Second Update of Communication, Dissemination, and Engagement Plan

Deliverable 4.8

Authors: Andria Nicodemou, Ilaria Vigo, José Luis Cánovas Zafra (Barcelona Supercomputing Center), Glen Peters (CICERO Center for International Climate Research), and Pierre Friedlingstein (University of Exeter)

This project received funding from the Horizon 2020 programme under the grant agreement No. 821003.

Document Information

GRANT AGREEMENT	821003
PROJECT TITLE	Climate Carbon Interactions in the Current Century
PROJECT ACRONYM	4C
PROJECT START DATE	01/06/2019
RELATED WORK PACKAGE	WP7
RELATED TASK(S)	T4.4.3
LEAD ORGANIZATION	BSC
AUTHORS	Andria Nicodemou, Ilaria Vigo, Jose Luis Canovas Zafra (BSC), Glen Peters (CICERO)
SUBMISSION DATE	31/05/2021
DISSEMINATION LEVEL	PU

History

DATE	SUBMITTED BY	REVIEWED BY
31/05/2022	Andria Nicodemou, Ilaria Vigo, Jose Luis Canovas Zafra (BSC)	University of Exeter (Pierre Friedlingstein) CICERO (Glen Peters)

Please cite this report as: Nicodemou A., Vigo I., Canovas Zafra J. L., Peters G. and Friedlingstein P. (2022). Second Update to Communication, Dissemination, and Engagement Plan, D4.8 of the 4C project.

Table of Contents

List of Tables

List of Figures

1 About 4C

4C, or **Climate-Carbon Interactions in the Current Century**, is an EU-funded project that aims to fill the crucial knowledge gap on carbon dioxide (CO_2) emissions, by reducing the uncertainties in our quantitative understanding of climate-carbon interactions and feedbacks. The objectives of the 4C project are to:

1. Better understand the processes controlling the global carbon cycle.
2. Develop new tools and methods to predict, for the first time, the evolution of global carbon cycle variability over the coming decade, including atmospheric CO_2, land and ocean carbon sinks, and climate response to track the overall progress towards the goals of the Paris Agreement.
3. Reduce uncertainties in climate projections over the 21st century.
4. Ensure the usability of the knowledge generated by scientific research and engage in bilateral interactions among scientists and policymakers, while also fostering the understanding of the findings for the broad society.

4C will achieve its objectives through the innovative integration of new models and a wide range of observations. It will develop systems for new climate predictions and projections from annual to centennial timescales that are informed by observations, and provide key knowledge to underpin IPCC assessments and support policymakers.

The project runs for 48 months, from June 2019 to May 2023. It should be noted that the consortium is planning to request a 6-month project extension. The communication, dissemination and engagement activities presented in this deliverable consider the project end-date to be May 2023, and activity dates will be revised accordingly in the case of project extension.

2 Purpose and objectives of WP4, and this CDEP update

Work Package 4 (WP4) is titled “Synthesis, dissemination and policy dialogue”. As such, the overall purpose of WP4 is to assess, synthesise, and disseminate the scientific findings of 4C to foster a broader understanding of climate-carbon interactions and accurate interpretation in support of scientific assessments and policymaking. WP4 builds on the findings and knowledge generated in WPs 1, 2 and 3.

This information is elaborated to make it easily accessible, and transfer it to targeted stakeholders using tailored techniques.

The main objectives of WP4 are to:

1. Develop and foster a broad range of communication, dissemination and engagement activities to facilitate knowledge transfer and support international scientific assessments, such as IPCC, IPBES, GCP, WMO State of the Climate, UNEP Emissions Gap Report, and similar assessments.
2. Enable a dialogue between the project and policymakers in order to ensure that scientific findings are accurately interpreted and utilised in the context of the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement.
3. Broaden the public's understanding of the carbon cycle and the risks of climate-carbon interactions enhancing climate change.
4. Increase the visibility of 4C and its outcomes in Europe and beyond, to support Europe's leadership in climate science.

Thoughtful and well-implemented communication, dissemination and engagement methods are key to achieving the overall goals of 4C and this WP. Ultimately, they can help facilitate real and positive project outcomes during and after the lifetime of the project.

2.1 Second CDEP Update

This document is the second update of the Communication, Dissemination and Engagement Plan (CDEP). The initial version of the CDEP was published in February 2020 (Deliverable 4.6), while the first update was provided in November 2020 (Deliverable 4.7). A final report summarising the communication, dissemination and engagement activities conducted in the project will be presented in February 2023, before the end of the project (note that the full list of Public Deliverables can be found on the project webpage).

The CDEP describes the strategies and activities planned along the lifetime of the 4C project (see Section 5). It also includes guiding information on the key messages that 4C partners should be aware of, identifies the target audiences and the channels to reach them. This plan also includes the Key Performance Indicators (KPIs) and a risk assessment.

A live version of the CDEP will be maintained in the project's shared folder (Microsoft Teams) in order to keep the plan updated and develop further communication activities to ensure that we continuously improve and enhance the WP's activities throughout the project's lifetime.

3 Definition of 4C communication, dissemination, and engagement strategies

In the context of this H2020 project, the differentiation among the communication, dissemination and engagement strategies is described below, although in practice these actions are closely linked.

Communication strategy: The project's communication strategy aims to raise awareness, create visibility, and support dissemination and exploitation by providing a strong visual identity, media tools and channels, as well as fostering linkages with other related projects and programmes. The communication strategy targets multiple audiences beyond the project's own community, including the media and general public in order to show how society can benefit from the research.

Dissemination strategy: The dissemination strategy aims to position the scientific results, tools and knowledge from the project to be usable by a range of stakeholders within the scientific community and society, contributing to the development of relevant national, European, and international policies. The dissemination strategy targets specialist audiences that may use the results in their own work, including peer groups, policymakers, industry, and professional organisations.

Engagement strategy: The engagement strategy aims to maximise the project impact and knowledge exchange by proactively engaging with groups of interest within and outside the EU, and elicit feedback from relevant actors. Engagement activities imply a multilateral conversation where the project hears, reacts and co-produces results together with engaged stakeholders.

4 Key messages

To effectively execute communication, dissemination and user engagement activities, it is essential that all 4C project partners understand the basic ambitions and expected impacts of the project. These "key messages" should be taken into account when preparing content to ensure that it aligns with these messages and creates the desired impact. Examples of the main project's key messages are presented below. These will be updated throughout the project.

Key messages related to climate-carbon interactions:

- Using multiple methods, combining observations and modelling, it is possible to better constrain the contemporary global carbon budget, and help reduce the magnitude of the budget imbalance.
- Predictions of the near-term evolution of the carbon cycle can be used to assess and improve our process understanding.

- Changes in atmospheric CO_2 are influenced by anthropogenic emissions, as well as by the intrinsic natural variability of the climate-carbon cycle system. Insufficient understanding of natural variability could generate misleading expectations of the impact of emission reductions on global warming.
- Understanding natural variability improves the knowledge of the likely outcome of implementing the Nationally Determined Contributions (NDCs) on atmospheric CO_2 concentrations, provides deeper insights on the ability to verify changes in emissions, and allows policymakers to set the right targets to achieve and verify key milestones of the Paris Agreement.
- The use of emergent constraints can help refine our estimates of the magnitude of the climate-carbon interactions, and thereby provide more robust projections of the future evolution of the carbon cycle.
- Clear understanding of climate-carbon interactions is key to ensure emission cuts deliver the goal of climate neutrality in Europe by 2050, set by the European Green Deal, and are consistent with the climate goals of the Paris Agreement.
- Adaptive scenarios, where the mitigation of emissions is revised at frequent intervals, provide better estimates of the remaining carbon budget compatible with the 1.5°C or 2°C target.

Key messages on the project ambitions:

- 4C will provide a better quantitative understanding of processes controlling the global carbon cycle, through the combination of observation- and model-based analysis of land and ocean sink variability and trends over the recent past.
- By the end of the project, 4C aims to provide robust annual to decadal predictions of atmospheric CO_2 to track the overall progress towards the goals of the Paris Agreement and inform the UNFCCC 2023 global stocktake.
- 4C will improve the understanding of land and ocean processes controlling the evolution of atmospheric CO_2 and reduce uncertainties in carbon-climate feedbacks.
- 4C will foster a broader understanding of climate-carbon interactions and an accurate interpretation in support of scientific assessments and policymaking.
- 4C will improve the understanding of the carbon cycle, and carbon-climate interactions, amongst policy makers, scientists from other disciplines, and the broader community.

Key messages on the expected impacts of 4C:

- 4C will actively work to support major international scientific assessments, such as the IPCC Assessment Reports.
- 4C aims to increase confidence in climate change predictions and projections.
- 4C will provide added value to decision- and policymakers by providing them science-based evidence.
- Our long-term goal is to sustain Europe's leadership in climate science.

5 Communication, Dissemination, and Engagement Plan

5.1 Tasks

All the activities listed in the plan are related to the WP4 work plan found in the Description of Action of 4C. These activities are framed within one of the following four tasks in the WP, with each task aimed at a specific audience:

Task 4.1: Knowledge transfer to support major international scientific assessments (lead by UEA)

This task intends to provide direct support to international assessments, in particular the IPCC AR6.

Task 4.2: Provide added value to decision- and policymakers (lead by CICERO)

This task engages with decision- and policymakers to add value by translating the emerging scientific consensus.

Task 4.3: Climate-carbon interactions for broad audiences (lead by BSC)

This task aims to adapt materials from Tasks 4.1 and 4.2 for a general audience, create outreach material and social media actions, communicate the results to the target audience and support media coverage.

Task 4.4: Communication and dissemination management (lead by BSC)

This task involves the management of the general communication tasks (e.g. creation of the CDEP). It also aims to create visibility for the project to the general public and media, design the project website and visual identity, and produce online and printed PR materials.

The lead for each task will be the main partner responsible for tracking the progress of the subtasks and the overall work performed in each task, while BSC and CICERO, as WP leaders, will ensure the linkages, timing and consistency across all tasks.

5.2 Gantt chart

A Gantt chart summarising the timing of the main subtasks of the four project tasks and defining the deadlines for deliverables (D) and milestones (M) is presented in **Figure 1**.

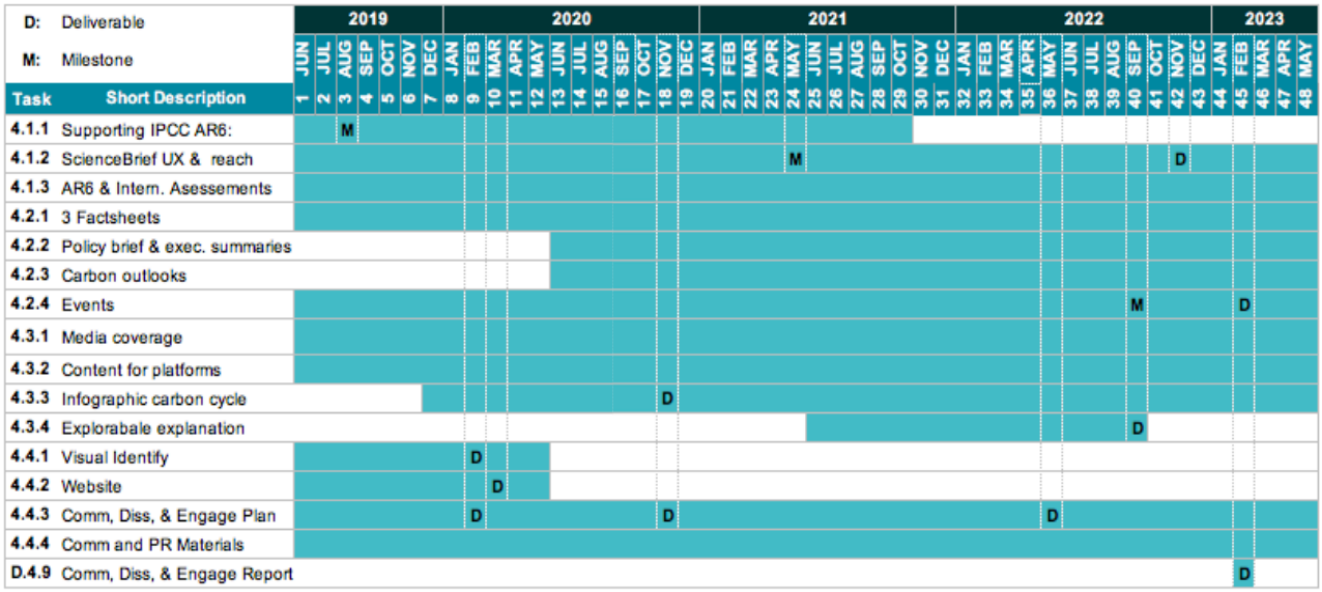

Figure 1. Timeline of deadlines for WP4 tasks, deliverables (D) and milestones (M).

5.3 Updated action plan

The detailed tasks of the CDEP for 4C are presented in **Table 1**. This action plan lists each of the subtasks of the project, defines the target audience and aims, and provides an initial suggestion of concrete actions to be carried out, together with their status and estimated deadline. In this second update of the CDEP, the status and deadlines of each task have been revised, and comments on the progress are shown.

It should be noted that this plan is conceived as a live document, thus additional actions to the initial ones have been included, and further actions will be added as the project progresses.

Table 1. Detailed Communication (C), Dissemination (D) and Engagement (E) plan. Each task is labelled according to the type of action. Please note that some of these actions may have mixed objectives and overlap.

	Task / Partners	Target group	Aim	Actions	Status / deadline	Comments
E	**4.1.1** (UNEXE, UEA, MPG, ETHZ, BSC, UBREMEN, CICERO, DLR, UOXF)	4C IPCC lead authors	Support IPCC AR6 (address issues of AR6 drafts, and identify key remaining issues that can be resolved by 4C) (*milestone 9 - UNEXE)*	• Kick-off workshop	**COMPLETED** (June 2019)	Minutes published on website (including key issues to address in 4C)
E	**4.1.2-A** (UNEXE, UEA, UBERN)	ScienceBrief users and platform contributors (particularly policymakers and media users)	Improve ScienceBrief user experience and reach (*milestone 10 - UEA)*	Deploy recommendations from the analysis of User Experience advice received in July 2019 (survey and interviews), and re-evaluate the usage of the ScienceBrief Carbon Cycle pilot after COP26	**COMPLETED** (May 2021)	Milestone 10 report summarised the key findings
D	**4.1.2-B** (UNEXE, UEA, UBERN)	IPCC authors, 4C consortium	Ensure ScienceBrief platform is up-to-date (*D4.1; UEA)*	• Work with IPCC authors to update the carbon cycle statements posted on ScienceBrief • Include all 4C results on platform	Nov 2022 Throughout the project	Ongoing
D	**4.1.3-A** (UNEXE, UEA, BSC, CICERO)	Scientific community	Support post-AR6 and other international assessments	Present 4C results at conferences and workshops (e.g. European Geophysical Union)	Throughout the project	The 4C Team is actively participating in remote and presencial events
E	**4.1.3-B** (UNEXE, UEA, BSC, CICERO)	Scientific community, particularly early career researchers	Engage the broad community (particularly early career researchers) to contribute to ScienceBrief	• Training session at next annual meeting	**COMPLETED** (June 2020)	The training session was held during the General Assembly online meeting (due to COVID-19 restrictions).

D	**4.2.1** (UNEXE, UEA, BSC, CICERO)	Decision- and policymakers, scientists	Build knowledge base of project users; present the main concepts of 4C to help understand the project outcomes	Prepare at least 3 factsheets (see expected topics in Table 2)	Throughout the project	The first factsheet discusses near-term predictions and is currently under preparation (to be published in May/June 2022)
D	**4.2.2-A** (UNEXE, UEA, BSC, CICERO)	Decision- and policymakers, intergovernmental organisations (IGOs)	Highlight all relevant results and adapt them for use by decision- and policymakers: 1. Most relevant results of project on emissions and climate-carbon interactions 2. Overview of current policies on emissions and climate implications 3. Policy recommendations	● Prepare a policy brief ● At least 3 science summaries of results	Towards end of the project June 2020 to end of project	2 science summaries have been published to date: ● Effect of COVID-19 confinement on daily global CO_2 emissions (July 2020) ● The increase in CO_2-induced global warming will only stop when humans stop adding CO_2 to the atmosphere (Aug 2021)
D	**4.2.3** (UNEXE, UEA, BSC, CICERO)	Decision- and policymakers	Carbon outlooks focused on carbon budget for recent years (T1.4) and forecast for coming years (T2.4); collaboration with the Global Carbon Budget project	● Publish annual carbon outlooks ● Related news story published on the project website each year	Autumn 2020, 2021, 2022 and 2023	2 Carbon Outlooks have been published to date (Dec 2020 and Nov 2021), along with related news articles and social media campaigns
E	**4.2.4-A** (UNEXE, UEA, BSC, CICERO)	EU policymakers	Communicate key findings to policymakers and discuss their perspective and goals	Participate in events to present key 4C findings: ● UNFCCC intersessional meeting (Bonn), or ● COP each year ● Other relevant events	May/June Nov/Dec	Participation in COP25 (Nov 2019) and COP26 (Nov 2021) and UNFCCC intersessional meetings (online and in-person). Earlier conferences postponed as a result of COVID-19 restrictions. Likely involvement in COP27 (Nov 22).

E	**4.2.4-B** (UNEXE, UEA, BSC, CICERO)	EU and national policymakers	Briefings around emerging topics from 4C (T4.2.1 and 4.2.2); help the interaction between scientists and stakeholders, exchange ideas	• Workshop in Brussels (*milestone 11*) • Publish workshop minutes • Organise or co-organise other briefings • Summary report on engagement with policy makers (*D4.2*)	Spring 2023 Spring 2023 Throughout the project Feb 2023	Plans are currently underway for the workshop in Brussels, expected to take place together with the final General Assembly.
C	**4.3.1** (UNEXE, UEA, BSC, CICERO)	Media outlets and journalists	Identify emerging news stories and encourage their media coverage	• Press releases and direct contact with journalists	Throughout the project	Press releases are produced by the institutions of the involved researchers to promote 4C-funded studies (see Annex 2 for press-release questions).
				• Rapid Response Review report, and statement added to ScienceBrief "*Critical Issues in Climate Change Science*"	Throughout the project	To date, 6 briefs with 3 reviews have been published (https://sciencebrief.org/4c)
C	**4.3.2** (UNEXE, UEA, BSC, CICERO)	General public, all target audiences, related projects	Materials adapted for a general audience (T4.1, T4.2) to promote 4C and knowledge on climate-carbon interactions; produce communication content in collaboration with other WP partners	• Prepare outreach materials (e.g. videos, opinion articles, interviews, infographics etc.) • Social media actions (Twitter posts and campaigns)	Throughout the project	Regular ongoing actions, including: • Weekly Twitter posts; campaigns to promote publications etc. • Bi-monthly website articles • Newsletter • Videos on research insights

C	**T4.3.3** (BSC)	General public, media, scientific community	Animated infographics about carbon cycle (*D4.3*): Poster to be used in press releases, reports, presentations, conferences; video for Youtube, website and live presentations	• Create a short animated video on carbon cycle (30 sec to 1 min) • Create a static poster on carbon cycle	**COMPLETED** (Nov 2020 - Animated infographic)	Animated infographic available online - a campaign was carried out to maximise its reach (website + social media), and is still regularly promoted. Creation of the poster has been deemed unnecessary, since 4C is not participating in many in-person events due to pandemic. Some flyers were produced for COP26.
D	**T4.3.4** (BSC)	EU decision- and policymakers, general public, media, IGOs	Provide context to understand the project's challenges, motivations and outcomes (*D4.4*)	Develop a web-based explorable explanation of project results and simulations (interactive application)	Sept 2022	Ongoing - the prototype and storyline of the Explorable Explanation are being finalised, to begin development in June 2022
C	**T4.4.1** (BSC)	4C consortium	Develop a visual identity for consistency of all project materials (*D4.5*)	• Design visual identity of project (logo, colours, design elements, fonts) • Design templates for letters, presentations, reports and newsletters	**COMPLETED** (March 2020) **COMPLETED** (March 2020)	
C	**T4.4.2** (BSC)	All target audiences	Website containing the project description and its various outputs, such as public reports, general information, dissemination materials and news (*D4.5*)	Develop project website	**COMPLETED** (March 2020)	Project website is now live, and can be accessed at 4c-carbon.eu

c	**T4.4.3** (UNEXE, BSC, CICERO)	WP4 partners and all 4C partners	CDEP to maximise the project impact; provide detailed information about planned activities, key messages, target audiences, communication platforms and activities, practical branding info (logo etc.), engagement actions (*D4.6-4.9*)	• Prepare CDEP (including two revisions) • Summary report on the communication, dissemination and engagement activities	Feb 2020, Nov 2020, May 2022 (updated during project) Feb 2023	CDEP - Feb 2020 First Update - Nov 2020 Second Update - May 2022 (this document)
c	**4.4.4** (UNEXE, BSC)	Related projects, EU decision- and policymakers	Produce communication and PR materials to give visibility to the project	• Roll-ups • Poster • Project brochure (online materials to reduce the use of paper)	Throughout the project	Production of promotional material was deemed unnecessary as most events took place online (due to COVID-19 pandemic). Instead, we focused on producing online informational / educational material, such as the Climate Classrooms.

- ## Communication campaigns for scientific publications

Promoting the project's research in a way that is understood by the non-specialist public is one of the main goals of the communication strategy. At the same time, the public disclosure of the results of scientific publications is key in terms of dissemination, in order to maximise the impact of the research and ensure the transfer of knowledge to the audiences that can best make use of it.

When a new paper supported by the 4C project is published and considered to be relevant beyond the technical audience, the Communication team prepares a news article for the project website (https://4c-carbon.eu/latest-news/project-news) and a campaign on Twitter. In some cases, depending on the publication, a press release is distributed to the media. The team uploads all open access 4C-funded studies to the scientific publications section of the website (https://4c-carbon.eu/resources/scientific-publications).

- ## Policy Publications

In the 4C project, policy publications can be grouped into three main categories:

- **Fact sheets** present the main concepts to understand the outcomes of 4C science. This material addresses policy makers, as well as fellow scientists.
- **Science summaries** highlight relevant results and translate them for use by decision and policy makers. They are based on project publications and public deliverables.
- **Policy briefs** present project results, similarly to the science summaries, but combined with an overview of current policies offering a set of policy recommendations.

The project has planned at least three factsheets, three science summaries and a policy brief that will be prepared towards the end of the project. An updated calendar of these policy-related publications is presented in **Table 2**. However, this is subject to some changes, especially with respect to science summaries based on publications. Moreover, new relevant topics may arise.

Science summaries, Factsheets and policy briefs are published in the “Policy Publications” page found under the menu option “Resources” in the project website (https://4c-carbon.eu/resources/policy-publications).

To date, two science summaries have been published (July 2020 and August 2021), and one factsheet is currently in preparation to be published in June 2022.

Table 2. Calendar of policy publications.

Publication type	Topic	Date (tentative)
Science summary 1	Effect of COVID-19 confinement on daily global CO_2 emissions (PDF)	July 2020
Science summary 2	The increase in CO_2-induced global warming will only stop when humans stop adding CO_2 to the atmosphere (PDF)	August 2021
Fact sheet 1	What are decadal predictions of the carbon cycle and why are they useful?	Second quarter 2022
Fact sheet 2	Emergent constraints: how can our understanding of past climate change help us refine estimates of future projections?	Third quarter 2022
Fact sheet 3	The evolution of the remaining carbon budget in the last decade: do we have more or less time?	Last quarter 2022
Policy brief	Anthropogenic emissions and climate-carbon interactions; Policy recommendations.	First quarter 2023
Science summary 3	Prediction of atmospheric CO_2 over the coming years	First quarter 2023

- ## Carbon Outlooks

Carbon Outlooks publish key 4C outcomes, in partnership with the high-profile annual Global Carbon Budget. The Global Carbon Budget has major releases in November or December each year, generally in line with the UNFCCC Conference of the Parties (COP). Many 4C researchers are also involved in the Global Carbon Budget.

The focus of the Carbon Outlooks will be on the carbon budget for the recent years (T1.4) and the forecast for the coming year (T2.4), including an assessment of past performances. This activity will be a collaborative effort with the Global Carbon Budget to ensure broad outreach. The 4C material will be integrated into the Global Carbon Budget communication material, such as key messages, PowerPoint presentation, and figure dataset. Each year the activity will be supported by a news story on the 4C website and a social media campaign.

- ## ScienceBrief

4C, in collaboration with the European project CRESCENDO (grant no. 641816), is financially supporting the initiative ScienceBrief (https://sciencebrief.org), which has been set up by researchers at the University of East Anglia's Tyndall Centre for Climate Change Research. ScienceBrief is a new platform for reviewing scientific publications that shows the status and strength of scientific consensus in critical areas such as climate change.

To date ScienceBrief has published 32 briefs with 8 full reviews. For example ScienceBrief published a rapid response review that shows strong consensus about the link between climate change and wildfire risk. The review was firstly published in January 2020 and updated in September 2020. The research, which collates over 115 articles, has been covered in the Project News section of the 4C website (https://4c-carbon.eu/newsroom/news/climate-change-increases-risk-wildfires). In addition, another review revisiting wildfires was published in September 2020. This second review focused on evidence that had been added to the platform since the first review was published. This shows how the continuously updating nature of science is reflected in a tool like ScienceBrief. These reviews were published at the news.sciencebrief.org publication site.

The 4C research feeds into ScienceBrief as new paper will be uploaded to the platform. With the IPCC AR6 approaching the end, the future of ScienceBrief is now under discussion.

5.4 COVID-19 Strategy

As a result of the COVID-19 pandemic, all related events (such as conferences, workshops, project meetings etc.) in 2020 were held online, cancelled or postponed. For instance, the 4C General Assembly meeting was held online on 23-24th June 2020, while COP26 (originally scheduled for November 2020) was held in November 2021.

Due to this shift to online events, the 4C project focused on producing online communication and dissemination materials, resources and campaigns, while the creation of materials like posters and roll-ups was deemed unnecessary. Furthermore, the 4C communication team planned various alternative online actions to promote the research and findings of 4C, such as producing short videos with 4C researchers explaining key concepts and a number of Twitter actions (described in more detail in the Website Strategy and Twitter Strategy sections). To strengthen internal communication among partners, internal seminars are also organised, during which partners can present their latest research or methods, and engage in a discussion with other researchers (more details in the Internal Communication section).

Currently, a number of events are being held in-person, along with some online events. For instance, 4C researchers took part in the COP26 in November 2021. In addition, the 4C General Assembly was held in Paris in March 2022, with >35 partners in attendance.

6 Target audiences and communication channels

To reach the expected impact of 4C's communication, dissemination, and engagement activities, some target audiences have been defined for each activity in the action plan. The full list of target audiences and the appropriate channels that will be used to reach these audiences are identified and summarised in **Table 3**.

Table 3. Target audiences and channels.

Target group	Communication purpose	Channels	Related tasks
All 4C project partners	Share knowledge and update advancements throughout the project	4C mailing lists, general assembly, emails, project intranet, internal seminars	T5.1
WP partners	Share progress and monitor completion of project tasks	Mailing lists, emails, project intranet, general assembly	T5.1
	Detect and mitigate internal risks to maximise positive impact	Video conferences, face-to-face meetings, group sessions at general assembly	T5.1
WP leaders	Coordinate the overall advancements of the project across WPs	Project intranet, Executive Board meetings, WP leader mailing lists	T5.1
General scientific community	Share scientific information and results; disseminate publications	Scientific publications (e.g. Journal of Geophysical Research, Journal of Climate), workshops, conferences (European Geophysical Union)	T4.1
Early career researchers	Provide opportunities to publish articles and share publications	ScienceBrief, workshops, conferences	T4.1
4C researchers	Promote publishing papers of latest scientific findings on ScienceBrief	4C mailing list for internal communication	T4.1
	Assist each researcher to disseminate major 4C results externally	Twitter, other social media platforms, personal emails	
Climate-carbon topic researchers	Exchange latest scientific knowledge	Emails to contacts, external mailing list, conferences, scientific papers	T4.1
IPCC authors: 4C authors, and other authors/ contributors	Share latest scientific knowledge for IPCC AR6 and synergies to 4C (ScienceBrief)	Networking activities, workshops	T4.1
ScienceBrief users	Improve ScienceBrief user experience and reach	ScienceBrief survey	T4.1
EU decision- and policy makers	Explain information and provide evidence-based recommendations for decision- and policymaking, relevant to their agendas	Personalised emails, social media, conferences, workshops, one-on-one meetings; local, national, regional and EU media and press; internal project database	T4.2, T4.3, T4.4
Intergovernmental organisations			

Other related projects: (e.g. CRESCENDO, VERIFY and other H2020, Global Carbon Project)	Enhance project clustering, and promote project synergies and joint actions	Conferences, presentations, workshops, one-on-one meetings, personalised emails, media (tagging other related projects to promote more publications)	T4.1, T4.2, T4.3, T4.4, T5.1
General public	Raise awareness on carbon emissions topic	Social media channels linking project handle @4C_H2020 & project website links; use key handles and hashtags to reach different audiences	T4.3
Large media outlets (e.g. Nature News, CarbonBrief, Vox, Associated Press)	Present significant and important new content or activity (i.e. launch, factsheet, executive summaries etc.) in press releases; op-eds for more opinion-related articles	Personalised contact, contact forms	T4.3, T4.4
EC project office and policy officer	Share periodic reports, factsheets, policy brief and executive summaries	Email, general assembly	T4.2, T4.3, T4.4, T5.2

Some of the communication channels listed in **Table 3**, for instance external mailing lists, surveys, or organisation of events or workshops, require direct interaction with individuals within the target audience. For all the activities that require the recruitment/engagement of people external to the project, 4C will follow the guidelines and best practices reported in "*D6.1 - Procedures and criteria that will be used to identify/recruit research participants*". Personal data will be handled according to the GDPR and will follow *"D6.2 - The informed consent procedures that will be implemented for the participation of humans and in regard to the processing of personal data*".

7 Website strategy

The 4C website (www.4c-carbon.eu) serves as the main communication channel and visual identity for the 4C project. This website is hosted and maintained by the Barcelona Supercomputing Center (BSC), and offers easy navigation for both the general public and consortium members' access.

The website contains the project description and general information. Throughout the lifespan of the project, the website will be actively maintained and updated to include information on the major project outcomes, including: facts and figures, public reports, presentations, news, press releases, science summaries, policy briefs, factsheets, summary pages on the project progress and achievements, list of 4C (open access) and 4C-related journal publications, and other dissemination material.

All partners should contact BSC with these outputs when completed, or in the case they wish to publish other specific items on the website. The 4C website will also include a FAQs page with questions that arise during engagement activities.

News articles, press releases or other project information will be uploaded on the 4C website at least bi-monthly. These can include the following types:

- **Project news**: News articles that discuss the latest project news, findings, events and publications are posted on the 4C webpage. These include press releases and articles discussing new studies funded by the project. Project news are posted in the dedicated page under “Latest News” on the 4C website. A total of 9 news articles were published in 2021, and 2 until May 2022.

- **Climate Classrooms**: These are articles providing an easy-to-understand explanation of the main scientific concepts behind the 4C project, such as the carbon cycle, short-term variations in CO_2, and other related concepts (see proposed topics in **Section 7.1**). Two Climate Classrooms have been published thus far, with one underway and more to follow throughout the project. These are posted in the same format as news articles, under “Project News”, and can be also found in a PDF format in Outreach Resources on the project website.

- **Other outreach material**: In order to expand the reach of 4C, other material aimed at a general audience will be prepared and shared on the website and other platforms throughout the project duration. This could include interviews or podcasts with 4C researchers, videos (such as recordings of periodical internal seminars organised to promote interaction between partners and allow them to share their research progress), infographics and other visuals.

In addition to these actions, **newsletters** will also be sent out to the 4C website subscribers at least 2-3 times per year, depending on the availability of updates on the project. Subscription to the 4C mailing list is possible through a permanent link present on the bottom left of the 4C page, and this has been promoted on Twitter and by adding a link to the top of the 4C website homepage.

7.1 Partner participation in future plans to maximise impact

During the 4C General Assembly in March 2022, the future plans of WP4 were discussed with researchers participating in other WPs.

The researchers were presented with a number of potential future actions that require their participation, and a Menti questionnaire was presented to vote the preferred future actions and encourage their involvement. The most popular options included Climate Classrooms, internal seminars, news articles and opinion articles (see **Figure 2**).

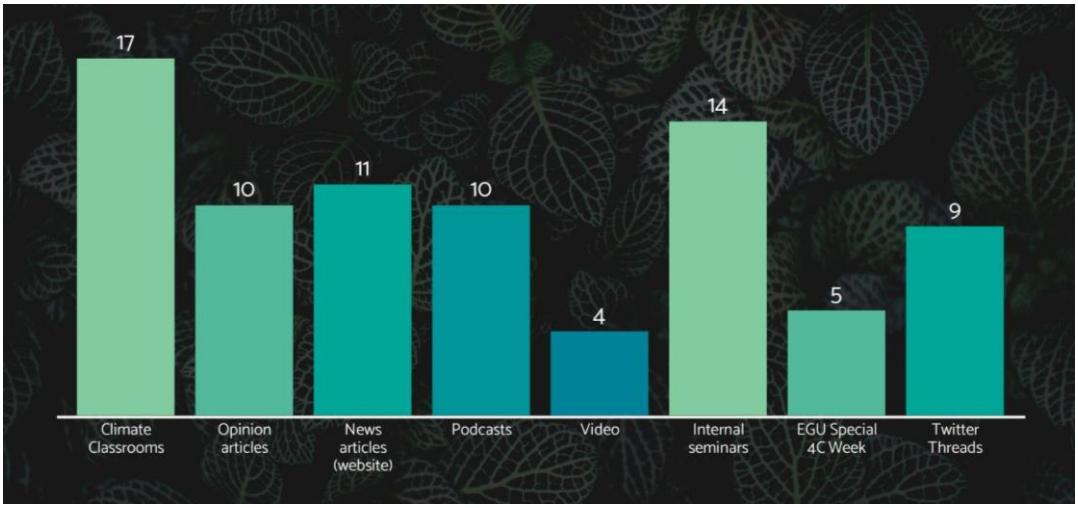

Figure 2. Most voted activities in which researchers would be willing to participate.

In addition, potential topics for the Climate Classrooms were suggested by researchers, such as TCRE, climate carbon feedbacks, internal variability and adaptive scenarios (see **Figure 3**).

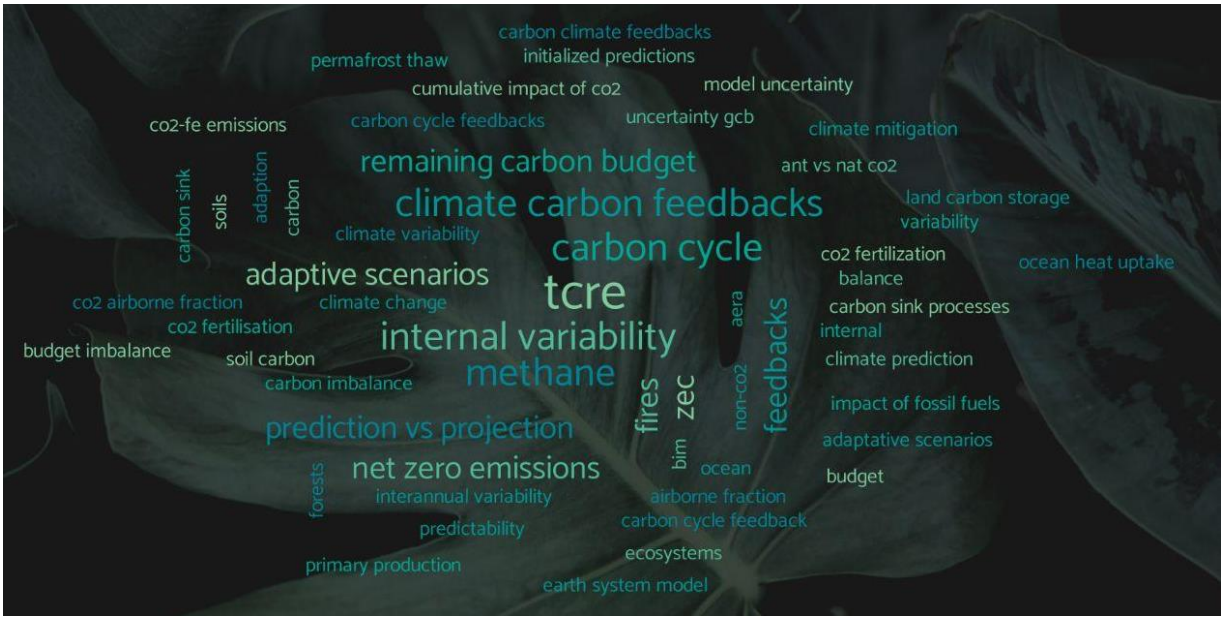

Figure 3. Proposed topics that could be covered in Climate Classrooms.

8 Social media strategy

To increase the project impact, WP4 has created the following Twitter account: **@4C_H2020**. The account is mainly maintained by the BSC, while all project partners are responsible for supporting the preparation of new content. Partners who already have a twitter account and a large number of followers are encouraged to tweet

through their personal profiles, in order to take advantage of these existing networks to disseminate important information about milestones and outcomes throughout the project.

In addition to using the project Twitter handle (@4C_H2020) in each related Twitter post (in order to monitor the platform's impact), partners are also encouraged to use handles and hashtags that are most likely to engage relevant target audiences for their post. For more information on the target audiences to consider, please refer to **Section 6** of the CDEP (Target Audiences). When deciding which hashtags and handles to use, the following potential questions can be considered:

- Who is this information most relevant to?
- Is this information connected to another project or EU initiative?
- Are there any specific groups or specific decision-/policymakers who could benefit from this information?

Initially, the posts on the account mainly involved retweets of related posts made by partners with a large audience (followers) and a basic introduction of the project. In this second update of the CDEP, the updated Twitter strategy and progress are described below.

8.1 Twitter Strategy

A Twitter Strategy has been prepared by the BSC team, which defines the frequency and type of posts, ideas for content and future actions, hashtags and accounts to tag. The aim of the Twitter strategy is to communicate and disseminate the 4C project research and findings to the target audience, as well as expand the reach of the project and communicate news on other relevant research on climate/carbon topics.

A minimum of 1-2 posts per week are published on the 4C Twitter account, including retweets of relevant posts by partners and other organisations/researchers. In addition, at least 1 thread per month on 4C-related topics is published by 4C partners from their personal account, tagging @4C_H2020, and these are then retweeted by the project account. More specific strategies are planned to disseminate important events, results and other project outputs.

The content published on the project's account include the following:

- Project news, Climate Classrooms and other articles
- Ongoing and future project research
- Project findings of the 4C project
- Rapid response reviews, posted in ScienceBrief
- Latest policy news (e.g. related to IPCC, Paris Agreement, and Global Stocktake)

- Findings of other relevant projects, initiatives and research on the carbon budget, climate-carbon interactions and CO_2, such as other H2020 projects, the Global Carbon Project etc.
- Events organised by 4C, relevant events where 4C partners are participating, or news on other relevant events and conferences taking place (e.g. COP26)
- Retweets of relevant external news and 4C partner posts
- Visuals (image + quote) based on Climate Classrooms and other 4C-related research, posted regularly with a dedicated hashtag
- Other Twitter Actions will be developed and carried out throughout the project, such as #MeetTheScientist, which will involve tweets of the profile of specific partners and the research they are doing in 4C, and campaign for the World Earth Day

In order to better manage the Twitter account, the tool Tweetdeck is used to schedule publications, monitor mentions and interactions, as well as follow users and hashtags which have a potential interest for the project. The tags and hashtags to consider are presented below.

Table 4. Twitter handles and hashtags.

Handles	Hashtags
@4C_H2020 @CRESCENDO_H2020 @che_project @CopernicusEU @WMO @UNFCCC @esaclimate @CONSTRAIN_EU @V_ERIFY_H2020 @gcarbonproject @SO_CHIC_EU	#CO2 #carbonbudget #Cbudget #Cemissions #H2020 #climate #carbonemissions #climatecarbon #climatechange #carbondioxide #carboncycle

Dedicated hashtags will be used to mark specific actions, such as #ClimateClassroom when posting about the Climate Classroom articles or #4CatEGU when promoting the 4C researchers' talks at EGU.

8.2 Progress

Since the launch of the Twitter account until May 2022, the 4C Twitter account has obtained >1,345 followers, creating a large community of people interested in the feedback between carbon emissions and climate, including researchers, politicians, journalists, students, and the general public.

In 2021, the monthly average of new followers was 47, which is a considerable number for a scientific specialised account publishing an average of two tweets weekly.

In addition, the account has been verified by Twitter (obtaining the blue badge), which means that it is an account of public interest, thus increasing its relevance and visibility.

Twitter stats since the launch of the project are shown below.

Table 5. Twitter statistics

Statistic	Numbers in May 2022
Followers	1,345 (vs. 315 in Nov 2020)
Tweets	115 (+22% vs. 2020)
Impressions	155,025 (-11% vs. 2020)
Mentions	634 (+120% vs. 2020)
Profile visits	17,559 (+308% vs. 2020)

The community of followers of the 4C Twitter profile includes recognised climate influencers (such as Greta Thunberg and Vanessa Nakate), institutions (such as the EU Commission's Directorate-General for Climate Action - DG CLIMA and for Environment - DG ENV), and specialised media (such as Carbon Brief or We Don't Have Time).

Besides the 4C Twitter account, key researchers involved in the project are using their personal accounts to share content related to 4C (with some including the handle @4C_H2020 in their personal bios).

- Glen Peters (@Peters_Glen): >44,500 followers
- Pierre Friedlingstein (@PFriedling): >3,870 followers
- Corinne Le Quéré (@clequere): >12,670 followers
- Robbie Andrew (@robbie_andrew): >5,720 followers
- Tatiana Ilyina (@ilitat): >990 followers

Since some of these researchers have a huge community of followers, the reach of 4C related content on Twitter goes far beyond the official account.

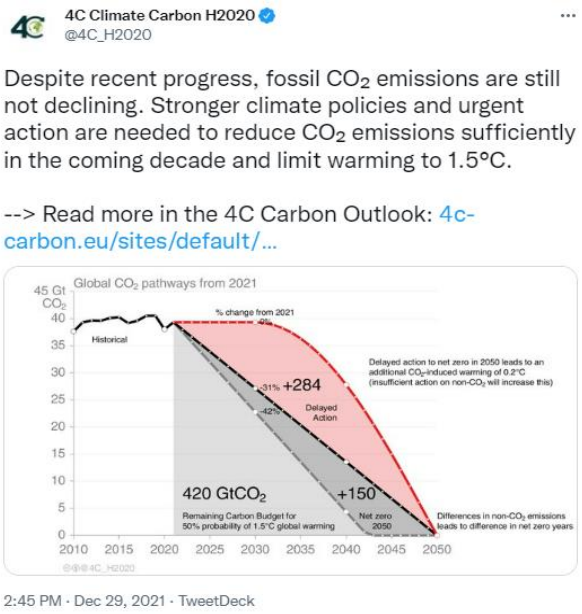

Figure 4. Twitter post with the highest impressions (13,785) and engagements (475) in 2021.

9 Internal communication

Active dialogue between project members is important to ensure effective execution of this plan. There are different procedures in place to facilitate intra-project communication.

WP4 virtual meetings are held regularly, where the project coordinator and WP4 members that are also involved in other work packages participate. This allows to have an overview of the ongoing and upcoming activities of the project that are relevant to WP4. WP4 progress, issues and next steps are also discussed.

Executive board meetings take place every few months. The project coordinator, project manager and WP leaders are attending these meetings. The agenda includes a review of the previous actions, the reporting of WP advances and any other item relevant at the time of the meeting.

Mailing lists are used to communicate among project partners, and these include the following:

- The mailing list *"4C-all"* includes all project members. After each executive board meeting, a short summary of the project activities will be shared. Publications, invitations to internal seminars and other project news are shared in this mailing list. This is also used from any member that wants to share or gather information.
- Each work package has its own mailing list (*4C-WPx*), which is used for internal WP communication and organisation to avoid communication overload for members not directly involved.

- There are also specific mailing lists for project PIs, Executive Boards members and External Advisory Board.

Internal seminars are regularly organised by the 4C project (at least bi-monthly), which are 1-hour internal online meetings that aim to improve communication and foster regular interaction among the researchers. During each talk, one or more researchers present a topic to the whole consortium and then engage in a discussion with the team. As part of this initiative, a 3-hour workshop / tutorial on the ESMValTool was held by WP3 researchers in March 2022, to help partners improve their knowledge on this tool.

10 Key Performance Indicators

The Key Performance Indicators (KPIs) set in the project are presented below:

Table 6. Key Performance Indicators.

KPI	Target	Result to date (as of May 2022)
Number of visits to project website	>2,500	8,528
Number of subscribers to newsletter mailing list	>150	84
Number of media mentions	>150	>150
Number of followers on Twitter	>500	1,345
ScienceBrief • Total evidence added • Total briefs published • Number of full published reviews • Total site visits	 1,000 25 5 >20,000	 1781 32 8 >42,000

11 Deviations

As noted earlier, the consortium will be requesting a project extension. In the case that an extension of 6 months is granted, the project will run until Nov 2023, and we anticipate changes in the following deadlines:

- D4.2 - Summary report on policymaker engagement - extension to end of project (Nov 2023)
- D4.4 - Explorable Explanation - extension to Aug 2023 (allowing 3 months for dissemination)
- D4.9 - Summary report on CDEP - extension to end of project
- MS11 - Workshop in Brussels - extension to spring/July 2023
- Final General Assembly in spring 2023 (Brussels)

12 Risks

A number of risks have been identified until this stage of the project. **Table 7** reports the risks identified with the associated assessment (risk level) and mitigation measures put in place, while **Table 8** explains how the risk level has been evaluated.

Table 7. Risks identified.

Risk	Risk Level (Low, moderate, high, extreme)	Mitigation actions
COVID-19 pandemic disrupts the organisation of events and other dissemination activities	High	A COVID-19 strategy was developed early on (see Section 5.4) mitigating the previously high risk and ensuring that the same impact is reached using virtual tools.
Low policy maker engagement	Moderate	• Carbon Outlooks released every year around the time of COP conferences, and disseminated across different platforms to reach policy makers and media. • Creation of targeted content and material (e.g. policy publications). • Participation in key events and organisation of workshops in Brussels (later in the project).
Lack of commitment to communication and dissemination from other WPs and the rest of the consortium	Moderate	We ensure regular internal communication in different forms (see Section 9).
Unable to engage broad audiences	Low	• Diverse and timely communication and dissemination activities are planned throughout the project. • Creation of outreach material targeting broader audiences (e.g. climate classrooms) • Social media actions leveraging the existing profiles of researchers in the project to ensure engagement.

Table 8. Risks matrix.

Impact	Risk			
Critical	Moderate	High	Extreme	Extreme
Major	Low	Moderate	High	Extreme
Moderate	Low	Low	Moderate	High
Minor	Low	Low	Low	Moderate
	Unlikely	Possible	Likely	Almost certain
	Likelihood			

The risks identified are more or less likely to occur, therefore they have been classified as follows:

- Unlikely = The event could occur in unusual circumstances (<10%);
- Possible = The event might occur at some point (10% - 50%);
- Likely = The event will probably occur (50% - 90%);
- Almost certain = The event is unavoidable or nearly unavoidable (>90%).

If the risk materialises the expected impact can fall in one of the following categories:

- Critical = The event disrupts the workflow preventing the completion of the task and affecting other tasks
- Major = The event disrupts the workflow preventing the completion of the task and the achievement of related objective without impacting on other tasks;
- Moderate = The event undermines the quality of the results and may delay the task;
- Minor = The event can cause minor shifts from the plan.

ANNEX 1 - Branding: logo, template, etc.

One of the first actions to start building the 4C brand was the design of the project's visual identity, which includes an official logo, a colour palette, typefaces and a number of templates adapted to each type of support material (e.g. PowerPoint presentations, deliverables, minutes etc.).

The 4C logo can be seen in Figure 5. Further branding information is available in "*D4.5 - Visual identity and project website available*". The logos in different formats (png and vectorial format) will be available for the whole consortium through the document repository.

Figure 5. Logo for 4C project.

Besides the logo, templates for deliverables, minutes and PowerPoint presentations will also be made available to the whole consortium.

Figure 6. Templates for deliverables, minutes and PowerPoint presentations of 4C project.

ANNEX 2 - Press Release Checklist

Table 9 describes a potential checklist that can be used to better assess the dissemination potential of a story. A communication officer may want to ask a scientist to fill in the table or use some of the points as a checklist when discussing communication and dissemination activities with project partners. The aim is to gain an understanding of what type of communication and dissemination action is suitable for the occasion; for example, a press release, news story, video, social media post, op-ed or another action.

Table 9. Press release potential checklist.

Novelty	Issues not previously known to the public are more newsworthy than those already known or anticipated.
	Is it something new?
Topicality and time	Current things that are happening now are on a general basis more interesting. Sometimes a current issue is new too, but not necessarily.
	When did it happen?
Prominence	News about well-known people, institutions or countries are more likely to receive media interest and coverage. This is a qualitative criterion.
	Does your story involve any prominent subject?
Conflict	Bad news gets more attention than good news. Opposition, disagreements and rivalries, especially with dramatic effects, get more attention.
	Is there a conflict in your story?
Peculiarity	Uncommon news and events out of the ordinary raise more interest. Peculiarity and strangeness are context dependent.
	Is your story uncommon?
Unexpectedness	Something that happens suddenly; it might not be rare or new, but it just happens when nobody is expecting it.
	Is there any unexpected element in your story?
Number of people affected	As a rule of thumb, the more people affected by a circumstance, the better the chances it will receive media coverage. This is a quantitative criterion.
	How many are affected?
Who is affected	It is also important who is affected by a circumstance, and who could do something about it.

	Who could or will be affected by it?
Proximity	Consider proximity to those affected. This can be either literal or cultural.
	How close to your target audience is your story?
Unambiguity	Clear-cut and definitive events which do not require previous knowledge are easier to communicate.
	Is your story unambiguous?
Consequence	Stories with potential and well-defined consequences in the near future are more attractive.
	What are the consequences, and what will happen if nothing is done about it?
Human interest	A human-interest story centred around a group of people or a person, which presents their achievements/failings/concerns in order to elicit sympathy.
	Does your story have human interest?