

Textual and visual analysis of Latin America's
official online, online climate change news
articles: a complementary study



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Resumen: Las noticias oficiales sobre cambio climático (CC) implícitamente educan a los lectores. En un estudio previo se reconstruyeron representaciones educativas emergentes de sus textos (14) e imágenes (35) a través de análisis de contenido cualitativo. El presente estudio expande dicho análisis a través del análisis de contenido cuantitativo. Un resultado prominente demuestra que los textos incluyen principalmente datos, objetivos, causas y consecuencias del CC lo que se limita a conocimientos y comprensión. La producción de noticias se mantiene baja y orientada hacia la política. Se recomienda mayor estudio incluyendo otros productores de noticias sobre CC.

Palabras clave: cambio climático, noticias en línea, representaciones, América Latina.

Abstract: Climate Change (CC) official news releases implicitly educate readers. Qualitative content analysis reconstructed educational frames in news' texts (14) and images (35) in previous research. The present study expands its analysis through the application of quantitative content analysis to them. Prominent finding shows texts include mainly factual data, objectives and causes and consequences of climate change limited to knowledge and comprehension. Production of CC news remains low and politically oriented. Further research is suggested with other producers of CC news.

Keywords: climate change, online news, frames, Latin America.

Textual and Visual Analysis of Latin America's official, online climate change news articles: A complementary study

Since the emergence of anthropogenic climate change in public debate (Moser, 2010; Schäfer & Schlichting, 2014), research on CC communications has rapidly evolved. A recent meta-analysis (Schäfer & Schlichting, 2014) of 133 CC and the role of media studies shows that the growth observed from the number of publications and scholarly interest per year shows major peaks in publications around high-level, widely diffused, priority meetings like the Earth Summit in 1992, the Kyoto Protocol in 1997, and the so-called Conference of Parties (COP) meetings. It also demonstrated that, despite the rapid growth of empirical research, more than two thirds of it still concentrates on print media like *The New York Times* (USA) and *The Guardian* (UK), to name some. Since the 1990s, online CC research also grows at however, a different pace. Last decade more than 16% were online media research studies (Schäfer & Schlichting, 2014), still constituting a low number given the wide variety of communication formats, applications, and users (e.g., websites, blogs, Twitter, YouTube).

Regarding online CC studies, research shows a higher focus on news media websites and a lower one on NGOs, political, corporate, and scientific stake-holders' online platforms (Schäfer & Schlichting, 2014). In addition, Schäfer (2012) reviews that the above-mentioned stakeholders have increasingly turned to the use of online communications to provide information and mobilize support, to name some.

Indeed, providing online CC information has shown educational purposes and effects. Those formative (or educational) purposes undoubtedly play an implicit educational role in online CC media in a rather non-formal setting. Schäfer (2012) points out that climate scientists and NGOs purposes to use online communication is to: educate the public and change behavior, to name a few. Looking further afield, it's common to find studies that show the 'potential improvement in audiences' knowledge, awareness, perceptions, understanding, engagement with the use news stories and frames (Zhao et al., 2014; Price, Tewksbury, & Powers, 1997). It is although not always the case to improve, but to rather hinder audiences' perceptions and learning depending on how CC news are framed and presented. Hibberd and Nguyen (2013) show that young undergraduate students (18-26 years-old) from two universities in the United Kingdom and environmental professionals (journalists and

experts) considered there is a lack of positive messages. Most are conflicting messages that also focus on the extreme, to name a few. Participants demonstrated a strong sense of pessimism, disempowerment, therefore justifying inaction and disengagement (Hibberd & Nguyen, 2013, p. 27). In addition, young students complained that given that news media is an important source of CC information, coverage of CC is either poor or ineffective. The role of news media in framing CC effectively is therefore important to learning, awareness, and perceptions of hope rather than hopelessness.

Global and Latin American' online climate change information

Every year, greater numbers of Internet users are revealed. Only in Latin America users account for 322.4 million people in 2014 or a bit more than half the region's population, making it the third Internet consumers in the world only behind Asia and Europe (Internet World Stats, 2015). Indeed, Latin America accounts for a 1,684.4% Internet users growth between 2000 and 2015 (Internet World Stats, 2015). Indeed, the benefits that online media has brought over the years are also rapidness, less space restrictions, and accessibility, to name a few (O'Neill & Boykoff, 2011). Furthermore, hyper-media is increasingly used as source of environmental information (Bun Lee, 2008; Viteri, Clarebout, & Crauwels, 2013; O'Neill & Boykoff, 2011, pp. 233-236). In this regard, CC communication profits as it is rapidly disseminated online. Indeed, O'Neill and Boykoff (2011) show a "google" search made in 2009 were they found over 35 million websites related to CC. It is therefore not surprising that the CC arena has become highly disseminated (Gupta, 2010; Moser, 2010; Schäfer & Schlichting, 2014) with greater need for reliable sources to choose from.

Indeed, as a matter of public concern, CC has known a marked global, political debate, which has launched periodical mainstream, high-level conferences' since the 80s (Gupta, 2010; Moser, 2010; Schäfer & Schlichting, 2014). Although in 1979, the first World Climate Conference (Gupta, 2010) took place, it is only in 1988 that an Intergovernmental Panel on Climate Change is established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) "to provide the world with a clear scientific view of the current state of knowledge in climate change" (IPCC, n.d.). Ever since, a series of international and regional conferences (e.g., Conferences of Parties or COP), agreements (e.g., Kyoto Protocol) and frameworks (e.g., United Nations Framework Convention on Climate Change) have shaped

present and future policy and action for the nations, also becoming official sources of CC information.

Indeed, regional offices are the spokespersons for the more contextualized urges per region. For Latin America and the Caribbean (LAC) for instance, the Economic Commission for Latin America and the Caribbean (ECLAC) is a keyplayer on coping with social and economic effects of CC (<http://www.cepal.org/en>); the Food and Agricultural Organization of the United Nations (FAO) role is to ensure food security and sustainable resource management considering CC (<http://www.fao.org/americas/en/>). CC is certainly interdisciplinary in character requiring integrated efforts and positionalities, a challenge that regional offices deal with.

Most LAC's regional offices have created online platforms to mainly communicate through first hand CC news articles, gallery of photos, social networks and other resources. Such communications serve the vested readers as well as journalists who, in turn, publish through mass media. As important official, first hand CC information providers, regional news framing or how CC messages are portrayed by official sources should be given consideration, given the interdisciplinary character and the diversity of possible voices and actors in the CC arena (eg., non-governmental organizations, scientific community, other).

LAC's online CC communications' research

Research in the LAC region has timidly increased in the area of CC communication with studies mainly focused on newspapers (or print media), CC framing and comparative studies (e.g., Dotson, Jacobson, Kaid. & Carlton, 2012; Zamith, Pinto, & Villar, 2012; Peña Moya, de Frutos García, & Díaz Estévez, 2013, Gavirati, 2013), and research at local level (e.g., Takahashi & Meisner, 2012; Takahashi, 2011; Takahashi, 2013; Mercado, 2013; Soares Veiga, 2013). Only few studies on general uses of information and communication technologies (ICTs) or online media (e.g., Eakin et al., 2015; Soares Veiga, 2013) have been published.

The present study contributes therefore with further research of online CC news articles particularly from official sources of information. The theoretical considerations are provided in the next section.

Framing theory

Audiences rely on how communicators (or journalists) frame (or portray) CC messages to make meaning. In these regards, relevant is the theory of framing to the construction, re-construction and

interpretation of news communications and, partly, how we process them.

Framing theory emerged as an alternative approach to agenda setting theory that studies “ideology in the news” in order to “expose hidden assumptions” (Tankard, Jr., 2001, pg. 96) or the reconstruction of for instance, cultural, social, educational representations implicit in texts and images. Acknowledged author of framing analysis Erving Goffman (1974, pg. 21) argues that human beings are capable to render interpretation and meaning to primary frameworks –or any individual’s particular event, experience, aspect occurring in, for example, everyday communication– even if unaware of the completeness of its meaning. Additionally in her meta-analytical study, Schlichting (2013) notes a dichotomy in framing research: the study of frames in communication–or the central idea of a news article–and frames in thought–or the meaning a person gives to an event. It has however been demonstrated that frames in communication certainly affect an individual’s meaning-making (Scheufele, 1999 cited in Schlichting, 2013, p. 494). Indeed, both frames’ studies rest interconnected in the construction of meaning.

Framing can be applied under multiple perspectives and across a variety of studies like effects, interpretive, critical research, to name a few (Reese, 2010, Schlichting, 2013).

Framing climate change

In her overview of research on CC media framing, Anderson (2009) highlights how media reporting frames climate change with respect to heavy influences from socio-political interests (p. 178) or political and industry interests; from an episodic approach or reporting catastrophic events (e.g., floods); or messages concentrated on mitigation rather than adaptation. Anderson (2009) therefore demonstrates the need for more ethnographic, cross-cultural research from also diverse media outlets like digital media but also television, images used by media, to name a few.

In addition, a number of CC studies have mainly focused on frames in thought (Schuldt & Roh, 2014) or effects of media frames in audiences’ meaning making. Research on CC frames in communication or both communication and in thought frames are nevertheless steadily increasing (e.g., Schuldt & Roh, 2014; Shrestha, Burningham, & Grant, 2014; Takahashi, 2011) with basically local studies of media frames. For instance, Shrestha, Burningham and Grant (2014) contribute with the construction of CC in Nepalese radio and meaning given by audiences. Takahashi (2011) reconstructs through content analyses frames provided by newspapers on CC in Peru. Schlichting (2013) meta-analytical study of frames by industry

actors' communications in the CC agenda gathers mainly a number of industrialized American and European countries given the nature of her research. CC framing with a regional perspective is yet hardly encountered in scholarly circles.

Research question

The present study's purpose is therefore to explore and complement with quantitative aspects the previous qualitative study (in revision) where educational and integral frames from online CC news articles were reconstructed from official agencies' websites in the Latin American region. Thus, research question is rather complementary and exploratory in nature:

How quantitative results expand discussion from inferred educational and integral qualitative frames from regional, official, online climate change news articles?

It is however important to indicate that this research is a first of a series of more in-depth studies that will gather and compare educational and integral CC frames found in online news articles from the diversity of actors in the CC regional debate (e.g., NGO's and associations, scientific community).

Methods

Research Design

The research design mainly followed an empirical, interpretive, exploratory, qualitative/quantitative content analysis (QCA) and followed guidelines mainly provided by Schreier (2012) and Saldaña (2013). In addition, descriptive statistics followed procedures by Krippendorff (2013).

Materials for analysis

Homogeneous LAC's official, online CC news articles from January 1 to December 31, 2014 were systematically searched for comparative analysis purposes. Initially, a database of 30 regional institutions that were either directly or indirectly involved with CC (e.g., Energy and Climate Change program, CC threats to food security) was gathered. Regional institutions included the Organization of American States plus 29 autonomous commissions, funds, programs and specialized agencies of the United Nations system were more than fifty percent LAC countries are signatory members states. In a second step, 38 online CC news articles were identified from the 30 regional bodies. In a third step, homogeneity

criteria were applied to distinguish CC news articles that focused only on regional information or at least three Latin American countries. If an article reported on only one or two LAC countries, it was eliminated from analysis as the number of countries included is too low to represent for the region. Finally, 14 out of 38 CC news articles were selected for analysis. The selected articles corresponded to six different regional websites: Economic Commission for Latin America and the Caribbean (ECLAC), Centro de Información de las Naciones Unidas (CINU), Food and Agriculture Organization (FAO), World Meteorological Organization (WMO), United Nations Industrial Development Organization (UNIDO), World Food Programme (WFP).

Images selected for analysis simply corresponded to images embedded in selected CC news articles. This could include a still photograph (or static image) embedded in the news content or a photo gallery directly linked to the news content. Therefore, 35 images found in selected news articles were analyzed.

Evaluation materials

Analysis of texts used a three column graphic organizer per news article. First column included full news' texts. Second column constituted a blank column where coders recorded emerging codes in first coding cycle. Third column also constituted a blank column where coders rearranged first-cycle codes into more general categorical and thematic codes in a second and third coding cycle. For quantitative analysis purposes, data-sheets were used to record for example, codes' frequencies from the different coding cycles.

Coding Procedures

Once selected material was determined, a trial and final coding mainly followed procedures by Saldaña (2013). Coding is the process of identifying a describing word for an organizing idea (e.g., EVENTS).

In an initial or trial phase to generate data-driven coding frames, texts were divided into coding units—sentences, phrases or paragraphs—that contained an organizing or main idea. Subsequently, an open, descriptive coding (Saldaña, 2013) was applied to texts and images to define preliminary, emerging codes that described the coding unit. Attributes coding took place to determine quantitative characteristics of articles.

In a second phase, preliminary structural codes—or main categories and subcategories—were determined. All descriptive codes were rearranged under an organizing category: Education, Attributes, and/

or Integral. These categories respond to the research questions' objectives of looking for educational and integral information. Attributes correspond to any factual and descriptive characteristics that aid further and necessary explanation of results. For example, an attribute or characteristic of a text is the date when it was published. No residual or irrelevant category was devised at this stage (Schreier, 2012).

In a third phase, preliminary structural codes were tested for replicability, inter-rater reliability purposes. Two previously trained, independent coders and researcher recoded full texts and images using such preliminary structural codes.

In a fourth phase or three weeks after, coders and researcher contrasted descriptive and structural codes for agreement/disagreement purposes. A better working categorization (see Figures 1 and 2) and coding scheme was agreed upon with minimal modification. This final coding and category scheme served for reliability and validity estimation.

Reliability and validity

Percentage of agreement among the three coders was 98.2% for textual analysis and 99,1% for visual analysis. In addition, Krippendorfs' alpha was ran using the original nominal or categorical codes (Geertzen, 2012) that emerged from coding procedures for the three raters, which allowed a high-er distribution of variables among the cohort and an $\alpha=.98$ for textual analysis and $\alpha=.99$ for visual analysis were found, considered as high reliability.

Analysis for face validity (Schreier, 2012) ensured that there was enough differentiation (or high face validity) of main categories and subcategories, in both texts and images, from a conceptual point of view (e.g., factual from explanatory information). It is however noted some codes overlapped or were present under more than one subcategory without disrupting subcategories' organizing concepts (e.g., REPRESENTATIVES or EXAMPLES) given the interconnected nature of texts and images.

Analysis of data

Qualitative data was analyzed with Microsoft Word 2011 for Mac v.14 and quantitative data was analyzed with SPSS v. 21 and Microsoft Excel 2011 for Mac v.14.

Results

Descriptive statistics were considered important for further comprehension and discussion of results and are presented under the

Attributes coding section. Results for textual and visual analysis are presented separately.

Attributes coding

Attributes or main characteristics (Saldaña, 2013) of all 14 news articles are reported with simple, descriptive statistics. Table 1 shows a summary of main findings:

Table 1. Total number of LAC's online CC news articles in 2014

Institutions	Publications ^a (N=14)
ECLAC	6
CINU	1
FAO	4
WMO	1
UNIDO	1
WFP	1

^a $M = 2.33, SD = 2.16$

Table 1

Total number of LAC's online CC news articles in 2014

ECLAC (42,9%) and FAO (28,6%) were more proactive in the release of CC news article than the rest of institutions (7,1%). Among the six regional bodies there was a mean of 2 publications per institution during 2014 of online CC news articles, a basically low pace of CC information transfer through these means. Even though ECLAC and FAO provided a higher number of news publications than the rest, it yet remains low considering they are published in an entire year.

Further attribute analysis (see Table 2) shows that news articles were focused either in narrating mainly an event, a project or an important report.

Table 2. Number of types of publications in 2014, (N=14)

Institutions ^a	Event ^b (n=11)	Report ^b (n=2)	Project ^b (n=1)
ECLAC	6		
CINU		1	
FAO	3		1
WMO	1		
UNIDO	1		
WFP		1	

^a $\alpha = .05$

^b Kruskal-Wallis test reveals no evidence of significant differences, $p > .05$

Table 2

Number of types of publications in 2014, (N=14)

In these regards, events accounted for 78.6%, reports for 14.3%, and project for 7.1% of the total of news publications.

CC news articles' publication dates (see Table 3) permitted to obtain a deeper insight of the concentration of news releases around certain months of the year.

Table 3. Frequencies of online CC news articles' publications by month* in 2014, (N=14)

Institutions	Apr (n=1)	May (n=1)	Jul (n=2)	Aug (n=2)	Sep (n=1)	Oct (n=2)	Nov (n=1)	Dec (n=4)
ECLAC		1				1	1	3
CINU								1
FAO			1	2		1		
WMO					1			
UNIDO			1					
WFP	1							

* Only months were publications were realeased are displayed in the table.

Table 3

Frequencies of online CC news articles' publications by month in 2014, (N=14)

Most publications were released on December 2014 while the rest were scattered in different months. Further discussion will be provided under the next section.

Interestingly, websites' links to social media or related articles for example, were quite diverse. However, websites importantly differed in the provision of these external links and not all articles from the same regional body's webpage provided the same amount of link alternatives per article. Hence, each link found per article was included in the frequency count.

Table 4. Percentages of the provision of links in online, CC news articles in 2014

Institutions	Social Media ^a (n=27)*	Resources ^b (n=9)	Contacts ^c (n=9)	Reports ^d (n=11)	Other services ^e (n=31)
ECLAC	74,1	22,2	44,4	54,5	93,5
CINU	11,1	0,0	0,0	9,1	0,0
FAO	0,0	66,7	44,4	36,4	0,0
WMO	0,0	0,0	0,0	0,0	0,0
UNIDO	0,0	11,1	11,1	0,0	0,0
WFP	14,8	0,0	0,0	0,0	6,5

* Frequencies of counts

^a Facebook, Twitter, G+, Flickr, You Tube, other social media

^b Photo gallery, infography, video. Photo gallery provided apart from images embedded within article text.

^c Contact information

^d Report, related articles, documents, announcement, more information

^e Print, share email, subscribe, labels

Table 4

Percentages of the provision of links in online, CC news articles in 2014

CLAC is the major links provider (e.g., social media, resources) while WMO does not provide any links at all. Facebook, Twitter, and G+ were the links mostly present across texts by the only three bodies that provide such a service: ECLAC, CINU, and WFP. Regarding resources, links to photo galleries were mostly provided by ECLAC, FAO, and UNIDO. Infography was barely provided by ECLAC and FAO and only two videos were posted by FAO. Contact information like names of contact persons, telephones, addresses and/or emails were found in more than half of the total of news articles (N=14). They are however not sufficiently provided in comparison to other link alternatives. Links to other related articles were delivered by ECLAC and CINU while FAO supplied links to related programs, documents, and statistics, only however in two out of its four news articles.

Results included all links directly related to the news article usually placed around the article's frame. All general or not related links (e.g.,

menu) were excluded. Links embedded within the news article itself were included under the structural coding scheme for further analysis. Although, the most counted link type was Other Services (print, share email, labels), they were provided in all texts by only two institutions (ECLAC and WFP), reflecting rather a low offer of this type of service.

Textual analysis

In the previous study [in revision], emerging frames were clustered by themes, subthemes, main categories and its codes (see Figure 1) during the third coding cycle for texts and images, respectively. Themes, subthemes, main categories are emerging codes clustered in a logical, general to specific manner.

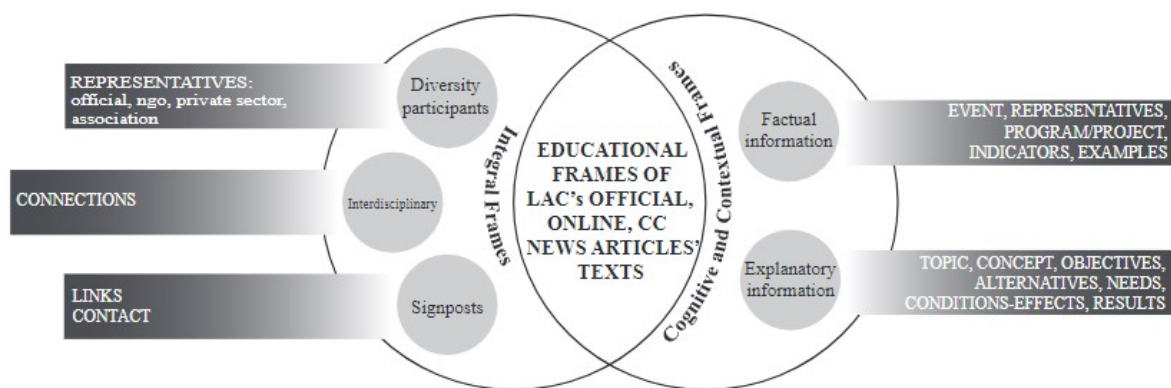


Figure 1

Emerging frames for online climate change news articles' texts. Major theme and subthemes in bold.

Main categories and its codes in gray fill.

From "Textual and Visual Frames of Latin America's official, online climate change news articles: A qualitative approach" by F. Viteri, G. Pérez, S. Serrano. Manuscript submitted for publication. Reprinted with permission.

Under the major theme established "Educational Frames of LAC's online, official CC News Articles' Texts", two subthemes were defined: (1) Cognitive and Contextual Information and (2) Integral Information. The following sub-sections will show mainly quantitative results per subtheme and category.

Subtheme 1. Cognitive and contextual information

Structural codes for this subtheme were counted as frequencies and converted to percentages for practical purposes.

When observing frequency counts of all codes contained in both categories, main findings reveal that narratives around EVENTS' facts and CONDITIONS-EFFECTS' (or causes and consequences of CC) descriptions dominate the coded texts. These frames were closely followed by concrete OBJECTIVES' of events, programs or

projects' explanations. These findings denote a writing pattern encountered in news articles from the analyzed websites, in general. The least or poorly used structural codes were CONCLUSIONS, CONTRAST and CONCEPTS. In general, factual information was more used in texts rather than explanatory information.

It is important to indicate that there are overlapping codes between category 1 and 2 like the case of EXAMPLES and INDICATORS, as indicators in its pure sense comprise straightforward data, but at the same time they support cognitive understanding or comprehension of narrative text. In addition, it was used simultaneous coding or a piece of text was described or organized by two or more codes. For this reason, quantitative analysis is limited to mainly descriptive quantitative results and whenever possible, inferential results.

Category 1. Factual information

Factual information frame included facts like indicators, titles, places, names of representatives, institutions, organizers or countries, dates, deadlines, concrete examples, and funding/budget data.

<p>⁶In the same period, ^{6a}forests acted as major sinks for GHG, ^{6b}absorbing 440 million tons of CO2 eq on average in the same period (2001-2010). ^{6c}With the above, the net forest emissions reached an average of about 1500 million tons between 2000 and 2010, ^{6d} showing a sharp decline in recent years.</p>	<p>⁶</p> <p>^{6a}</p> <p>^{6b} INDICATOR</p> <p>^{6c} INDICATOR</p> <p>^{6d}</p>
<p>... ²Pradeep Monga, Director of the Energy and Climate Change Branch of the United Nations Industrial Development Organization (UNIDO), and Jan Hartke, Director of Clean Energy at the Clinton Climate Initiative of the Bill, Hillary and Chelsea Clinton Foundation...</p>	<p>² REPRESENTATIVES (official, NGO, names, institutions)</p>

Quantitative findings for factual information are shown below.

Table 5. Percentage of Factual Information emerging descriptive codes, (N=5)

Codes	Subtotal
EVENTS	33.5
REPRESENTATIVES	20.0
PROGRAM/PROJECT	12.5
INDICATORS	13.5
EXAMPLES	20.5

Table 5
Percentage of Factual Information emerging descriptive codes, (N=5)

Again, the most counted or used code, with a little more than one third of total counts (or 67 counts), was EVENT, which included information focused on the event's title, place, date, and/or general information. Concrete EXAMPLES and REPRESENTATIVES facts followed as the second used codes in texts. In contrast, PROGRAM/PROJECT titles or facts (25 counts) and INDICATORS (27 counts) were the least emerging codes in news content. These findings, particularly the great use of EVENT information, corroborate outcomes shown in Table 2 where most publications are devoted to the development of events.

Category 2. Explanatory information

The second category promotes cognitive understanding or comprehension.

As follows, an example of the different codes' applications. Although the example below do not show all codes for the ease of the reader, it was indeed possible to apply simultaneous coding or more than one code for a coding unit whenever necessary:

¹⁵According to the results of ECLAC's project, the ^{15a}quantity of carbon in a product –or the carbon footprint- ^{15b}greatly relies on production and processing methods applied along the supply chain.

¹⁵ RESULTS

^{15a} CONCEPT

^{15b} CONDITIONS

Table 6 shows descriptive results.

Table 6. Percentage of Explanatory Information emerging descriptive codes, (N=12)

Codes	Subtotal
TOPIC	8.3
CONCEPT	1.8
OBJECTIVE	20.3
NEEDS	4.8
CONDITIONS/EFFECTS	23.1
ALTERNATIVES	12.1
RESULTS	4.1
CONTRAST	1.0
DISCOURSE	6.6
EXAMPLES	14.1
CONCLUSIONS	0.4
RECOMMENDATIONS	3.4

CONDITIONS/EFFECTS (or causes and consequences) of CC and OBJECTIVES of news articles were mostly used 67 and 59 times, respectively while CONTRAST information and CONCLUSIONS of events, programs or reports were the least mentioned with 3 and 1 times, respectively. News articles contained more explanatory information (11 codes) than factual information (4 codes). EXAMPLES were eliminated from the previous finding since it constitutes an overlapping code under both factual and explanatory categories.

Subtheme 2. Integral information

Integral information gathered all codes or frames that reflected diversity and connectedness in images. The code REPRESENTATIVES have been subcoded to determine images of official, NGO, private sector, association, and network alliance's representatives.

Category 1. Diversity of event participants

The diversity of participants was observed with official representatives (from international/regional bodies and government) remarkably present in texts while the rest of participants (NGOs, associations, network alliance and private sector) hardly represented in texts.

Table 7 shows descriptive findings under this category.

Table 7. Percentage of Diversity of Event Participants emerging descriptive codes, (N=5)

Code	Official (n=38) ^a	Private sector (n=2) ^a	Civil society		
			NGOs (n=2) ^a	Association (n=2) ^a	Network Alliance (n=1) ^a
Representatives	84.4	4.4	4.4	4.4	2.2

^a Frequency of representatives mentioned in texts.

Table 7

Percentage of Diversity of Event Participants emerging descriptive codes, (N=5)

Educational and communicational implications are discussed under the Discussion section.

Category 2. Interdisciplinary representation

The category Interdisciplinary representation included only one emerging code CONNECTIONS, which referred to the narratives that delved on the complex connections between one or more environmental problems.

Frequency count of the use of connecting aspects was 44 times in the 14 news articles analyzed.

Category 3. Signposts to further information

Descriptive statistics showed LINKS within texts (not the same as shown in Table 4) were used 85.2% (23) in contrast to CONTACT information used a 14.8% (4).

LINKS within texts differed from LINKS outside the texts (shown in Table 4) as they rather comprised links to concepts, images or other related reports, for instance.

CONTACT information observed within texts was also observed outside the texts in nine articles as shown in Table 4. Therefore, online news articles generally contain contact information for the reader.

Visual analysis

A preliminary attributes codification or description of images elements was applied to the 35 images before the application of the same structural codes to examine components that may promote education. Themes, subthemes, and categories (see Figure 2) that emerged were slightly different from the ones presented under Figure 1.

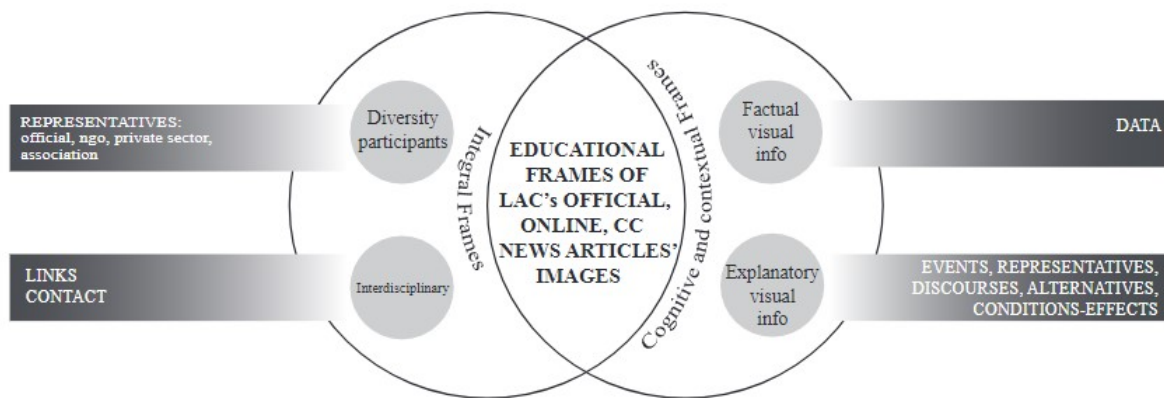


Figure 2

Emerging frames for online climate change news articles' images. Major themed and subthemes in bold. Main categories and its codes in gray fill

From "Textual and Visual Frames of Latin America's official, online climate change news articles: A qualitative approach" by F. Viteri, G. Pérez, S. Serrano. Manuscript submitted for publication. Reprinted with permission.

Noteworthy, images mainly played a supporting role to texts. Given that images reflected the main focus of the story, they too comprised complementary evidence to findings under textual analysis.

Subtheme 1. Cognitive and contextual information

Cognitive and contextual frames were the result of searching patterns that distinguished applied codes to images. A main pattern

was that all codes supported knowledge acquisition and cognitive understanding (or comprehension). Therefore, under the present subtheme, two categories were identified: 1) Factual information visual aids, and 2) Explanatory information visual aids.

Category 1. Factual visual information

This category was named after images that basically contained factual textual-visual information in images. For example, encountered DATA in images comprised representatives names in clear labels, logo information, and titles of events in banners. Thirteen images (37%) out of 35 contained such facts.

An example is shown in Figure 3.



Figure 3

Name and title of representative in label

Adapted from “Destacan coordinación público-privada para proteger recursos hídricos ante cambio climático” by ECLAC, 2014, October 29. Retrieved from <http://www.cepal.org/es/noticias/destacan-coordinacion-publico-privada-para-proteger-recursos-hidricos-ante-el-cambio>

Category 2. Explanatory visual information

By cognitive purposes, the study refers to images that support the acquisition of knowledge and understanding.

Close observation of compositional elements that reflected structural codes demonstrated that more than half (n=21) of the images were devoted to showing images of EVENTS with its REPRESENTATIVES mainly pronouncing their DISCOURSES in front of a microphone. Twelve images visualized EXAMPLES mentioned in texts with seven reflecting the CONDITIONS-EFFECTS of CC (e.g., fuelwood, deforestation, air pollution), three reflected ALTERNATIVES or possible solutions (e.g., crop diversity), and two provided CONTRASTS (e.g., CC vulnerabilities' levels across countries).

As observed, Table 8 illustrates in percentages the above findings.

Table 8. Percentage of Explanatory Visual Information emerging descriptive codes, (N=7)

Codes	Subtotal
EVENTS	25.9
REPRESENTATIVES	25.9
CONDITIONS/EFFECTS	8.6
ALTERNATIVES	3.7
EXAMPLES	14.8
CONTRAST	2.5
DISCOURSE	18.5

Table 8

Percentage of Explanatory Visual Information emerging descriptive codes, (N=7)

Subtheme 2. Integral frames

All compositional elements that together permitted to make connections around topics, participants or else were placed under . The following two categories were the result of close scrutiny.

Category 1. Diversity of event participants

A number of images illustrated people, particularly, representatives of the different organizations. Whenever their names and titles were observed in label within the image or a brief description of the REPRESENTATIVES was provided below each image, it was used to determine the kind of representation made (e.g., official, private sector, association, and NGO).

Table 9. Percentage of images of event participants, (N=18)

Code	Official (n=13) ^a	Private sector (n=3) ^a	Civil society	
			NGOs (n=1) ^a	Association (n=1) ^a
Representatives	72.2	16.7	5.6	5.6

^a Number of images of representatives

Table 9

Percentage of images of event participants, (N=18)

Official representatives images dominated the analysis. Less than one fifth were representatives of the private sector. Only one representative from an NGO and one from an association, respectively, were portrayed. Note that not all representatives' photos contained labels or names. These were excluded from analysis. Some were panoramic images of the entire group of participants. An example of the use of people is presented in Figure 4.



Figure 4

Image of an event with representatives providing discourses

Adapted from “Crecimiento económico y combate al cambio climático no son excluyentes” by ECLAC, 2014, November 17.. Retrieved from <http://www.cepal.org/es/noticias/crecimiento-economico-y-combate-al-cambio-climatico-no-son-excluyentes>

Category 2. Interdisciplinary representations

All images that contained clear compositional elements, which allowed making connections and contrasts to diverse topics and symbolisms were gathered as interdisciplinary representations. Note that in some cases, the collection or gallery of images together reflected better the connectedness.

In the case of CONNECTIONS to diverse topics there were 24 (69%) images that contained interdisciplinary representations. For example, an image of an operating factory pouring smoke out of a chimney into the blue sky shows how unsustainable industrial production and economic activity produce air pollution. Some other compositional elements like different nation's flags together in the background of events' auditoriums symbolized the unity of nations. Flags portrayed in a number of images while only one image was focused on the full, spiral auditorium as the means for an integral teamwork from diverse backgrounds.

Discussion

Overall findings demonstrate the principal and basic educational or formative frames that emerged from regional, official, online news' articles texts and images. Discussion for quantitative and qualitative attributes', textual and visual analysis is provided below.

A salient finding under attribute coding for main characteristics of news articles texts in a digital environment was the low pace of CC news publications and that most articles rather focused on events instead of projects communications, for example. Further observation (see Table 3) of findings showed that most CC news releases were greater during the month of December when major international CC events (e.g., COP-20) took place. Studies corroborate higher media coverage (e.g., Nielsen & Kjærgaard, 2011; Boykoff, 2007; Schäfer & Schlichting, 2014) of CC is provided mainly around major international events. Possible explanations to the aforementioned findings are on the one hand, official websites constitute the main sources of information not only for the vested public, but also for journalists/editors (e.g., Takashi, 2011) who reproduce articles through public or private mass media. In addition, journalistic norms (e.g., personalization, dramatization, novelty) and agendas may pose limits to what and when is published and how (e.g., Boykoff, 2011, p. 99-120; Boykoff & Boykoff, 2007). As observed, CC communications in the region were mainly focused on events as a novelty (or the immediate) that, in turn, personalized news' contents by consistently using the comments or discourses of main executive actors (e.g., executive secretary, ambassadors, ministers). Such personalization of articles distracts attention from the groups' dynamics involved or deviates attention from more textured/in-depth analysis/information of such events (Boykoff, 2011). Indeed, regional communicators' agendas may too respond to relations of power within and beyond the communication field (Boykoff, 2011, p. 4) as argued by Bennet (2012, p. 119-121) who shows how official prefabricated messages contain calculated discourses of their high level spokespersons to render the impression of being 'the' official message. Although, they do constitute the official CC politics spokespersons, official news tend to render invisible any other actors' important voices in such events. All of these added to administrative issues like workload, time pressure, and/or budget constraints diminish the control for better-investigated/constructed stories from official sources.

News stories are presented with a series of links as observed in Table 4. For example, there are links to other related articles or reports, opportunities to share the articles and/or watch photo

galleries. Two learning models might explain how CC news' consumers learn in a complex, hypermedia environment. A first is the Construction Integration Model (CIM), a constructivist approach, which requires three stages for learning to occur: first, word decoding; second, construction of a textbase; third, situation model or the integration of new knowledge with prior knowledge (Shapiro & Niederhauser, 2004). In a CIM, the two first stages take place when dealing mainly with the factual information and the third stage takes place when understanding occurs as a result of making sense of the text. In this regards, CC news' educational frames do count with factual and explanatory information required for knowledge construction. Thus, the second model called Cognitive Flexibility Theory (CFT) (Shapiro & Niederhauser, 2004; Spiro, Feltovich, Jacobson, & Coulson, 1992; Spiro & Jehng, 1990), is also based on a constructivist approach, but differs in that knowledge construction occurs not only from prior and new knowledge integration, but from analyzing the information from multiple perspectives (deconstruction) and assembling it into new schemata (Shapiro & Niederhauser, 2004). Put in the context of the present study, online news' consumers may have more control over what they read, by rapidly navigating from one news to other related news', links, websites, thus approaching the same topic from different perspectives. In addition, learning construction in such an environment theoretically requires users' to be able to use the acquired knowledge in a flexible, metacognitive manner (Shapiro & Niederhauser, 2004 p. 606). The latter is therefore true for advanced learning or users who have the skills, interest, and capability to navigate from multiple perspectives. Particularly, Lowrey and Kim (2009) demonstrated that online news' presented in three different formats (or designs)—linear format, traditional non-linear format, cognitive flexibility format— did not necessarily demonstrate better learning outcomes among users. The CF format was however efficient for experienced users only. Most CC news' articles, in this study, use a traditional non-linear format, given that most of them offer links to other related articles, usually from the same provider, thus not necessarily offering multiple perspectives. Furthermore, within the text itself, it was mainly main spokespersons voices/ comments published. In the way official, online EE news' articles are presented, it therefore rests at users' interest, motivation and navigation skills to truly engage in more meaningful learning from CC news. An additional consideration to learning from hypertexts is that natural forgetting of information occurs due to cognitive load in working memory and natural decay of memories when information was actually transferred to longterm memory (Dehn, 2008). Cognitive load or devoting many memory resources to information

processing is also one of the possible reasons to ineffective learning from hypertext media (Shapiro and Niederhauser, 2004). It is therefore important that official, online CC news texts integrally consider news' content and web design (or presentation format) that facilitates users navigation and learning from CC with multiple perspectives. Empirical studies already show evidence of presentation format for learning and memory (e.g., Gümüs & Özad, 2011,2013). For example, dual stimuli like audio-visual or text-visual enhanced memory and comprehension for news, probably given to familiarity and cognitive load. Further effects research that considers online CC news presentation format, educational frames and cognitive load may offer interesting findings.

Specifically looking into factual and explanatory educational frames, pedagogical and environmental education literature may also add to further discussion of frames implied in texts' content. Indeed, 'Factual information' (see Figure 1) is necessary for an initial or basic cognitive processing level named as 'Retrieval' or the first of four cognitive systems included in the new taxonomy of educational objectives (Marzano & Kendall, 2007, 2008). Simply speaking, accurate and detailed information (facts) are basic elements of knowledge acquisition. Looking further afield, quality factual information is a primer requirement when producing environmental material for formal and non-formal education (NAAEE, 2011, 2009, 2004).

While factual information is aligned to a basic knowledge acquisition level, explanatory information aids the next cognitive processing level called 'Comprehension' (Marzano & Kendall, 2007, 2008). Although acknowledged as basic too, it is however crucial in the process of integrating and symbolizing information for effective learning. The integration of knowledge is accomplished by making a generalized sense of the key characteristics of information (Marzano & Kendall, 2007, 2008), supported by explanations, for example. When Tables 5 and 6 are contrasted, it is not surprising to observe a greater number of explanatory codes than the factual ones. This is due to journalism news' formats like the common use of the basic 'inverted pyramid', which requires devoting content space to factual and explanatory elaboration (e.g., What? Where? When? How? Why?). On the other hand, when closely observing that EVENTS' facts in Table 5 and OBJECTIVES and CONDITIONS/EFFECTS in Table 6, are most used codes, it is plausible to interpret this as news focusing on concrete, basic but important information, and a 'shock' strategy, when mainly delving on the causes and consequences of climate change. Further inferential study is required for more in-depth analysis.

After analysis, Integral information was placed as the second subtheme of the major theme Educational frames given that integrality is a characteristic of education and that the main categories contained connecting elements to education. Indeed, the three main categories (or frames) constructed under Integral Information were Diversity of Event Participants, Interdisciplinary and Signposts to further information. In the case of Diversity of Event Participants, the names and titles of representatives provided further insight into the main spokespersons reflected in CC news articles. Official representatives were at the forefront of all spokespersons and representatives in an event or report. Given the official events, it is not surprising that high executive, official representatives enjoyed privileged limelight in publications. For example, news articles constantly publish discourses by and images of Christiana Figueres as she is the Executive Secretary of UN Framework Convention on Climate Change. However, concerns around the underrepresentation of the different sectors of society in official communications, important in CC political decisions, may be raised. Underrepresentation of NGO's and the general civil society in the UN climate debate has already been raised (e.g., Global Policy Forum, n.d.). Although participation of civil society in UN Climate decisions is growing, official communications still lack to reflect their role, proposals and positions. For learning purposes, unbalanced messages may rather hinder and bias readers' knowledge acquisition and comprehension by portraying unilateral positions mainly.

Findings around the CONNECTIONS to other related topics showed the complexity of the climate change dimension. While such concrete connections may support the illustration of the interdisciplinary character and the level of comprehension of the article, they still provide a macro view of the CC process. Climate journalism strives with the complexity of CC reporting and other factors (e.g., power relations, journalistic norms) (Boykoff, 2011). Looking further afield, alternatives may emerge such as increasing the number of quality links within texts to facilitate navigation through news stories, reports, networks and many other quality sources of information that complement the interdisciplinary dimension and balance information too. Finally, the study shows that links within texts are scarce and ephemeral compared to links outside texts (see Table 4). It should however be noted that number of link options drastically varied from one webpage to another, with WMO webpage not offering at all link options to further information or services.

Descriptive visual analysis shows a striking attribute during a first coding cycle evident in images was that there were more males portrayed than women with at least ten images of individual men representatives, four were mostly men in a group and three were only

men in a group while there were only three pictures of individual women representatives and one of only women in a group. Underrepresentation of women in the climate debate has already been voiced (UN, 2008) and attribute coding visually reflects such concern might still be present. Other factors like the photographer's choice might be at stake but will not be discussed under the context of this study.

Structural visual analysis shows supporting educational frames for knowledge and comprehension through factual visual-textual information, explanatory visual information, diversity of event participants and interdisciplinary representation. For readers to comprehend and learn from texts with complementary images, it is important that an internal process of integration takes place. Such integration is required to be able to symbolize or create “a symbolic analog of the knowledge produced via the process of integrating” (Marzano & Kendall, 2008, p. 17) executed “typically in the form of images” (Marzano & Kendall, 2008, p.17). In other words, textual explanations aided the integration of knowledge while images facilitated further cognitive processing for comprehension. So far, texts’ and images’ factual and explanatory educational frames constitute elements that may support basic learning or knowledge acquisition of the climate change debate in the official arena.

There were more images that illustrated mainly examples mentioned in texts and conditions and effects of CC than images that showed factual textual information (e.g., labels). Only four images that contained clear labels indicating the title, besides the name of the representative, corresponded each to a different representation (one official, one NGO, one association and one private sector). While it might be assumed as information balance in presenting the different participants, it is not possible to confirm since 23 images portrayed representatives (not necessarily with a label underneath). It however supports the textual analysis finding that official representatives are prominent in such CC regional news articles given their high public exposure making them familiar to the bare eye. DiFrancesco & Young (2010) and O’Neill (2013) demonstrate how CC visual imagery in print media in Canada, UK, US, and Australia deploys mainly people and politicians. It therefore can be argued that images corroborate the political centeredness deployed and emphasized also by mass print/online media. On the interdisciplinary representations, at least 24 images contained compositional symbolic elements (e.g., a set of flags) that support making connections between disciplines mainly environment and economic, agricultural and industrial development. A clear, repeated “cliché” used was an image of an industrial factory polluting the air. A high number of images rather show a united work of LAC’s nations, political gatherings, a

representation of the CC debate agenda. Further visual imagery research is required for in-depth analysis.

The present study is limited to its scope. It is exploratory in nature. It may be used as the start of interesting, inferential, in-depth research questions. Generalizations should be avoided. In addition, ongoing comparative research may allow further discussion.

Conclusions and Recommendations

As a general conclusion, educational implications of the emerging frames are that LAC's official, online, CC news articles mainly contain elements that promote basic knowledge acquisition and comprehension. Most narratives contain mainly events' factual data, objectives of events and an explanation of causes and consequences within the climate change debate. For this reason, it is suggested that if these kind of articles are used in an formal educational setting, they should be complemented or be the supplement of exercises and activities, more complete reports, that promote high order thinking skills (e.g., analysis, evaluation), critical thinking, meaningful learning. Since more than half of the images portrayed representatives during events, it is also suggested to complement lessons with the use of images that rather depict the environmental contexts in discussion.

Given that online news do possess a formative purpose for audiences as shown by the emerging educational frames, it is suggested that LAC's official websites as producers of first hand information, integrate more news focused on the overview of reports, programs in itself with resources (tools, forums, videos) rather than focusing mainly on events and its facts (names and titles of only high executives). More in-depth, analytical information for the region is required for the vested public.

As CC news in official, regional webpages are pretty much limited in po-tential educational frames and learning from hypertextual environment, the slow publication pace in addition to highly homogeneous publications about mainly CC political events, interest or motivation to read them may be lim-ited to the vested public.

Further research is recommended with the use of other sources of CC news for comparative, comprehensiveness purposes and higher in-depth discussion of the dimension of CC information and its formative implications in the Latin American region.

As an additional observation from the field of online journalism, websites varied in the number of link services provided (e.g., social networks, e-mail, contact information, see Table 4) within or around the text. All articles were written in the traditional inverse pyramid writing style too. Videos and/or infographies were hardly provided. CC news articles were rather filled of top executive representatives'

images during discourses rather than portraying the climate change issues of discussion during events or the diversity of representatives if there was so. Finally, few reports mentioned in texts were directly available through links. The online platform constitutes a media of convergence that allows journalists to enhance and upgrade news (Hill & Lashmar, 2014). It is therefore suggested for integral purposes, the higher use of multimedia tools or direct access links to important reports, websites or others to enhance navigation by users and ultimately support educational purposes too.

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