what other people in a similar situation are doing, for instance, to influence and empower the public to act (Lede et al., 2019). More so, periods of drought can be a perfect opportunity to educate the public about its impact on the water supply and the need for conservation before, during and after a drought. Instead, it was noted during this analysis that the frequency of conservation messages was reduced before and after a drought.

### 3.3. Newspaper coverage of drought events

A total of 172 newspaper publications, from January 01, 2018, to December 31, 2020 were considered. Although a number of concerns have been raised on how factors like political control, ideological settings, ecological modernisation and communication complexities influences newspaper reportage on climate change (Fegan, 2020; Fox & Rau, 2016; Wagner & Payne, 2017). A rise in water quality issues and drought stories as a climate phenomenon were identified as saturating the media space (see e.g. FitzGerald, 2018; Houston, 2019; Moran, 2020). While not rejecting earlier claims on factors influencing climate reporting some key informants alluded to the rise in media interest on drought's impact on water resources in recent times.

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*“And I don't know how we insure us, I suppose one of the things that tends to kind of offer protection is that a lot of journalists in an Irish context would perhaps, lean slightly towards the left politically, and it would perhaps make them more put them more in touch with issues around environment, and social justice issues, which obviously environment feeds into so that they we don't have, and in Ireland, a very robust kind of right wing press like they would in the UK and the USA, where there would be media outlets actively undermining climate change” (RI 1)*

*“You know, you just, you've report as carefully as you can when things happen and talk to the right people and rely on science and rely on the data that shows you what's happening. And so I like, I think the only problem that has arisen in the last few years is people underestimated the threat of climate change and climate disruption. And so, you know, maybe you didn't get enough media coverage as a consequence. But I think that that's not the case anymore. Like, climate change is getting a lot of coverage now and more and more with each passing year, which is the right thing, because it is such a big threat to humanity, and, and to the planet. So it's, you know, it's, it's less of an issue” (RI 5)*

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The Irish Times led in the reporting of climate change, water resources and drought impacts on water resources by 42% (n=73), followed by The Irish Independent 31% (=54) and The Irish Examiner 11% (n=18) (Figure 6). During this period, Kevin O'Sullivan of The Irish Times had the highest number of publications (14), Caroline O'Doherty of The Irish Independent (9), both Paul Melia (Irish Independent), Micheal Viney (Irish Times) and Sylvia Thompson (Irish Times) had five publications a piece.

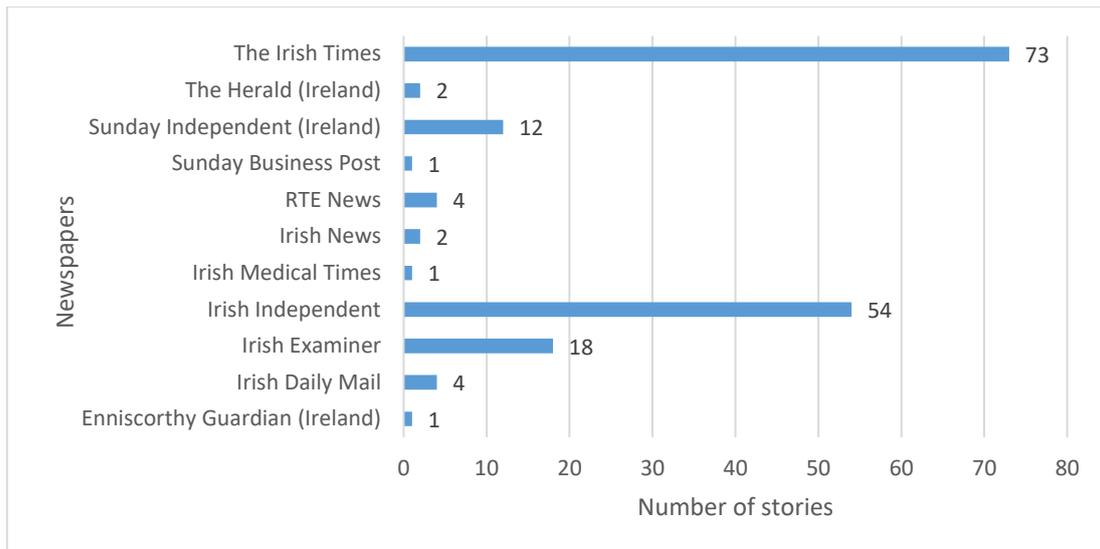


Figure 6 Total number of climate change stories with associated terms and content (2018–2020)

Figure 7 is quite revealing in several ways. First, it shows that in most newspaper publications, the associated terms usually appeared from June to August and between September and November i.e. periods characterised by hydrological drought and post spring and summer conditions. Secondly, while 2019 maintained a relatively lesser but consistent media focus, there was heightened media reporting on the 2018 drought compared to 2020. The impact of the COVID-19 pandemic took the media’s spotlight away from the drought conditions. The figure also shows that other related factors and not necessarily drought conditions influenced the media’s attention. For example, the announcement in 2018 to separate Irish Water from Eirvia to enhance probity, accountability and transparency in its activities by 2023 (Houses of the Oireachtas, 2018), and the creation of An Fórum Uisce to promote public engagement on socio-economic resources, the environment and water resources in the ROI (The Water Forum, 2018), led to increased media attention as evident in the number of publications made in 2018 (Figure 7).

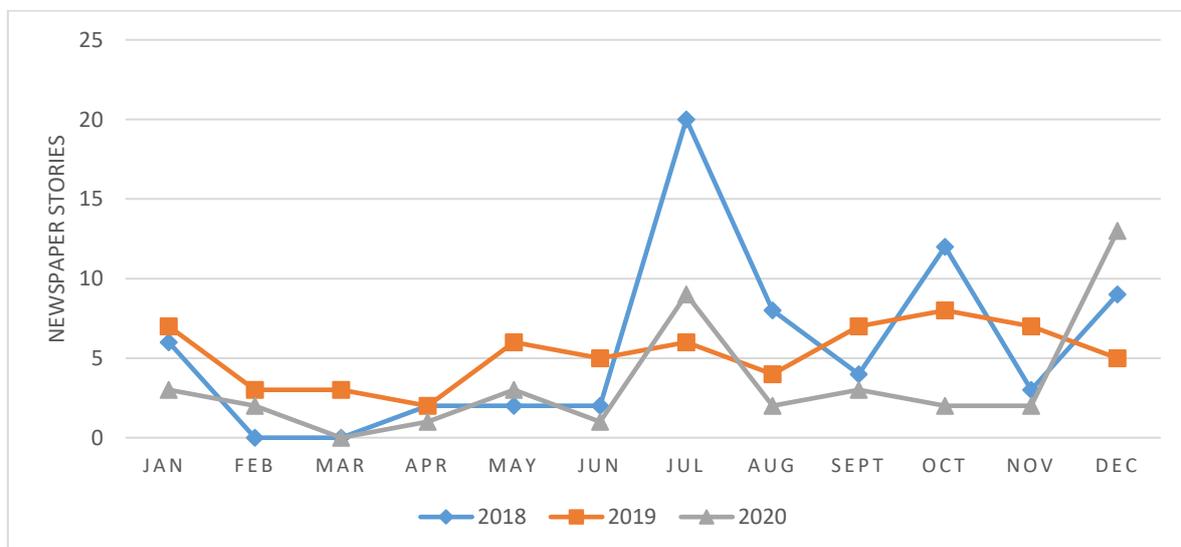


Figure 7 Newspapers coverage of research terms from 2018-2020 per month

### 3.3.1 Dominant Irish Newspaper framing

In order to avoid the criticisms that come with devising new frames instead of associating previous studies with ongoing research in a similar field (Culloty et al., 2019; D'Angelo & Kuypers, 2010), this study adopted political and economic frames from scholarly works of both Culloty et al. (2019) and Wagner & Payne (2017) based on their work on climate change framing in the Irish media space. Other established frames applicable to climate change like technical/policy, uncertainty and risk frames were also adopted (Appendix 3 provides an overview of each frame). As distinctively used in this study, eco-hydrological framing deals with the connection between hydrology, ecology, and ecosystem services to show the interlaced benefits of climate change adaptation and integrated water management perspectives (European Environmental Agency, 2020). Its relevance lies in the growing interest in the linkages between ecological status and ecosystem services and the potency of eco-hydrology processes in, for example, addressing water quality issues and values on water resources as well as climate change adaptation and coping strategies (European Environmental Agency, 2020; Sun, Hallema, & Asbjornsen, 2017).

As shown in figure 8, uncertainty and risk is the dominant frame of climate change in Ireland, accounting for 41% of all frames. Within this climate change is presented as a threat to society with profound impacts on citizens' wellbeing and health due to rising temperatures and risk associated with stormy conditions, heatwaves, and prolonged dryness. Publications under this frame also consider acute water supply and availability during such periods of extreme conditions, but its content avoided or rarely used words like water scarcity which was presented under water quality when discussing the long term impact of drought on water resources. Eco-hydrological also accounts for 18% of all frames. It represented the growing increase in measures and adaptation strategies to address water quality issues and cross-cutting measures on agriculture and production activities towards the multi-benefit of quality supply, source protection, hydrological and ecological well-being of the environments, particularly during drought periods in the country. The economic impact of climate change on the water resources economic frame (16%) consisted of stories that focused primarily on the cost of extending water supply, repair works and general investment into the water sector to make the sector resilient against extreme conditions like drought. How climate change will also affect products and commodities like agricultural produce were also dominant (Gardner, 2018).

In contrast to previous studies that identified political frames as the most dominant in Irish newspaper coverage of climate change (Culloty et al., 2019; Wagner & Payne, 2017), a political frame represented only twelve per cent for this study period, followed by technical/policy frame (13%). Although politicians are still interested in matters of the environment, this suggests they are not to the forefront in talking to the media on water issues and the impact of drought on resources, including water quality, availability, conservation and charges/cost of water.

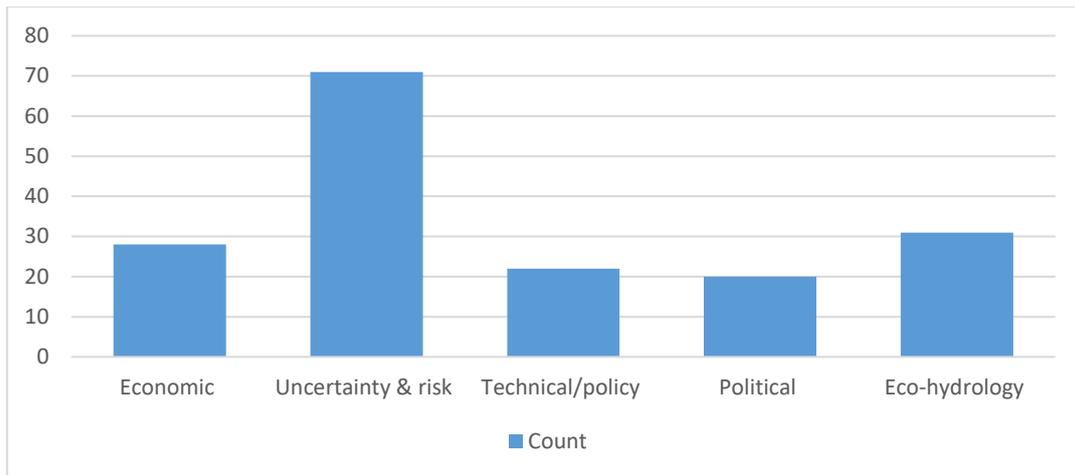


Figure 8 Irish newspaper framing per typology

The breakdown of stories under each frame, as depicted in Figure 9, shows that The Irish Times reported thirty-two times on risk and uncertainty, followed by the Irish Independent with twenty stories. The Irish Times and Irish Independent reported ten stories each under the political frame, followed by The Irish Examiner with seven. (7). The Irish Independent had the highest number (13) of stories on economic frame, whereas the Irish Times had fourteen under the eco-hydrological frame. The Irish Times led in reporting under technical/policy frame with ten stories and the Irish Independent with six stories.

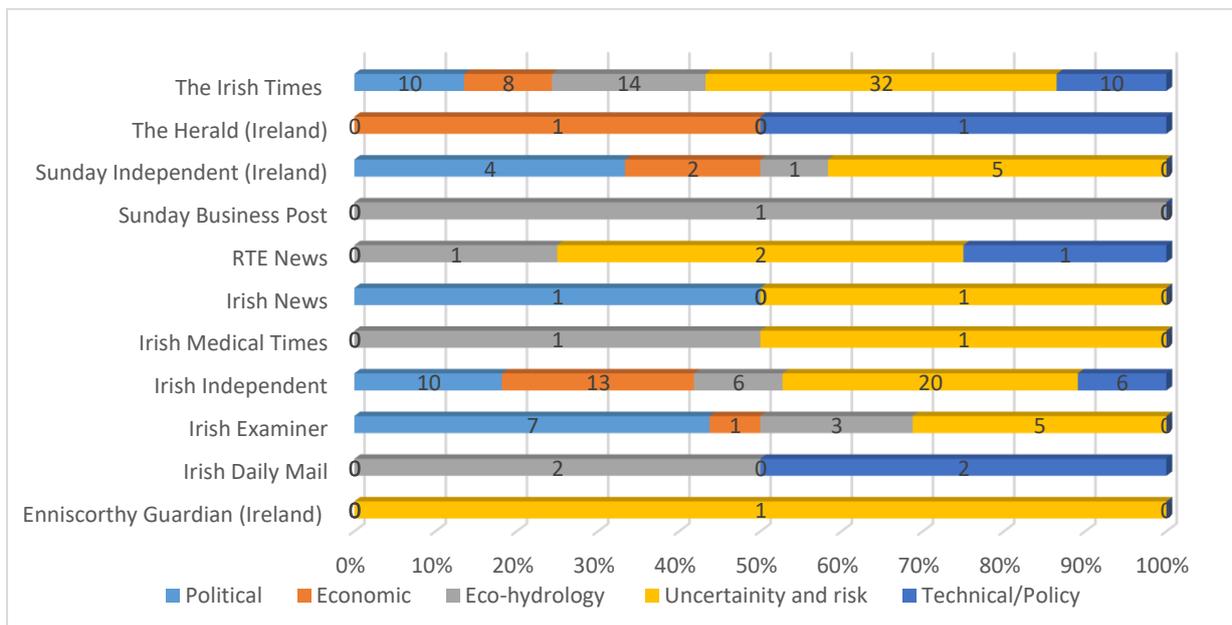


Figure 9 Percentage score of the total number of stories reported by various newspapers under each frame

Interestingly, the content, 23.13% (n=62) of all stories reported by Irish newspapers under the search keys was predominately outside Ireland. These stories focused on the impact of drought in countries like Kenya, Zimbabwe, the Sahel regions of Africa, flooding in Mozambique and bush fires in Australia and other environmental concerns in the USA. The RTE News – the national news service of the ROI carried the majority of these stories. Though these stories were filtered out (Appendix 1), it affirms previous studies that shows developed countries

emphasise more on climate change impact in developing countries than portraying climate crises in their own backyard (Tavares et al., 2020; Vu, Liu & Tran, 2019).

### 3.3.2 Organisational type of typological frame

Key stakeholders argued that concerns over water and climate change in recent times have become a matter of public concern and not just a political decision to be made vis-à-vis politicians serving as principal actors in matters of the environment, particularly on water resources and those issues around it. Key stakeholders made reference to some factors influencing the limited political involvement in water related matters in 2018 and 2020.

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*“And I think politicians are beginning to get more and more aware of it and aware of the consequences. And also, they're beginning to understand how climate change is a threat to all that. So they're recognizing that we need to undertake action. They have passed a Climate Action Plan, which is really good, very comprehensive. And the new government has a program for government which has a lot of climate actions in it, not just in terms of reducing carbon emissions every year, but also in in better preparing the country for the effects of a warming world and also they have committed to achieving net zero emissions by 2050.....And so therefore, there, there is consensus across a whole variety of parties on what needs to be done. And there's been some very good reports done by the climate committee in the Irish Houses of Parliament at all. And they've also analysed ledges key legislation, climate legislation, including the climate bill, which is due to be passed in the next few months.” (RI 4)*

*“So again, that will place more demand on water resources. So you know, they need to have better long term vision. But I think the interesting thing in the last two years is that politicians of all political persuasion, have understood the risk that's coming from climate change much more. And they've also acted together in responding to that there's almost all party consensus on that we need to do this thing together. And I don't think it will be implemented properly unless they act together. So they are key part, a key player in trying to bring about big change and at give us any chance to hold the rise in temperature, and all the impact impacts that are has including on water quality”(ROI 3)*

*“Water is a bigger issue for TDs, because they're their constituents are telling them about dirty water or low water supply or whatever it might be. I think the conversation around water quality in Ireland has been distorted by the water charges controversy again, because the idea of charging for water is seen as so politically toxic, now that it's very unlikely to come back on the agenda over the next and treats five years if even then, at two. I personally would be in favour of water charges. But I think we're at a stage now where that's very unlikely to happen in in the immediate future. I think the only thing that could shift that would be if we were starting to have these Issues of pollution and water shortages every year in the major urban areas. And it sorts of scared people into thinking” (RI 03)*

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This shows there is still a strong political interest in water and issues that affect its quality and supply, but politicians did not want to talk openly about it as Table 6, on the number of organization found talking about water and drought events from 2018 to 2020 suggests. Research-based institutions including the EPA, Science Advisory Council, An Fórum Uisce and the Intergovernmental Panel on Climate Change (IPCC) were found to be communicating more in the media space, followed by commentaries/ editorials from environmental advocates such as Professor John Sweeney and other sector experts. Other governmental and non-governmental institutions including Sustainable Nation Ireland, Met Éireann, Bord Bia, Climate Action Committee, Climate Change Advisory Council, Farmers Union and Irish Water also made

several pronouncements on climate change and water resources in the years under review. Politically, the Green Party were the most outspoken among all other political organisation. The party made constant calls on the government to consider its climate actions and projects in the water sector, including the €1.3billion Shannon to Dublin water pipeline to ensure continuous water supply amidst extreme conditions such as storms and drought conditions (Moran, 2020).

Table 6 Organisational type of typological frame

<b>Organization</b>	<b>Count</b>	<b>Percentage</b>
Political parties	16	9%
Research Institutions/Academia	46	27%
NGO/Business association	31	18%
Government Agencies	36	21%
Environmental/Editorial	43	25%
<b>Grand Total</b>	<b>172</b>	<b>100%</b>

## 4. Conclusion and points for policy recommendations

This review of Irish Water's communication and newspaper coverage on drought and water availability and the public's comments on water conservation messages have provided useful insights into how water availability was communicated during the 2018 and 2020 droughts in Ireland. As drought events become prevalent, continuous public education, and awareness on drought events and their impact on water resources are needed to promote home water conservation efforts. This should be driven through a collaborative approach involving Irish Water, the media, policymakers and, above all, the Water Forum.

It is hoped the recommendations made here, for policy consideration, will enhance communication on drought and water availability before, during and after drought events in Ireland.

- Irish Water communication strategy should offer the public a chance to interact and to have a say in conservation measures and actions by improving its responses to public queries and comments on social media. A toll-free number for the public to report suspected water-related issues like leakage or excess usage is required. Enabling a two-way communication approach would improve consumers' engagement as advocated under Article 14 of the Water Framework Directive on public engagement and involvement (European Union, 2000).
- A consolidated National Integrated Drought Information System is needed. This should coordinate, monitor, forecast and help plan and inform regional, county and local levels of drought issues and should serve the general public, stakeholders, policymakers and the media. Such an information system should be managed by the EPA given their experience and vast data repository. The national integrated drought information system should also be accessible online, user-friendly and designed to provide actionable, shareable and easy to understand information and visuals/maps that highlight present and historical drought conditions across different parts of the country. It should also provide disaggregated data on the impact of all types of drought on other sectors of the economy, such as agriculture, manufacturing and production etc. and should also contain a learning and research tab where one can get basic information about drought, the latest research and information, and personal measures the public can take to conserve water and adapt to drought conditions.
- A national drought plan that examines drought governance, preparedness, responses and recovery to bolster adaptation and mitigation while enhancing resilience in the water sector to meet drought-driven water scarcity situations is also required. The process towards the plan should be led by An Fóram Uisce and developed to meet regional and local needs with the involvement of local authorities. The plan should be statutory and integrated into broader river basin management plans and national development

frameworks. It should also comprehensively spell out all institutions' actions, roles, communication channels, and overall responsibilities.

- Regular media (i.e. print and electronic) coverage of drought events is needed to increase public interest and conservation action. As a link between policymakers and the public, the media should publicise government policies, plans, and interventions relating to the water sector, drought and climate change effort. Having a constant media spotlight on Ireland's progress regarding drought resilience will impel policymakers to remain committed to climate efforts in general. The media should also continuously engage the scientific community to increase drought awareness and simplify discussions around drought and water resources. An increased media attention on drought events would influence behavioural changes towards water conservation and national policies towards drought mitigation and adaptation.
- Environmental interest institutions should see drought communication as an emergency that requires collaborative efforts in promoting public awareness. Irish Water should not be left alone to carry the task of communicating to the public on the impact and threat of drought on water supply. Institutions like the Commission for Regulation of Utilities (CRU), Local Authority Waters Programme (LAWPRO), An Fóram Uisce, Sustainable Water Network (SWAN), research/academic institution and the local councils should help educate the public on water conservation and measures during drought periods by collaborating with Irish Water. Such collaboration can also lead to an evidence-based approach to communication backed by empirical studies.
- To ensure that drought resilience around the water sector is built not as crisis management but as a proactive approach will require active stakeholder engagement involving state institutions and the private sector, individuals, academic institutions, and financial institutions, for example, given that these stakeholders can influence proactive measures and approaches to building drought resilience. An Fóram Uisce should proactively lead national stakeholder engagement on drought and its impact on water resources and the need for conservation actions. Such engagement should be before, during and after drought to encourage commitment to long-term actions and resilience building.
- There should be prioritisation in investments and funding allocation for water-sector infrastructural development, particularly in drought-prone regions as part of resilience building. This should be matched with public education as the public feedback points to a limited appreciation for the work that ensures water supply. The amount of work behind the tap is a mystery to many of the public. An Fóram Uisce should lead this public awareness campaign and education at the national level.

- As a statutory body committed to facilitating stakeholder engagements on all water issues in the ROI, An Fóram Uisce should increasingly subject policy makers to scrutiny by assessing their policies, plans and interventions towards the water sector, on drought and climate change efforts and make policy submission for improvement and amendments where possible.
- Considering the impact of water metering in promoting water conservation and the long-term sustainability of water supply amidst uncertainties driven by factors such as drought, An Fóram Uisce should also facilitate participatory stakeholder engagement and communication strategies that can drive a move towards achieving consensus in discussing water conservation and the climate benefits of domestic water metering.

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