

Visualization of Climate Change in Internet

Rodrigo Rosales González, Ana Carolina Robles Salvador

Autonomous Metropolitan University
Lerma de Villada, Edo. de México, México
r.rosales@correo.ler.uam.mx,
a.robles@correo.ler.uam.mx

Abstract

The *Climate Change* is a concept (CC) that has been changing in order determined by the incorporation of new knowledge and scientist evidence around it. Looking for effects mitigation in quality of human beings several efforts at an international cooperation scale have been made specially within the United Nations agenda. From the communication point of view, in Internet circulate many documents, pictures, drawings, infographics and simulations that represent such a problem in different grades of complexities in its accessibility. *Visualization* also is an emergent concept that has been defining its frontiers according to advances in representational computer processing of *big data* from reality combined to the necessity to understand it. This situation applied to any discipline brings about two regular study approaches: a didactic and an analytical one. So, this paper presents a methodology based on diverse artwork that traces organizational changes in the Intergovernmental Panel for Climate Change (IPCC) in up to now five informs emitted in Internet. In this way is possible to project a future scenario for visual representations and policies actions concerning CC communications.

Keywords

Visualization, Climate Change, Cybernetic Image, Digital Art, Science Communication, Sociocomplexity.

Introduction

The CC is a planetarium phenomenon which affects all living beings. If it is true that involved changes are measure in geological ages, science verify gradually more accurately that the main reason in this era is due to technological uses and its natural fossil fuel burning to sustain human society.

As well, to keep life of 7000 million human imply a massive production of food and services that exhaust and pollute finite natural reserves. [1] The CC is a concept that has come to problematize the mankind future.

Before such a big data on this issue it is an adventure to say that through art images situated in Internet is possible to interpret this sociocomplexity.

This happen around the cybernetic theory through we observe organization of knowledge and art as a form of reflexive communication.

As we'll see, visual art gives us synthetic information to visualize communicative momentums of international science organizational evolution around the CC.

Climatic Visualization

Various authors speak about images: Serge Gruzinski registers their strength to convey ideology, especially in a doctrinal way in the conquest of the indigenous America (Gruzinski, 2003); Regis Debray philosophizes on its history depending on the technical development of communication (Debray, 1994); Román Gubern immerses into the psyche perception qualities (Gubern, 2006); likewise, Ernst Gombrich finds in the art work an indicator of uses and customs of the time in encloses (Gombrich, 2003).

To mention apart is the Vilém Flusser (Flusser, 2011) ideas to understand images in a cybernetic form. He observes how it is projected through them society and foresees a future of images produced and governed by circumstance and probability.

However, the closest forerunner of visualization field is recognized in Edward Tufte (Tufte, 1990), a statistician figure that found in the image the power to represent complex data clearly. Together with the computer technics to produce and distribute images, funded the *visual design* studies. For, this capacity they should make abstract ideas visible or understandable, become didactical and analytical (Ballantyne, Wibeck, & Neset, 2016).

Within the academic transdisciplinary tendency, *climatic visualization* is understood as "research interactive platforms that use computer graphics to create visual images of the causes and effects of climate change and its options of mitigation and adaptation" (Wilbeck, Neset, & Linnér, 2013, p. 5).

In a more specific mode, different studies focusing on the interaction between gadgets and humans have been carried in Europe and in the US to sustain science teaching (Wilbeck, Neset, & Linnér, 2013); (Gilbert, 2008) and science popularization (Nicholson-Cole, 2005) to have an impact in program universities and persuasive public policies on cultural change (Moser, 2010).

In some of this scopes, are pointed out certain prevalent images related with CC (polar bears, submerged statues, catastrophic scenarios that are indicative of a cultural environment in a form of signs called metaphors (Ballantyne, Wibeck, & Neset, 2016). This kind of communication is valid for art as content to work with.

Searching form

In cybernetics words, here we talk about a third observation level. That's why we have two objects to observe: one, is the selected artwork which is regarded as a paralinguage that condense predominant ideas based on its circulation and recursion force (*clichés*); the second one, is the selected organization of the IPCC and its issues in science knowledge that produce communication.

This paper recognizes images and its circulation a data quality condition to explain a model about communication in Internet, applied to CC.

Following the same logic, the ideas circulate, stay and transform just as the “ecological” conditions may allow communication. Today, most of the social reproduction of signs happen in Internet, so the analytical nucleus is constituted by the way databased are organized and read.

[...] the very meaning of “survival” becomes different when we stop talking about the survival of something bounded by the skin and start to think of the survival of the system of ideas in circuit. [...] ideas, under further transformations, may go on out in the world in books or works of art”. (Bateson, 1987, p. 467)

Apparently, what here is presented as a paradox, indeed is the contingency selection capacity of any system before the disturbances of its own environment to cope with. In the field of Luhmann ideas, science knowledge couple with art-work to innovate selfprogramming. “The ‘essence’ of art is the self-programming of the artwork” (Luhmann, 2000, p. 204).

Art exists not only because of that; rather, it is confirmed the identity of art. And this give information to explain it as a phenomenon -in a cybernetic scope- in

the form of relationships among data.

Further, with this observation level, we introduce a reflection operation to the system, for “without context, there is not communication.” (Bateson, 1987, p. 410). It means to “map” those connections through “the propositional or informational aspect of the events and objects in the natural world” to give sense to organization (Bateson, 1987, p. 409).

So, at first place we look at the artist who observe the world and to himself (first-second order observation); and secondly, us who observe their communications as reflections of IPCC emitted scientific communications.

This third cybernetic observation level allow us to watch for models: a research model. Namely, to recognize those regularities (iterations) that mark changes in time of any organization (IPCC).

The next figures illustrate in a concise manner the last ideas: a cornerstone warning idea in newspaper set the statistical graphic as the main medium to represent scientific data of the phenomenon on CC (figure 1a). Through time this same idea is reproduced and actualized by artwork (figure 1b).

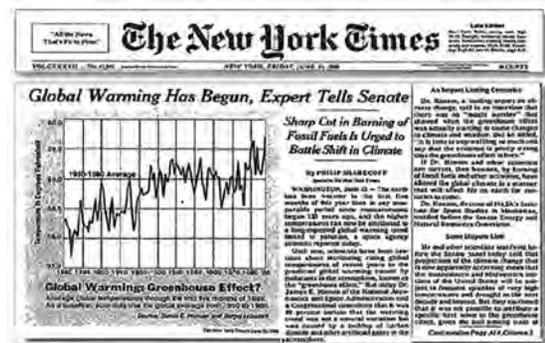


Figure 1a. Iconic testimony of Dr. James Hansen before United States Congress concerning CC, 1988. Retrieved from <http://www.ucsusa.org/sites/default/files/legacy/images/2015/06/gw-graphic-new-york-times-1988-hansen-testimony-front-page.jpg>



Figure 1b. *Landscape of Change*. Jill Pelto, 2016

Ecological Patterns

As just said, cybernetic images are considered circulating messages that set circuits. The iteration -redundancy- of images are forms which produce sense; they evolve as are informed with new knowledge or interactions.

In this context, images are indicators -sign marks- depending of its condensation gradient value. Specifically, trough variation, images accumulate communication capacity, in this case from a scientific vision of nature

The starting point of this research is to identify a meaning pattern. In redundancy terms (signal/noise) there are repetitive images in the “discursive universe” of Internet that produce a sense (Bateson, 1987, pp. 419-425). Therefore, the metaphorical contents are chosen from a cybernetic position.

Then, this patterning based on artwork (as a transit of iconic to metaphorical messages on ecological issues) is expected to reflect an “information economy” (Bateson, 1987, p. 467) of CC thematic issued by IPCC that represent a sense of organization change in its own communicative policy.

The unit of survival is *organism plus environment*.

We are learning by bitter experience that the organism which destroys its environment destroys itself. [...] If, now, we correct the Darwinian unit of survival to include the environment and the interaction between organism and environment, a very strange and surprising identity emerges: the unit of evolutionary survival turns out to be identical with the unit of mind (Bateson, 1987, p. 489).

A unity identified in actual interdisciplinary collaboration among media artists with science and consequently, showing the need to explore new

methodological approaches to innovate meaningful tasks for joint research (Forbes, 2015).

Communicative States of IPCC

As an application of this kind of ideas, a preview of methodological classification envisions three states: one, of transition set in the middle of two stables. We call the first, *em-bryonic*, when in 1998 IPCC was founded; and in the opposite extreme, the *cybernetic*, started in 2013-14 through 2022. It is a projected scenario derived from the evolution of technical images observed in Internet (figure 2).

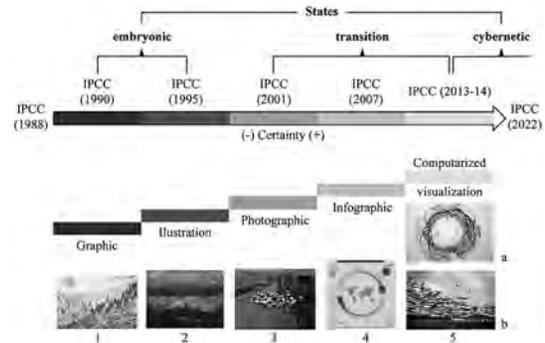


Figure 2. Events sequence. Own source

Briefly, these three evolutionary states are distinguished from the assumption that organizations learn from reflection in different “loops” moments when aesthetics bridges and connect patterns (Tosey, 2006). In this case, trough artwork observed images which synthetizes a problematic around CC.

Up to now, the five IPCC (1990, 1995, 2001, 2007, 2013-14) carried out are the institutional scenario debate that set-back the international political actions of United Nations on the CC issue. Since the “Assessment Reports” publications country negotiations are set to make agreements between them. Each one is compromised to modify or to adapt a legal regulatory frame and to diffuse knowledge on it among their citizens.

As shown, along this division correspond a specific image technique (graphic to infographic). There’s a close linking between the Internet and IPCC starting date development. Accordingly, as images computer manipulation capacities have been adopted through Internet, these techniques have been integrated and

diversified in a visualization emergent field.

On the bottom of the above figure we can see different marked moments using several techniques. Despite the states of this process are a consequence of complexity increment they are techniques overlapped by circumstance and rather what they represent here are the contingency possibilities that organization's communication have.

That's why the range between graphic and infographic limit the sense of complexity as information is transformed in knowledge and need to be understood.

The forms of representation stabilize understanding and socialize meaning:

The gradual processes are gifted with a powerful booster force. In this sense, is interesting the correlation between the scientific discoveries and the technical realizations. The biggest scientific ideas are, in a way, akin to art: its origin is like an explosion [...] the scientific ideas can come ahead of times (Lotman, 1999, p. 26).

Back to IPCC, this organization is aimed by its communicated production knowledge based on mathematical models to evaluate present and predict future climate scenarios. [2]

So, depending on those communications we identify the three mentioned states:

An embryonic state, has been dedicated to organize the scientific doubt around the climate physics with resonance in press and in the education system (figure 3).

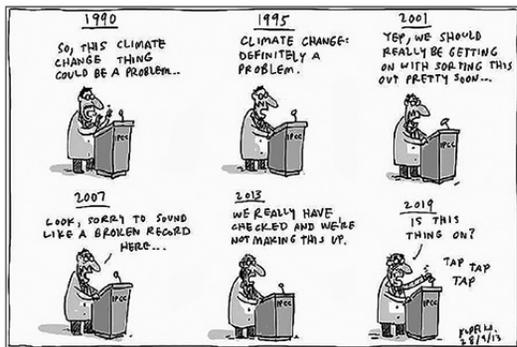


Figure 3. Jon Kudełka, 2013. *Non So Deaf*. Retrieved from <http://www.kudelka.com.au/tag/ipcc/>

The second, a transition period (2001 to 2013) where the accumulation of quantitative and existential data exposed in diverse climate models has verified gradually

the hypothesis -put it in doubt by economic interests- of the anthropogenic induction, but also when it has been recognized the necessity to act before the probable catastrophic scenario to mitigate or to adapt through consensual international policies (figure 4).

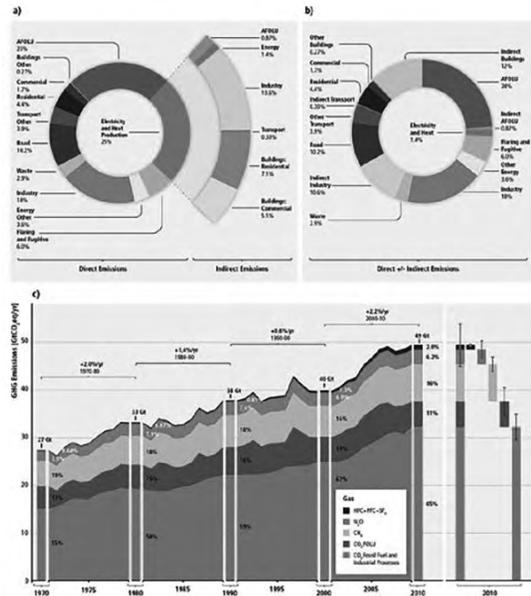


Figure 4. Accumulation and linking of observed data. IPCC, 2001

Ultimately, the yet incipient third one (cybernetic) when the previous actions are taken more precisely, but now emphasizing the social participation with the aim to reduce the risk-uncertainty factor influencing the institutional communicative policy and adopting capabilities available with computerized visualization (figure 5).



Figure 5. Video in YouTube IPCC, 2016. Retrieved from <https://www.youtube.com/watch?v=fGH0dAwM-OE>

As a matter of fact, for the first time the IPCC (AR5) produced a video of its *Synthesis Report* available in Internet (2016) and, unprecedentedly, a communicators meeting was requested by the mentioned panel to support them. On the other hand, public opinion has pressure on scientific arena to share information in a comprehensible manner (Geiling, 2014).

Although most of the referenced images contain a catastrophic view about CC, the relevance here was to illustrate with them a sequence change in communicative policies issues of IPCC according with time. We agree with Angus Forbes (2015) about the possibilities to “generate, augment, provoke and mediate” of media art in communication processes and through Internet make it an aesthetic resource to comprehend sociocomplexity.

Conclusions

This work suggests a mode to observe qualitatively artwork that visualize Climate Change as a methodological route to identify communicative status among organizations.

We assume that changes in organizations are observed through changes in the way information is visualized. This happen mainly from communication technological innovations. Each “level” is possible to identify from the overlap between the way art represents reality and the way organizations communicate findings. This occur in a timeline of a common public problem observed (CC).

Selected artwork construct “looping signs” that

feedback the cultural evolution in organizations. When they are observed as patterns, conjointly, besides to reflect different learning levels of organizations -not given in a sequentially order but rather in a parallel and reciprocal manner-, they aim toward a reflexivity communication goal.

Because of this reflection Science Visualization is an opportunity “to produce high quality images to use them in the histories e infographics, so emphasizing the key message of their assessment reports” (IPCC, 2016, pp. 184, 193).

We regard the above recommendation as the beginning of a change in the communicative politic of IPCC. In cybernetics words, the change of a system state depends on its adaptation to environment perturbations. The CC and Internet stimulate a change in IPCC organization and support the thesis that it is nowadays suffering a transition state toward a cybernetic one. [3]

The IPCC started with diffusion of images based on statistical graphics. The repetition of this visual resource with informatics technology has done it more complex increasing noise and taking distance from original message (figure 2). Art recovers this memory. However, as it is showed in the upwards sequence figures, communications produced by IPCC contains every time more complexity. A curious data is the origin coincidence with the commercial irruption of Internet (1988-1991); also, both are planetarium organizations. The announcement of the diminishing size of ozone hole (figure 6) verify the successful coincidences between politics, science and computerized visualization to get into the cybernetic era. Shall be art and science the future human coincidence to communicate digitally with earth.



Figure 6. Computer graphic of the recovering of ozone depletion area. Retrieved from <https://www.bas.ac.uk/media-post/30th-anni-versary-of-the-discovery-of-ozone-hole/>

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2. Despite IPCC has based from the beginning its projections on data and scientific models, recognize the impossibility to prevent future events. "The knowledge is insufficient to say if there will be or not some change in the occurrence or geographic distribution of severe storms, for example tropical cyclones" (IPCC, 1995, p. 7). With the continuum collected data has increased the confidence grade to sustain its climate projections.
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in Transdisciplinary Studies of Culture and Communication. Professor-researcher at Autonomous Metropolitan University in Arts and Humanities Department.

Authors' Biographies

Rodrigo Rosales González. PhD in Social Communication Sciences in the UNAM, with master in Design and Art Sciences, specialized in Visual Praxis of Design and Art. Professor-researcher at UAM in Arts and Humanities Department.

Ana Carolina Robles Salvador. Ph.D student