The Copernicus Climate Change Service: perspective from the insurance industry

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Coordinated and managed by the European Commission and implemented in partnership with member states as well as a range of European agencies, Copernicus is a program providing a range of service (land, atmosphere and ocean monitoring, emergency planning, security and climate change) based on both satellite and in situ observations.

The Copernicus Climate Change Service, or C3S, is progressively coming online and will provide access to information for monitoring and predicting climate change, for the specific purpose of supporting the development of adaptation and mitigation strategies. It will provide access to a range of climate information, such as temperature increase, sea level rise, ice sheet melting, warming of the ocean and drought events, to name just a few, but also a range of standard tools and functionalities, which will allow users to transform climate data into actionable information.

Through this service, a vast amount of global data originating from various sources are made **freely available** in order to support service providers, public authorities and other international organisations in their daily operations. One of these services, the Copernicus Climate Change Service, which is run by the ECMWF, focuses specifically on the environmental and societal challenges associated with human-induced climate changes. The Copernicus Climate Change Service, or C3S, is progressively coming online and will provide access to information for monitoring and predicting climate change, for the specific purpose of supporting the development of adaptation and mitigation strategies. It will provide access to a range of climate information, such as temperature increase, sea level rise, ice sheet melting, warming of the ocean and drought events, to name just a few, but also a range of standard tools and functionalities, which will allow users to transform climate data into actionable information.

Meeting user requirement is a key concern in the development of the C3S. As such, ECMWF, who oversees the development of the C3S, launched a large consultation campaign in May of 2016, focusing specifically on six economic sectors: agriculture & forestry, coasts, health, infrastructure, tourism and **insurance.** This European-wide consultation, which was completed last summer, was conducted by 11 institutions spread across six European countries, with expertise in both climate and user engagements. The exercise was intended to establish an inventory of existing needs and user requirements in terms of climate information, identify gaps and deliver recommendations on future needs to support better decision-making in these different sectors. In the context of this user engagement exercise, the institutions engaged and interacted with a wide number of European organisations, including Consorcio de Compensación de Seguros, through surveys, workshops and one-on-one interviews. To support this consultation, each of the six so-called sector leaders partnered with an industry partner (so-called sector champion), whose purpose was to facilitate the entry to each of the different sectors, and promote and encourage the participation of the relevant societal actors in the consultation process. An overview of the user engagement process is depicted in figure 1. The insurance sector consultation was led by Dr. Louis-Philippe Caron (Barcelona Supercomputing Center), while the role of sector champion was filled by Dr. Tom J. Philp (XL Catlin). Here, we provide a brief overview of the C3S along with some of the insights shared by the insurance industry representatives who agreed to participate in the consultation.

The Climate Data Store: the essential component

Unlike many of the other sectors addressed by the C3S, the insurance sector can often rely on scientists to provide them with actionable climate information. In fact, it could be argued that, within the insurance industry, cat-modelers already act as bridge between climate data and decision making. Thus, the main interest of the majority of insurers who participated in the exercise was the provision of reliable climate data, the manipulation of which has traditionally been performed locally. In the C3S, the provision of climate data will be done through a specific access point, the so-called Climate Data Store.

The Climate Data Store (which is somewhat of a misnomer since data are provided for free) will be the backbone of the C3S: in addition to in situ and satellite data, the Climate Data Store will also provide global and regional re-analyses of the Earth's climate as well as a range of quality controlled climate projections and seasonal predictions performed with state-of-the-art climate models. As there are multiple data suppliers, the data are transformed by C3S to a common format to ease the use for developers as well as expert and non-expert end-users. The Climate Data Store will also have different entry points, each reflecting the various degrees of expertise of the users, ranging from raw data at the bottom layer, to Python workflows and JavaScript application code in the upper layer of the store. For example, one dataset that will be made available is the 5th generation of ECMWF global re-analysis, ERA5, which will cover the period 1979 to present, at 31 km resolution, with hourly outputs and uncertainty estimates. ERA5 will also provide near real time updates, with a delay currently estimated to be around 5 days.

One of the priorities of the consultation exercise was to identify the data that should be included in the data store. Not surprisingly, most of the data that were highlighted by actors in the insurance industry could be associated with extreme events, in particular: tropical cyclones; flooding events; severe convective storms (including hail and tornado); European windstorms and droughts.

Similarly, most of the suggested improvements in regard to the provision of climate information currently used by the insurance sector could be linked to these perils. Some of the most recurrent suggestions in terms improvement were:

1. Increase spatio-temporal resolution and/or provide downscaling tools to increase resolution of data. Similarly, some users requested guidance, based on currently accepted scientific consensus, as to the upper limit until which a given dataset could be downscaled and still provide useful information.
2. Extend temporal coverage of dataset back in time, possibly including paleo-data.
3. Provide tools that would reduce the amount of data being manipulated locally in order to reduce download time and local computation.
4. Improve access to some climate information collected on the European continent. Radar data was flagged as being particularly difficult to obtain, making risk estimation of European convective storms particularly challenging.
5. Allow the use of shape files, and provide data in, or tools to convert data to, GIS format (e.g. maps visualizing the return period of certain perils).
6. Make data compatible with loss models.

Interestingly, this last aspect is already being integrated in the Wind Information Service (WISC) component of the C3S. This contract intends to provide a transparent and authoritative dataset to improve the understanding of windstorm risk over Europe. As such, it is developing a catalogue of past storms and storm tracks at high resolution from observations and re-analysis, which will provide, amongst other things, 3-second wind gusts and maximum surface wind speeds. The wind-storm service makes use of ERA-Interim, ERA-5 and ERA-20C, tracking the storms directly in these reanalyses, but also provides additional spatial downscaling. WISC will also provide an event set based on ensemble runs derived from the UPSCALE climate model, providing 130 model years in current climate conditions. It is hoped that the storm footprints will eventually be combined with an exposure/vulnerability component in an open source Loss Modelling Framework (OASIS) to assess potential losses.

The wind-storm service is a practical example of a service developed by the C3S, but it is by no means the only one. One of the proof of concept service developed for the energy sector (European Climatic Energy Mixes) allows the creation of homogeneous energy demand graphs for a given country using historical information and predictions for the future, for both hydro and wind power. Another such service is UKKO, which produces industry-tailored seasonal forecasts for the wind energy sector. These various data-to-application products are not the main products of the C3S, but rather tools used to determine what is useful and what is required by various users, and are intended as benchmarks for best practices. The C3S doesn't aim to be a provider of services addressing every possible market niche available, but rather a place where it is possible to access sectoral relevant information of the highest possible standard, which can then be used to develop downstream services addressing market niches.

Some target niches, which would fill existing gaps within the insurance industry, were identified during the user engagement exercise. One such niche is the validation of private vendor catastrophe models. Providing in-house scientists with data and easy-to-use tools to compare the cat-model outputs would better allow them to validate those models and allow individual insurers to form their own internal view of risk, which is a requirement imposed by Solvency II. Similarly, the emergence of microinsurance offers another niche that could potentially be filled by the C3S. In many emerging countries, where there are practical limitations to the implementation of traditional indemnity-based products, insurers have to rely on weather-based parametric insurance products wherein payout is determined not through a claims made & validation process, but from an index value derived from climate variables such as precipitation and surface temperature as measured from satellite and in situ observations. Thus, by providing quality-controlled climate information, free access and easy to use functionalities, the C3S offers a platform to the microinsurance industry on which to develop new parametric products which the insurer can rely on to determine whether their customer should be compensated for a loss or not.

Wait, but what about climate change information?

As mentioned above, most of the interest of the insurance sector in regard to the C3S was in the supply of observational and reanalysis products and, generally, very little interest was shown for climate projection data. The time scale covered by these climate projections (>30 years) was not seen as relevant for current insurance industry activities, even on strategic levels. To this point, the feedback mostly suggested that climate projections greater than ~10 years from present were largely too abstract to be actionable in the industry. Furthermore, the climate change induced impacts on the variables that were identified as concerning to the insurance industry (i.e. extreme events such as Tropical Cyclones, flood etc) at the time-frame of <10 years were perceived as being relatively small, at least compared to inflation and economic & social changes which must also be factored in at this time scale. On top of this, the perceived uncertainty of the climate projections on extreme events specifically was highlighted as an issue that would restrict the potential use of any projections by the industry. Finally, the underlying philosophy behind insurance pricing has traditionally been to analyse risk from as robust and lengthy historical records as possible, while on occasion adding in loadings/reductions for near-term trends/fluctuations in the risk. Changing these practices to incorporate climate projection data, particularly while the perception exists that the real-world, <10yr change is small while the uncertainty is high, would be no mean feat, especially if the currently held perceptions of the industry are proved to be true.

Despite a general lack of interest for climate change data, some insurance actors nonetheless identified some use for the climate projections provided by the C3S. It was argued that these simulations could be used to identify new emerging risks and new potential vulnerabilities due to changing conditions, which could then lead to new insurance products. And while climate projections might not be so interesting for a single insurance company, they could be used to design strategies for the insurance industry as a whole at the national and regional level, and to steer discussions and policies in order to improve governance and building planning.

Similarly, there was little interest in the use of seasonal forecast by the insurance sector, mostly due to the period covered by these products (which is too short), the timing of production (which does not necessarily coincide with the underwriting period) and their perceived lack of sufficient skill for the lead time and regions of interest. Some opportunities were nonetheless identified for the use of seasonal forecasts, in particular for agriculture insurance, where the growing season matches current forecast length, and for up or down adjustment of re-insurance based on forecasted estimation of any given peril. Seasonal forecasts were also perceived as useful for alternative risk transfer (e.g. retrocession, insurance linked securities, industry loss warranties) given that these products are not bound to a yearly contract. However, practical applications for both climate projections and seasonal predictions within the insurance sector generally remain elusive.

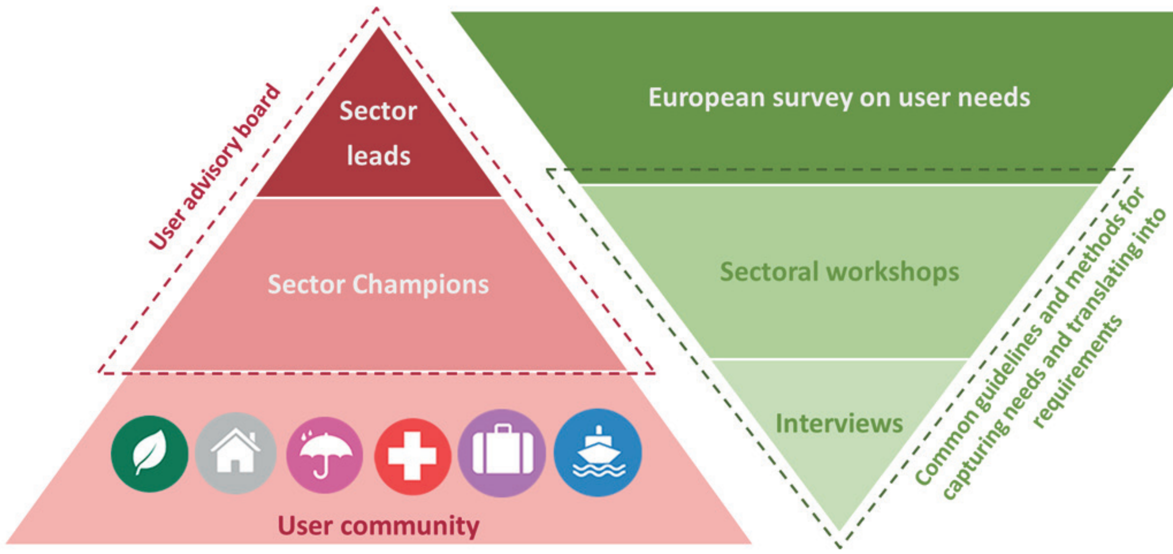

Figure 1: Overview of the user engagement process.
Source: Adeline Cauchy, TEC-Conseil.