Knowledge Exchange Activities in the CCI Programme

# D-1 Existing activities review document

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# Table of contents

# 1   Introduction

The European Space Agency's Climate Office runs a series of knowledge exchange (KE) and communication activities that have been developed over a period of time, and in a largely ad hoc fashion. However, this has not negated their effectiveness or prevented the development of a large scientific community. The primary focus of the engagement activities is through the Climate Change Initiative (CCI), which identifies the use of Satellite Earth observation data for scientific purposes. Currently the CCI programme looks at 14 essential climate variables (ECVs), however under the CCI+ programme, another 9 ECVs will be introduced and developed. This report reviews the role that KE and communications plays in the work of the Climate Office which manages the CCI programme. As well as the role that KE and communication plays, the report critiques the mechanisms that are employed, and the success of each mechanism in engaging targeted stakeholder groups.

# 2   Methods

Table 1 identifies the methods used to evaluate and critique the key KE and communication tools used by the Climate Office.

| **Table 1. Research methods to review existing CCI communication mechanisms. These mechanisms are explained in greater detail in the SoW.** | | | | | | |
|---|---|---|---|---|---|---|
| **Resource** | **Interview CO staff** | **Analyse web stats** | **Social media interactions** | **Download stats** | **Stakeholder interviews** | **Observations** |
| Visualisations | x | | | x | x | |
| Open Data Portal & Toolbox | x | x | | | | x |
| Brochures | x | | | | x | x |
| Online activities | x | x | x | x | x | x |
| Presentations | x | | | | | x |
| Exhibition stands | x | | | | | x |
| Massive Open Online Course (MOOC) | x | X | | | x | x |
| Educational resources | x | | | | x | x |

Due to the delay in starting the project, the time needed to carry out the initial review has been limited and therefore it has not been possible to interview key stakeholders to identify their thoughts on the current KE and communication activities. This can be addressed in the third deliverable (Deliverable D-3 Knowledge Exchange Strategy Report) which identifies what needs to be done in order to meet the aims of the Climate Office in developing their KE and communication strategy.

# 3   Results from the interviews

## 3.1   Stakeholders

Fundamental to any KE and communications strategy is knowing:

- who you want to engage with
- why you want to engage with them
- what you want to engage about
- what the best mechanism to achieve this is.

At present, there is no fixed definition within the Climate Office as to who they consider to be a stakeholder, which limits what they view as Knowledge Exchange activities. Other terms used included 'end user' which suggests a more uni-directional flow of information rather than a dialogue to co-create knowledge. Whilst this in itself is not a problem, it would be beneficial to distinguish the purpose of KE and communications, and where one option is preferred over another. During the interviews it was suggested that users could be broadly divided into two groups: those that produce the data (projects) and those that consume / download the data.

In a recent workshop with Climate Office staff exploring the development of the CCI website, the following groups were identified as those that they want to engage or are currently engaging with (see Table 2).

| Table 2. ESA Climate Office stakeholder groups | | |
|---|---|---|
| **Priority level** | **Group** | **Group members** |
| **Tier 1** | | |
| 1a | Climate services | |
| 1b | Funders for ECO | ESA delegates<br>Member states |
| 1c | Non-EO climate scientists | Non-EO research community – IPCC<br>Climate scientists – non-EO experts<br>Carbon cycle community<br>Climate science research community<br>Reanalysis community |

| | | Earth scientists with an interest in climate – worldwide, not just Europe<br>Future earth scientists i.e. scientists not necessarily familiar with ESA data |
|---|---|---|
| **Tier 2** | | |
| 2a | Educators | Teachers – ahead of students<br>Teachers – elementary level<br>Teachers – secondary level<br>Teachers – university<br>Young scientists – PhD, MSc, BSc<br>Students – university<br>Students<br>Educational audience – to be decided… whoever we aim our educational material at, Visualisation tool for schools output |
| 2b | Journalists | Journalists – science<br>Journalists – non-science<br>Weather presenters |
| | UNFCCC & COP | |
| **Tier 3** | | |
| 3a | General public | App-ers<br>Crowd-sourcing contributors<br>Knowledgeable public interested in climate:<br>What is climate change?<br>How does it affect me?<br>What can I do about it?<br>What is ESA doing about it?<br>How is my tax / public money supporting this?<br>General public:<br>Who come to website via the App<br>Are interested in climate science |
| 3b | EO climate scientists | Scientists<br>App developers<br>Climate modellers |
| 3c | Space agencies | CEOS<br>NASA |
| 3d | ESA internal | ESA colleagues' divisions<br>ESA hierarchy<br>ESA staff<br>Communications office |
| **Tier 4** 🗨 | | |

| 4a | Environmental organisations | |
|----|------------------------------|---|
| 4b | Decision-makers | COP, GCOS, policymakers Climate policy community Political decision-makers Politicians |

During the interviews, it was established that to get new data out to the 'wider community', projects need to be developed that demonstrate the utility of the information, which in turn could lead to the development of new products. This would be particularly important when engaging with a broader scientific community in order to provide confidence in the products, encourage adoption of them and provide feedback to understand and inform what more needs to be done. This process of dialogue has already been successful in developing products and data sets, and will continue to be a valuable process as new ECVs are introduced.

Whilst the present process has been successful in developing an engaged scientific community, it can be seen as ad hoc, with the possibility of introducing a more systematic approach. Considering the time pressures that members of the Climate Office face, a systematic approach would be more efficient and potentially recruit more targeted researchers. This new systematic process must continue to recognise the importance of opportunistic engagement through face-to-face meetings along with possibly providing opportunities through the website for scientists to approach the office with questions and ideas that in turn could be developed into research.

An integral part of stakeholder 'recruitment' is in publicising the work, data, products and services offered by the Climate Office and ESA more broadly. This would include allowing easy access to this information, but also a celebration of the CCI's work and achievements. Social media and other online mechanisms will have a critical role in this process. In particular, the use of web stories could be used to better effect. These are described in Section 5.4.3.

The Climate Modelling User Group (CMUG) is an important stakeholder community in identifying how data and other outputs could be developed for the scientific modelling community.

Users are continually engaged during the development of the toolbox to ensure that any data or products meet the needs of the scientists. The tool box consortium strongly reflects the types of users that would employ the CCI data. Where stakeholder comments have not been implemented into the current toolbox, they can help to inform the development of new projects.

ESA's programme of post-doctoral and young graduate trainees appears to be a largely untapped network of scientists that could be used to champion the work of the CCI, and also support in the development of broader stakeholder groups. However, there is already a strong network of ECV champions that are paid to promote the use of the data to other scientists. It is not clear how much they network between themselves or if they work independently.

There is already good engagement with the media where a number of 'friendly' journalists pick up news stories, and even help to write content for the news section of the website.

Education is a key sector to engage with, but in the first instance, efforts would be aimed at university level. This is a more appropriate level at which to involve industry, and therefore more appealing to funders from the Member States who would rather see their money invested in areas which have a direct application to industries in their region.

## 3.2   Communications

The overriding opinion from the interviews is that there has been a lack of coordination, consistency and proactive engagement which needs to be addressed. Interviewees recognised that there have been some outstanding achievements, however, an integrated approach to communications and engagement would increase the impact. This could be something as simple as a more aesthetically pleasing website through to a suite of education tools for teachers. Current project structures make the development of a coherent look difficult, as the projects have a large degree of autonomy on how they engage with stakeholders.

## 3.3   Contract process

The process by which funds are awarded to project consortia provides both opportunities and barriers to engaging with stakeholders. Due to the variety of projects, there is no one single Knowledge Exchange or communication structure that, to-date, works, as each engages with their stakeholders differently.

This happens from the outset of the project, where each ECV gathers a range and depth of data from their stakeholders – some of it is detailed and some quite superficial. Under the current system, once the project has been agreed the climate office effectively loses control of the communication process. Whilst allowing the projects to dictate their own direction is seen as a good thing in terms of project autonomy, it does mean that attempts to increase engagement can be problematic. Having a single point of contact would suggest an efficient channel of engagement between the CO and the project, however, in reality the engagement process is largely dependent on the efficiency of that point of contact, which is some cases can be quite poor. This makes gathering information for dissemination to ESA's wider stakeholder community difficult and may not reflect the full extent of the work that is being conducted.

Communication and engagement appears to taper off at the end of the project life-cycle as there is pressure to start the next. The interviewees feel that there is not enough time allowed to reflect and capitalise on project outputs, and give due consideration to how the outputs can be used.

## 3.4   ESA's organisation

The organisational structure of ESA general makes knowledge exchange problematic: internal communication mechanisms do not facilitate easy exchange of information, which is exacerbated by the geographical dispersal of the offices. This is typified by the communications between Technical Offices, where information about what each office is doing is often not shared, or at least, not shared easily. In turn, a lack of sharing can engender a sense of disconnect between the staff in the European offices, with no one knowing what the others are doing. The exceptions to this are critical, cross-Office events, e.g. Living Planet symposium, where the information is often more forthcoming.

Any knowledge exchange and communication strategy will need buy-in from all parties. However, it was noted that the Technical Officers could be resistant to change. The forthcoming change in the organisation could help to overcome this, with the majority of the Technical Officers based at

Harwell, along with the new communications 'manager' who will be able to liaise directly with each other over news and events.

## 3.5 KE and communication mechanisms

The interviews identified a number of observations about the current Knowledge Exchange and communications mechanisms employed by the CCI.

The biggest strength of the current CO KE work is through its face-to-face interactions via meetings, workshops, conferences, presentations etc. It is seen as an excellent way to get messages across, using mechanisms such as the visualisation tool, videos and images that allow the science to be more easily targeted to the audience, particularly focusing the level of technical information appropiately. However, this approach is not cost or time effective given the small number of staff and the increasing demands. It has led to feelings of frustration at not having the opportunities to stop and reflect: "Okay, so what's the message I want to promote and who am I promoting it too?", and recognising that what often happens is, "Let's put a web story up on this and we'll see what happens."

An important part of the face-to-face KE process is facilitated through the project structure: using formal meetings to engage with and between project consortia, and actively involve stakeholders. These meetings provide an opportunity for ESA to 'challenge' consortia about their work, and potentially could provide a platform with which to influence their KE and communications activities. It is also an opportunity to stay abreast of developments within the project and showcase data, products and services that previously might have been overlooked.

Digital technologies that facilitate remote engagement are already being used to allow scientists to ask questions, for example, queries regarding the data portal using a wiki. There has not been a chance to evaluate this tool, though in principle any process that allows for efficient use of time and money should be considered for the strategy. The Massive Open Online Course (MOOC) is another example of how internet technology has been used to great effect to remotely engage stakeholders. This was developed as an ad hoc module, but was well-received by participants.

The CCI website is seen as key engagement tool and one that could be better exploited to communicate the work of the projects – it is the one website that the CO office control and therefore do not have to rely on others to upload content and maintain 'style'. The issue of a lack of a coordinated style and approach to the project websites was referred to by most interviewees, with one going as far as referring to them as 'stomach churning'. Whilst autonomy within the projects is seen as a positive, there is clearly an issue with how material is presented.

The role of 'web stories' on the website was seen as an excellent way to promote and highlight results from the projects. To-date, these short 'blog features' have been written as and when staff have had time, however, as has been noted, time pressures have prevented more of them from being written.

Academic engagement is also developed through the familiar channels of published papers, and though the Climate Office does not engage in research per se, journal papers are encouraged within and between consortia. Papers do get co-authored with the Technical Officers though this can be problematic given issues of copyright.

Innovative approaches have been used to develop engagement though these may not be seen as communications or knowledge exchange. Two excellent examples include the development of a cookbook and a calendar to help build better relationships within a project, which also helped to promote the projects as well. More could be made of these approaches to engage stakeholders.

With regard to the brochures that are produced for high profile events such as COP, it was felt that their purpose was more promotional rather than informative as they do not necessarily reflect the projects or their outputs.

# 4   ESA content review

- Visualisation: The CCI Visualisation Tool in its Exhibition format, and tablet App format 'Climate from Space' as well as the animations of Earth system processes showcasing CCI data.
- Open Data Portal and Toolbox: looking at how to promote them in order to attract new users of CCI data – from EO expert to wider global change scientists, in coordination with the project teams.
- Brochures: CCI overview brochure, Fact sheets, CCI project newsletters.
- Online activities: CCI website, noting the CCI project websites, @esaclimate Twitter account, news stories on the main ESA and ESA EO websites, and in relevant media.
- Presentations: overview presentations made to non-scientific audiences such as public exhibitions.
- Events: The representation of CCI at conferences and exhibitions, e.g. UNFCCC's COP, scientific conferences and presentations given.
- Massive Open Online Course (MOOC): the 'Climate from Space' MOOC, run via FutureLearn and Imperative Space.
- The prototype "Earth system stories" booklet to accompany the Visualisation Tool.

## 4.1   Visualisation
We've been unable to get this to run on a Mac so far (high spec iMac, MacBook Air, old MacBook Pro).

### 4.1.1   iPad app: Climate from space
First issue – it's a big app, 1.2 GB. While storage is becoming cheaper and more plentiful on mobile devices, that's a chunk of available space. This is no doubt due to the amount of data and the images, but it's something to consider for subsequent versions. It did keep fading out, but that could well be the ancient iPad it was viewed on – another ongoing issue with app development is keeping up to date with operating system updates and ensuring compatibility with older versions.

It's an attractive app, the opening sequence is well thought out and looks inviting. From what we've been able to see, it's well designed and put together. A few comments:

- The videos of people talking are a good idea, but a voiceover on top of a group of still images or short descriptive films might be more engaging.

- Who is the target audience for the app? Some of the text is too technical for a general or non-expert audience, but is it too simplistic for scientists?
- Why would someone come back to the app a second time – once you've read through all of the text and played with the globe / maps, is there a point in revisiting it?
- The data viewer struggled on my iPad, I was unable to compare datasets and I couldn't get to the data viewer from the home screen.

This could link with the Earth system stories booklets, and contain narratives about the impacts on people and their livelihoods as well as an explanation of the satellite data gathering.

For example, Firestorm is an excellent collection of video, audio and narrative from The Guardian – for an app, the human aspect of a story could make it more appealing. The way people use an app on a mobile device is different to a desktop, they are more likely to use headphones, so audio can be as important as the visuals.

## 4.2   Open Data Portal and Toolbox

### 4.2.1   Open Data Portal

Firstly, the subscription pop-up when you first open the data portal is very annoying, particularly as it reappears whenever you go to the page! There are more effective methods to get people to sign up. It's also not clear from the pop-up how often the news will be distributed which may put people off.

Opening content in a new window is not good practice. Current advice is to leave the decision whether or not to open a new window or tab up to the user.

**CCI Dashboard** – this wouldn't open in Safari. When it does open – in another window – the timeline needs clearer dates on it, at the top and the bottom. It's also not clear what the significance of the colours of the bars is (if there is any). When the next level pages open, all the information you need is in a single place, which is very useful. The styling needs updating, but the functionality is good. The text descriptions would benefit from editing and breaking up into shorter paragraphs to ease legibility. Again, it would be preferable for the content to load as a web page rather than a pop-up – it is easier to navigate back to a page

**CCI Search** opens as a new page – it would be more efficient to incorporate the search fields into the Open data portal page rather than separately.

**CCI FTP** needs clearer instructions on how to access it – it asks for a user name and password without any warning, or information as to where to register to create login details.

**CCI Data viewer** doesn't link to anything – this is unhelpful, it would be better not to mention it rather than build up expectations.

The **Helpdesk** facility is just an email address and doesn't need a page of its own, likewise the **Data news** subscription doesn't need to go to a separate page either.

### 4.2.2   CCI Toolbox – Cate

The recently released toolbox is a big improvement on the main CCI website – the home page has a much more modern feel and it's responsive. The only small criticism is the home page bears little

visual relation to the rest of the site, and doesn't quite fit with the corporate styling, but it's much more inviting.

It possibly needs a more explicit description of who the toolbox is designed for, fairly near the top of the page, so the curious amateur isn't surprised at the technical nature of the download options. The language may be slightly too technical, but that may be appropriate for the audience and less of an issue than on the main CCI website.

It looks to be well documented, with well signposted help and a user forum. It will be interesting to see how well used it is and by whom.

## 4.3   Brochures

**6th CCI Colocation meeting poster** was printed to be viewed using an augmented reality app – which is no longer available. While it's tempting to use new technology, it can be expensive to implement and runs the risk of becoming outdated quite quickly. It's also worth asking what a particular new app or device adds to the subject matter – does it make a point clearer, or reveal something that a more traditional display can't? If there are no real benefits, it may be better to invest the time in a format that is proven to work well.

**CCI 8pp flyer** is a good format – A4 documents don't fit easily into most bags – and the foldout is an interesting way of presenting the content. Visually, the typography and the use of large images is attractive. There are a few minor layout issues, for example, justifying text makes it gappy and more difficult to read, and the background images with the globes superimposed are too busy. The content needs livening up a little, to appeal to a broader audience – a more active voice, and a little less corporate tone would help.

**The factsheets** are also a good format for people to take away. The typography and choice of images is attractive – the factsheets are better for not having background images across the whole page. Again, there are minor layout issues that could be easily improved. The content would also benefit from a more active voice to make it a little more engaging – as the audience for leaflets is more likely to be the general public, this would help to get people interested.

**Project newsletters** are provided in a pdf format – on the website, only 15 people have visited the newsletter page since 1 January 2017. This is most likely due to there being no obvious link to the page from anywhere on the website. The most recent issue is for CCI from April 2016, while the project newsletters are all dated September 2015 and labelled as a Special Issue for COP21. There may be little benefit to such an irregular publication, and emailing out a pdf is a very inefficient method of communicating with the outside world – there is no way of tracking which articles people are reading, nor any way of knowing if people are actually opening the attachment.

It's not clear who the audience for these newsletters is – project participants, other scientists? While there is a template to help to create a coherent visual style across the projects, it's quite an advanced layout to master for someone with little experience. The writing is also of mixed quality – writing engaging news stories is a very different task to writing academic papers.

Creating individual newsletters for each project may sound like a sensible approach, but in reality, it takes time to coordinate and organise, and a single newsletter to a broader group would be more effective.

We would recommend using one of the free enewsletter mailing services – they offer customisable templates in an easy to use interface, with full analytics available for open rates and links clicked, list segmentation and a wealth of useful tools. This type of newsletter allows people to read the articles they are interested in without having to open or download a pdf. It's also an effective method of directing people to specific sections of the website – competition for people's attention is huge, they're bombarded with information and it's no longer feasible to expect people to 'find' your website. A message sent directly to a person's inbox is a more efficient way of getting information out to a willing audience.

## 4.4   Online activities

### 4.4.1   ESA CCI website

#### 4.4.1.1   Styling & content

The CCI website needs a complete overhaul, as discussed. We think the main issues are:

**Styling** – it looks very dated, the trend for left-hand navigation has generally been superseded by a top-level menu that works better across multiple platforms.

**Devices** – the site is not responsive, i.e. it doesn't scale to fit a phone or tablet. It's written in old code rather than HTML5, which means that some of the functionality may not work on newer devices.

**Content** – the content does not conform to best-practice for web writing. The main principles are:

- keep paragraphs short and jargon-free
- break up text with subheadings and lists
- put the most important points at the top
- front-load headings and subheadings i.e. the most important words first
- keep headings short and descriptive

Much of the content is too long and wordy, with elements of repetition.

**Structure** – there are too many short pages which could be combined into fewer, longer ones. With the increased use of tablets and mobile phones to access online content, people are used to scrolling down long pages rather than having to click for the next page.

**Images** – there are many excellent images available from the ESA library which are underused, and some poor quality graphs in odd sizes. Some sections of text are displayed as images – this is problematic for screen readers if there isn't a proper 'alt' description, and also if the images don't load properly due to technical reasons or user preference. Screen readers also rely on the hierarchy of heading and subheading tags in web text to navigate through content.

The site needs a fundamental rethink – a refreshed structure, edited content, a new design and a content management system that's easy to use for non-experts but can incorporate the needs of the data portal.

Keeping a website current, lively and interesting takes time and effort, and really needs a dedicated person who has editing skills and some design knowledge, or an editor and access to a designer to create images and diagrams.

### 4.4.1.2    ECV project sites

Each project having its own independent website makes little sense. While they all began with the same template, they have all evolved slightly differently over time and no longer present a coherent image.

The lack of analytics data on any of them means it's difficult to know if the site content is useful or not.

The writing style varies across the sites too, the authors all need training and guidance on writing for the web – which is a very different skill to writing academic papers.

We would strongly recommend incorporating the individual project websites into the main CCI portal, and organising training in Writing for the web for the editors from the various projects.

### 4.4.1.3    Web usage

We explored statistics from 1 January to 27 September 2017 to understand the overall usage of the CCI website – numbers of users, how they got to the website and the most popular content. There are no analytics for the individual project websites, so how frequently they are visited is unknown.

The number of sessions averages at around 60 per day, with distinct peaks of up to 200 sessions – interestingly, these peaks don't correspond with activity generated by CCI tweets or news items on the EO or CCI websites. The peaks seem to have occurred from June onwards, and could be related to internal activities or reviews.

| Table 3: Headline web statistics from 01/01 to 27/09 2017 | |
|---|---|
| **Total page views** | **27,259** |
| **Total unique page views** | **19,413** |
| **Total unique sessions** | **12,169** |
| **Average time on site** | **2 mins** |

Daily web users
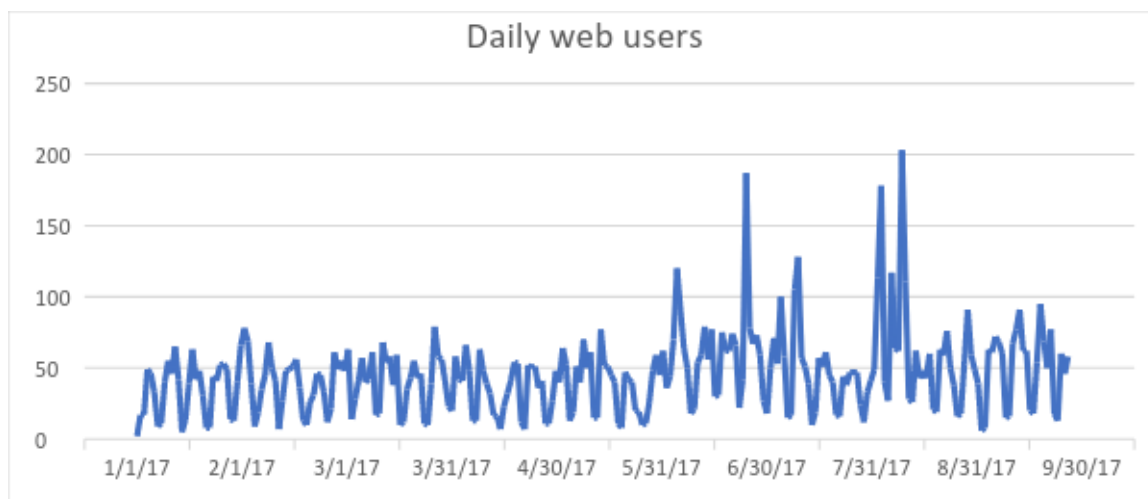
**Graph shows the number of daily users of the main CCI website between 1 January to 27 September 2017.**

| Table 4: Days with highest number of sessions between 01/01 to 27/09 2017 | |
|---|---|
| **Date** | **Sessions** |
| 10/08/2017 | 203 |
| 26/06/2017 | 187 |
| 04/08/2017 | 178 |
| 11/07/2017 | 128 |
| 06/06/2017 | 120 |
| 07/08/2017 | 117 |
| 03/08/2017 | 113 |
| 11/08/2017 | 111 |
| 10/07/2017 | 105 |
| 06/07/2017 | 100 |

The most viewed pages are documented in Table 5, with the Open data portal being the most popular other than the home page. The portal page views featured spikes in activity between mid-June and mid-July which don't appear to have been generated by CCI promotion. See Table 6 for an overview of where users found the link to the data portal.

The Vacancies page has proved to be very popular, despite only being active since early August – much of this traffic was generated through a coordinated push from CCI. Peaks in visits correspond with CCI tweets (03/08) and other social media articles, as well as with tweets from external followers such as UKCIP (10/08) and clicks from the project websites. This is a good demonstration of how effective a coordinated social media campaign can be in directing traffic to a specific page.

Other popular pages are about CCI and the projects, in addition to the news items on the top-level page. Given the popularity of the news items, it would be worth writing longer, more in-depth articles or blog posts for people to share their thoughts and opinions. Blogs also allow for comments,

which could be a good starting point for discussions. They're also a good way to get guests from outside the projects to contribute, which in turn increases potential readership.

| Table 5: Top content 01/01 to 27/09 2017 | | |
|---|---|---|
| **Page** | **Page views** | **Unique page views** |
| / (home page) | 9,655 | 7129 |
| /data | 4,338 | 2731 |
| /content/vacancies-esa-climate-office | 1,281 | 935 |
| /sites/default/dashboard/index.html | 1,252 | 1026 |
| /sites/default/searchui/index.html | 1,018 | 800 |
| /objective | 814 | 644 |
| /content/cci-information-day | 760 | 383 |
| /projects | 551 | 428 |
| /content/esa-climate-office-0 | 398 | 328 |
| /content/tablet-app | 395 | 294 |
| /content/land-cover-data | 346 | 264 |
| /content/redirect-message | 279 | 241 |
| /content/contact-us | 241 | 200 |
| /content/7th-collocation-meeting-2016 | 209 | 133 |
| /content/sign-ecv-mailing-list | 179 | 98 |
| /content/documents | 172 | 105 |
| /content/working-groups-0 | 164 | 99 |
| /content/what-ecv | 152 | 126 |
| /content/climate-space-ipad-app-launched | 150 | 128 |
| /content/cci-users | 145 | 116 |
| /content/posters-factsheets-flyers | 113 | 93 |
| /faq | 111 | 93 |
| /content/land-cover-annual-global-land-cover-maps-v207-dataset-release | 104 | 80 |
| /content/cci-toolbox-itt | 101 | 80 |
| /content/cci-data-viewer | 100 | 76 |
| /content/cci-achievements | 98 | 81 |
| /content/climate-space-—-now-available-android | 88 | 56 |
| /content/terms-and-conditions | 79 | 57 |
| /content/project-teams | 74 | 70 |
| /content/soil-moisture-dataset-release | 69 | 55 |
| /content/cci-open-data-portal | 68 | 54 |

| Table 6: Routes to Open data portal page | |
|---|---|
| Direct | 1,903 |
| Google | 1,265 |
| 192.171.139.42 (data server) | 156 |

| Twitter | 138 |
|---------|-----|

Visitors are located across the globe – the most frequent visits are from the UK and Italy, as one would expect, followed by the US, Germany, France, China, Span and The Netherlands. The visitors are quite widely spread across the individual countries and not focused on a few hotspots.

Table 7 focuses on the main referring sites, that is the website the visitor has come from. Direct links and Google searches make up the majority of the referrals – around 72%. Of the ECV project sites, Soil moisture is the most popular source, with Twitter driving the highest percentage of social media referrals.

| Table 7: Referral sites – where visitors come from | | |
|---|---|---|
| **Source** | **Sessions** | **Pages** |
| Direct | 3,794 | 2.40 |
| Google | 4,986 | 2.09 |
| Other search engines | 221 | 2.17 |
| 192.171.139.42 (data server) | 168 | 4.30 |
| journals.elsevier.com | 77 | 2.14 |
| | | |
| **Source** | **Sessions** | **Pages** |
| **ESA projects** | | |
| esa-soilmoisture-cci.org | 379 | 2.04 |
| esa-oceancolour-cci.org | 212 | 2.15 |
| esa-cloud-cci.org | 210 | 3.20 |
| esa-aerosol-cci.org | 136 | 2.38 |
| esa-glaciers-cci.org | 129 | 3.12 |
| esa-sealevel-cci.org | 112 | 3.54 |
| esa-sst-cci.org | 102 | 2.36 |
| esa-icesheets-greenland-cci.org | 65 | 2.25 |
| esa-data-cci.org | 55 | 2.31 |
| esa-landcover-cci.org | 48 | 2.17 |
| esa-icesheets-antarctica-cci.org | 39 | 2.44 |
| esa-fire-cci.org | 31 | 2.87 |
| esa-ozone-cci.org | 29 | 3.55 |
| esa-cci.nersc.no | 25 | 2.20 |
| esa-ghg-cci.org | 13 | 0.54 |
| | | |
| **Social media** | | |
| Twitter | 627 | 1.48 |
| Facebook | 133 | 1.28 |
| Linkedin | 17 | 3.18 |
| Youtube | 14 | 1.50 |

Google Analytics, which is the free package currently used to explore the website stats, is an extremely useful tool but has some limitations. We would recommend installing Google Tag Manager as a next step, which allows tracking of downloads, clicks to external web page and scroll depth as an extension to the basic analytics. In the longer term, we would suggest building a measurement model to define objectives and outcomes for the website to evaluate the statistics against. The lack of an analytics function for the individual project websites does mean there are gaps in the analysis, but it's probably not worth setting up on all of the sites in the short term.

### 4.4.2 Twitter

Twitter is the most effective of the social media channels for communicating directly with users, and allows for a range of interactions, from linking directly to content, to beginning conversations. @ESAclimate only follows 157 users, but has 2,266 followers. Some of the followers are inevitably businesses or individuals looking for 'likes' or follows, but the majority are genuine people, projects or organisations who are interested in some aspect of ESA CCI. When someone retweets or comments on a particular tweet, the 'reach' of that individual tweet expands to include that person's followers, hence the pressure to gather more followers.

While Twitter is a very useful platform, it can be very time consuming to manage. There are a number useful scheduling tools, apps to track multiple accounts and interaction types, and well-written guides that can help. It is essential to consider which and how many of the social media platforms to engage with, and create a communications plan to define how all of the various media support the main messages for the project.

| Table 8: Twitter impressions & engagements | | |
|---|---|---|
| **Most impressions / views** | | |
| 28/03 | 10,373 | Climate data at your fingertips; have you discovered our Climate from Space tablet app yet? |
| 03/08 | 9,265 | Do you want to come & work with us? Two jobs are open now in oceanography & science communication #job #climate |
| 09/05 | 7,491 | Average surface air temperature maps put April's temperatures in context - it's been warm! Particularly in the Arctic Ocean. |
| 07/06 | 7,455 | Paper: how CCI satellite data can improve our understanding of permafrost extent & degradation in a changing climate |
| 03/08 | 6,897 | Entries are open for the @royalsociety scientists' photo competition. Would it count if @astro_timpeake sent this? |
| **Most engagements – all types** | | |
| 10/04 | 328 | New annual CCI Land Cover data set available, 1992-2015 #climate |
| 28/03 | 311 | Climate data at your fingertips; have you discovered our Climate from Space tablet app yet? |
| 03/08 | 269 | Do you want to come & work with us? Two jobs are open now in oceanography &amp; science communication #job #climate |
| 21/02 | 167 | ESA adopts Open Access policy for its images, videos and some data - get exploring! |
| 07/06 | 156 | Paper: how CCI satellite data can improve our understanding of permafrost extent & degradation in a changing climate |

| Most retweets | | |
|---|---|---|
| 02/06 | 35 | Interested in the data that backs up our knowledge of climate change? Free & open access to ESA's CCI programme here |
| 03/08 | 31 | Do you want to come & work with us? Two jobs are open now in oceanography & science communication #job #climate |
| 09/05 | 30 | Average surface air temperature maps put April's temperatures in context - it's been warm! Particularly in the Arctic Ocean. |
| 10/04 | 24 | New annual CCI Land Cover data set available, 1992-2015 |
| 07/06 | 22 | Paper: how CCI satellite data can improve our understanding of permafrost extent & degradation in a changing climate |
| **Most link clicks** | | |
| 28/03 | 121 | Climate data at your fingertips; have you discovered our Climate from Space tablet app yet? |
| 10/04 | 108 | New annual CCI Land Cover data set available, 1992-2015 |
| 03/08 | 101 | Do you want to come &amp; work with us? Two jobs are open now in oceanography & science communication #job #climate |
| 05/04 | 48 | New global CCI Soil Moisture data set available, 1978–2015 with new sensors: |
| 21/02 | 44 | ESA adopts Open Access policy for its images, videos and some data - get exploring! |
| **Most likes** | | |
| 03/08 | 38 | Do you want to come & work with us? Two jobs are open now in oceanography & science communication #job #climate |
| 03/08 | 35 | Entries are open for the @royalsociety scientists' photo competition. Would it count if @astro_timpeake sent this? |
| 28/03 | 25 | Climate data at your fingertips; have you discovered our Climate from Space tablet app yet? |
| 02/06 | 25 | Interested in the data that backs up our knowledge of climate change? Free & open access to ESA's CCI programme here |
| 10/04 | 21 | New annual CCI Land Cover data set available, 1992-2015 https://t.co/B90MrXQgJV #climate https://t.co/4bZAbPhtlc |

### 4.4.3   News on ESA & ESA EO websites

The news articles on the main ESA website are well-written and researched – and are exactly the sort of news story that should be featured on the ESA CCI pages. This would provide an opportunity to write more in-depth articles on specific topics that are relevant to the CCI programme but are less likely to be featured on the main ESA or EO sites. Once the articles are live, they can be easily shared through newsletters and social media.

News on the NASA Climate website is a good example of how to present and write news stories.

## 4.5 Presentations

The generic presentations have a well-thought out Master, but the slides have been tinkered with and need to be tidied up and made consistent. A style guide attached to the master files would help to remind authors of the best approach. The graphs used are often low resolution screen grabs from a range of sources, and could be much better presented with a more coherent approach to the look and feel. Photographs should be good quality, high resolution and most importantly, correctly attributed.

Many of the slides contain too much information – we would suggest limiting each to either text or an image rather than attempting to squeeze both onto a single page. Taking the audience into account is essential – some of the more technical slides may need more explanation for a general or non-expert audience.

As has been suggested, a library of generic slides with annotations and appropriate graphics would be a good starting point for most presentations that the team are likely to deliver. These will need to be updated occasionally to reflect new satellites and product developments.

There doesn't seem to be a way to incorporate presentations on the website currently – they can be a useful reminder for people who attended a talk, but also for background information. We would not recommend filming an entire presentation for use online – the lighting and sound are rarely good enough quality, and few people have the time or patience to watch 60 minutes+ of poor quality video. Slideshare is a straightforward method of sharing presentations, and allows a clickable version to be embedded into the website. The slide notes are incorporated beneath, and a pdf version can be downloaded if needed.

[Example of a Slideshare presentation](#) embedded into web page.

The short, ESA-produced videos are excellent, however, about the right length, clear and well produced. Short (less than 5 minutes, but ideally less than 3 minutes) are easier to share on social media and are generally more user-friendly.

## 4.6 Events

As highlighted in the interviews, face-to-face events provide an excellent opportunity for Climate Office staff to directly engage with target audiences, explaining and promoting the data products and services of the organisation. From two events that have been observed [International Forum of Weather and Climate and the European Researchers' Night], there is a lot of interest generated by visually demonstrating the tools and actively engaging with the audience. Projecting the visualisation tool on to a large screen proved beneficial in attracting initial attention, with the iPads then providing a way to demonstrate the data. At both events, promotional material was offered [stickers, brochures, post cards, USB cards] though it was not easy to let the audience know they were free and they could be taken when you were talking to another person about the data. As such most of the material was brought back. Therefore, consideration should be given as to how to promote the promotional material or to consider which, if any, should be used at different events. It should be noted that younger audiences liked the USB cards whilst older liked the post cards. More could certainly be made of the satellite images as part of the promotional material.

The holographic bookmark is an excellent idea and easy to transport, as are the memory sticks. Merchandising is a nice to have, rather than essential. We would suggest limiting the scope to two or three products that are useful and whose production have limited impacts on the environment. There is a lot of unnecessary cheap 'stuff' produced that has little or no use, and contributes to carbon emissions and raw material depletion either in production or through transporting the goods.

## 4.7 Massive Open Online Course

From what is available to view (the course isn't currently running), it looks interesting. We've only been able to access the introductory pages for each of the course sections – the text could be slightly more inviting, but the videos are well written and produced.

With a targeted publicity campaign, this could be a popular short course as an introduction to the data portal and other resources.

## 4.8 The prototype "Earth system stories" booklet

Cat's ideas for using interesting events to explain how the earth system works and why the data is useful, is exactly what we need to focus on – people connect with news stories and are more likely to understand a concept if it's explained in the context of an event they can see or experience.

# 5 Conclusion

This report provides an overview of the current process of communication and knowledge exchange in the CCI programme. Through interviews and review of resources it is clear that there is a strong scientific stakeholder community using a range of mechanisms to engage, understand and utilise the science. Ongoing dialogue through the project cycle allows for products and services to closely match stakeholder needs, whilst giving them a sense of ownership. However, there are limitations to the current process in particular that they are time intensive and lack consistency in look, feel and approach. The problem of consistency is accentuated by the fragmented nature of the structure where ESA offices are geographically dispersed and projects given autonomy over their own KE and communication processes. This structure also makes it problematic to coordinate news stories and information critical for ongoing social media engagement.

Whilst it has been valuable to interview members of the CCI staff and review current resources, it would also be useful to interview current stakeholders and other ESA staff to understand their perceptions of the knowledge exchange and communications. It was also not possible to access all the resources such as the MOOC as they were not available at the time of writing, however, these can be reviewed and commented on when considering where the strategy needs to be developed in the next report.