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CLIMATE CHANGE AS SECOND-HAND KNOWLEDGE: ON THE SOCIAL EPISTEMOLOGY OF A SCIENTIFIC CONCEPT

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Abstract

The issue of climate change has been ubiquitous in media discourse in recent decades. Having become a subject of common knowledge, the concept is commonly used outside the strict domain of environmental science, affecting the way human communities understand the transformation of their relationship with nature. Climate change tends to be presented in the media as a universalistic narrative, although the argument is based on scientific predictions whose inherent uncertainty remains difficult for common sense to accept. The concept of social representation is an interdisciplinary construct, with a remarkable analytical potential, which allows a theoretical investigation of the cognitive appropriation of knowledge objects as a psychosocial process. Our aim is an epistemological analysis of how the scientific identity of the concept of climate change is re-created in common knowledge as a consequence of what Moscovici and Hewstone call "second-hand" knowledge, which emerges through what they call the scientification of common sense. Representations of climate change tend to become autonomous, both in relation to the academic environment from which they emerge as a particular species of scientific discourse, and in relation to militant groups professing pro-environmentalist ideologies. As a complex, unknown and threatening reality, climate change becomes, via conceptual appropriation, a structural social object in the sense that, by re-producing it through re-

signification, human communities tend to redefine themselves in relation to nature, re-evaluating their relationship with the environment.

Keywords: ***social representations, climate change, second-hand knowledge, indexicality, scientific incertitude, cognitive discomfort.***

1.Introduction

While many people are now experiencing the effects of climate warming first-handedly, the present popularity of the public debate on climate change also owes itself to the fact that, now naturalized and having become a part of common knowledge, this concept is currently used outside the field of environmental science. The sustained production of scientific and technological knowledge is increasingly important to everyday life. More than ever, scientific practice is exposed to the scrutiny of both expert and amateur audiences. The more the issues addressed acquire social relevance, the less can they be kept in the 'ivory tower' of science for science's sake and must be addressed in the light of those community practices or institutional cultures involved in the production of this knowledge [1].

Scientific concepts are increasingly affecting the way communities understand the imminent transformation of their relationship with nature. There is a growing need to understand how scientific knowledge about climate change is produced in expert communities and then re-produced on the level of common sense. Nowotny shows that scientific information is a subject of general interest to increasingly heterogeneous communities, whose expectations and modes of understanding reflect alternative epistemologies usually based on traditional hyper-specialized, or niche, cultures. However, she notes that scientific expertise is beginning to take on a transgressive character. This is not only because the pluralism of possible perspectives can no longer be ignored by researchers, but also because the highly effective dissemination of research results contributes to the development of a culture of interdisciplinarity leading to a process of "democratization" of specialized scientific expertise within the scientific community as a whole [2,3]. Going beyond the reductionist epistemological realism of hard science could contribute not only to accepting the uncertain and gradual nature of scientific knowledge [4,5] but also to minimizing the epistemic distance between the artificial languages of science and the natural language of common-sense.

The discourse of environmental science remains relatively inaccessible to common sense because of the level of abstraction which specialized concepts inevitably operate with. On the other hand, the undeniable popularity of the public debate on climate change has made it a familiar reality, although the language of environmental science still remains specialized and largely alien to common knowledge. Below, we present two epistemologically relevant issues arising from this uneasy relationship.

One issue is that the concept of climate change does not yet have a generally accepted meaning. Oreskes and Conway show that, although quite heterogeneous, the epistemic community involved in this issue, consisting of scientists, environmental activists and the political elites concerned, has reached a relative consensus on the content of the term: climate change refers to climate variations already detectable, but mostly anticipated on a global scale, as a result of the warming of the Earth's atmosphere, a process to which human activity contributes significantly [6]. In the media, however, climate change continues to appear as a relatively ambiguous concept, suspected of not actually meeting scientific consensus and continues to be associated with unclear science, contested science, or developing science [7]. Distrust of environmental science has encouraged the adoption of radical epistemic positions such as climate change skepticism or even scientific denialism [8].

Scientifically substantiated claims coming from experts are used to justify the implementation of risk management policies associated with supposedly catastrophic future consequences. Therefore, the second easily identifiable problem can be expressed by the following question [9]: how comprehensively can the uncertainty inherent in predictions usually based on statistical-mathematical modeling be quantified in terms of common knowledge? In this regard, Lam and Masjak note that, as long as they refer to future events, as yet unobserved directly, climate predictions will retain their uncertain status in the eyes of the general public. In addition, the scarcity of scientific information makes expert opinions necessary in the process of political decision-making, which induces a significant degree of arbitrariness in the way the long-term impacts of climate change are understood and assessed by policymakers and the electorate [10]. Moreover, Pongiglione and Martini note that the relative inability of the general public to distinguish between genuinely scientific information on climate change and pseudoscientific information, often deliberately disseminated, is yet another epistemic flaw that cannot be ignored [11].

Aufenvenne, Heike and Von Elverfeldt note that the epistemological maturation of the scientific approach leads to the realization that all knowledge gained about the causes and especially the dynamics of climate change will always have a progressive character. Nevertheless, at the same time, the general public comes to expect clear and certain predictions instead of probable scenarios and scientifically justified opinions [5].

In conclusion, communicating the scientific results of climate change research induces a noticeable epistemological tension between the epistemic communities directly involved in knowledge production and the general public. In this context, starting from the presumption that all knowledge is socially produced and using the Theory of Social Representations in Moscovici's classical formulation, I aim to show that a theoretical evaluation of climate change as a social object of representations can contribute to the understanding of how scientific knowledge on this phenomenon can be epistemologically reconstructed at the level of common sense.

I first argue that Social Representation Theory is relevant to the study of how the scientific identity of the concept of climate change is re-created in common knowledge. I then show that social representations can be considered second-hand knowledge resulting from the "scientification" of common sense, actively transforming individual views and contributing to the social production of knowledge. Starting from the observation that climate change representations are modalities of social knowledge that integrate academic viewpoints into the logic of common sense, I will analyze the conditions of their emergence from a theoretical point of view. Then, discussing prior empirical results, I will focus on the role of visual language in cognitive appropriation and on the cognitive discomfort generated by the uncertainty of scientific predictions. Finally, I will analyze the psychosocial processes involved in the objectification and anchoring of climate change representations pointing out some relevant epistemological issues.

2. Theoretical premises

2.1. Collective representations

Although there are important individual differences in how climate change is conceived, a core set of shared concepts can be empirically identified at group level [12].

The classic Durkheimian concept of collective representations is useful as a starting point in the analysis of how we construct our own image of climate change because it relates cognitive processes of representation to what Durkheim calls collective consciousness [13]. Analyzing social

symbolism as it emerges from the practice of everyday life, he finds that the existence of common states of mind, shared by distinct groups, or even whole human societies, manifest as belief systems and feelings shared by almost all their members. As irreducibly social realities, collective representations reflect the religious, moral or economic structure of human collectivities [13]. The ideas, beliefs and common values that constitute them are developed on a social level and cannot be treated as mere aggregations of individual ideas, beliefs or values. They emerge over generations, through the creative association and combination of similar views, ideas, feelings and attitudes, and are manifested consistently enough over time by a multitude of individuals engaged in sustained cooperation [13]. From the point of view of social cognition, they can be viewed as ways, common to individuals belonging to social groups, of understanding and evaluating reality and of communicating this knowledge in a symbolic language.

The concept proposed by Durkheim can be correctly interpreted through the prism of the idea that governed his sociological conception: the idea of social solidarity. At a micro-social level in particular, collective representations have a cohesive function, playing an essential role in the societal affirmation of the ideas and feelings of the groups to which they belong. Their constant symbolic manifestation in everyday practices becomes one of the indicators of the cultural uniqueness and degree of solidarity of human groups as distinct social formations.

It must be said that representations can be considered 'collective' only to the extent that those symbols that express them in the practice of everyday life have, for the members of the group concerned, not only the same cognitive meaning but also a similar emotional impact. Because these representations are constructed, transmitted and reconstructed in the history of collective experience, their presence can always be noted at the level of the fundamental concepts of group culture. Regardless of whether they refer to specific modes of understanding, values, beliefs or ideologies, individual representations will reflect these social realities, being intimately associated with what is considered normal and normative over time.

The concept situates social knowledge at the group level capturing how we form our own representations, always starting from an irreducibly social experience. As a result of social interaction, collective representations become autonomous relative to the group in which they emerged, manifesting themselves as supra-individual realities. In relation to the society to which we belong, our degree of individual autonomy remains, Durkheim believes, limited. For him, as macro-social realities, collective representations have a constraining character, determining, to a

large extent, our individual choices and particular actions. Our patterns of social conduct are based on collective representations that tend to reproduce themselves extremely effectively at the level of individual practice.

Beyond the strong social determinism that emerges from these considerations, the concept of collective representations is valuable as a starting point for the issue at hand, namely climate change, both because it shows how a common way of interpreting surrounding world phenomena is possible and because it contributes to explaining processes of social change.

2.2. Social representations

Moscovici takes up Durkheim's pioneering work by reassessing the sociological content of the concept originally proposed, in terms of social psychology. On a group level, Moscovici considers, social reality presents itself not so much as a network of interconnected social facts, but as an inter-subjective construction. Social representations are "systems of values, ideas and practices" that serve as implicit common frameworks of interpretation [14]. Their existence makes social communication possible in the sense that any individual is aware of how others understand and evaluate a given issue based on these frameworks, regardless of whether one agrees with them.

Drawing on the shared nature of these representations, he argues that representations guide the practice of everyday life as social life, actively contributing both to our orientation in the complexity of its inter-subjective dynamics and to how we conceptualize our relationship to the surrounding world [15]. For him the representations involved in collective practice remain macro-structurally determined "from the top down" even though they are permanently constructed and reconstructed in the process of interaction between human groups and their objects of knowledge, i.e. "from the bottom up". Human communities produce and use social representations that accurately reflect the socio-economic, historical and cultural context in which they emerged.

Based on these epistemological positions, Moscovici concludes that the radical reification of social reality proposed by Durkheim fails to account for the continuous nature of social change processes. Moreover, through their socio-logical reductionism, macro-structural explanations do not take into account the multitude of alternative modes of knowledge that have come to characterize contemporary societies. The contemporary individual is freer from the cultural patterns of family, class or religion, all of which, in traditional communities, would have guided

one's thinking. As a result, social structures determine our individual practices in a less constraining way. In this context, the shift from mechanical to organic solidarity entails significant cognitive changes. Contemporary societies have become public markets of representations [16]. Confronted with an increasing variety of specialized, often competing or even contradictory knowledge, we are compelled to make our own selections. In these conditions, Jodelet insists on substituting the expression of collective representation for that of social representation, continuing Moscovici's critique and making three arguments [17,18].

Firstly, the notion of collective representations is not epistemologically precise enough. As an elementary cognitive process, any representation is a representation of something which always refers to an object. Social representations can only arise in the relationship between distinct communities and their preferred objects of interest.

Secondly, because it is only by taking into account the predeterminations of the macro structural context wherein the group has been constituted, that both the symbolism of communication and the group culture and ideologies or value systems shared by its members can be accurately assessed.

Thirdly, and this is the most important aspect, Durkheim's proposed concept does not capture the role of group culture as a filter of understanding.

We present below, starting from the results of Jodelet's analysis [17,18], the most significant common features of this concept from a social epistemological perspective.

Social representations are modes of collective knowledge that emerge at the social group level. In the constitution of social representations one can find academic views "translated" or adapted to the language of common sense.

Social representations emerge through the groups' relationship to social objects of a material or cultural-symbolic nature. In terms of how they relate to their objects, the constitution of social representations does not distinguish the gnoseological or emotional dimension from the axiological.

Social representations tend to become autonomous in relation to their inter-subjective foundation, acting "from the outside" upon the groups wherefrom they emerge.

In conclusion, social representations emerge in the complex fabric of cultural relations through which the subjects of groups are bound in the shared history of their daily lives that unfold

in determining macro-structural contexts and manifest themselves as shared beliefs, ideologies or values.

2.3 Social representations as second hand knowledge

As self-evident, quasi-generally shared knowledge, common sense provides that tacit consensus which serves to structure and confer intelligibility to our way of perceiving and interpreting the world we live in [19,20]. Common representations and usual associations used in solving familiar, recurrent problems become traditions that are continuously transmitted, enriched and sanctioned in social practice, becoming, in consequence, ubiquitous in everyday language. The classifications and categories that thus arise spontaneously become the assumptions we start from when we seek solutions to new problems. However, from the point of view of social cognition, common sense cannot simply be considered as a homogeneous pool of shared knowledge, since common knowledge is produced at the individual level. The ability to grasp significant aspects of natural phenomena or the meaning conferred to social events differs significantly from individual to individual, as does the way common knowledge is used in everyday life. Common sense therefore appears to be a rather dynamic set of intuitive, sometimes competing acts of knowledge, based on common observations, but which, beyond general agreement, are always interpreted in different, nuanced ways [21].

Acquired in the continuous process of socialization, common knowledge emerges primarily as a result of non-specialized observation, lacking scientific rigor, but also as a result of the process of social diffusion of scientific knowledge through the educational system, or through means of mass communication. They are expressed as simple prejudices or mental clichés, but also as explanations based on remarkably subtle reasoning [19,20].

Moscovici and Hewstone identify two forms of knowledge or common sense: "first-hand" knowledge and "second-hand" knowledge [21].

Based on consensus and tradition, the first form of knowledge is intuitive, coming from the direct experience of subjects and comprising knowledge produced spontaneously within the groups to which they belong, since the period of primary socialization. This knowledge tends to retain its naïve character in the sense that it is least epistemologically influenced by specialized education. It constitutes the ground or soil of the sciences, which continually refine it, rationalizing in scientific terms what common sense offers as primary cognitive material.

Although at some point it becomes so radically detached from the common sense from which it originated that it becomes overwhelmingly counterintuitive, scientific knowledge eventually infuses our common knowledge. The early socialization of scientific-type culture leads to a gradual rationalization of common sense, responsible for what Moscovici and Hewstone call "second-hand" knowledge. Scientific information comes to be assimilated in a selective, approximate and conceptually un-rigorous way [21]. Although it seeks to imitate the scientific approach, aspiring to universality, this form of knowledge remains based on judgments circulating in different socio-cultural contexts, judgments which, although they may be accurate descriptions and assessments of reality, are nevertheless uncritically appropriated. Because it does not resist the temptation to absolutize particular case findings, even if they are based on valid observations, common sense reasoning most often leads to completely unjustified generalizations. Science becomes for many a kind of violin d'Ingres [22,23].

Given that the whole issue of climate change has been intensely socialized in recent decades, both in media discourse and through education, the way we, as non-specialists, represent climate change can be seen as a consequence of common knowledge. More precisely, as second-hand knowledge. This appears to be the scientification' of common sense [21] in a world in which the production of scientific knowledge about the environment is multiplying exponentially amid the assumed uncertainty of predictions.

Emerging as a result of the imperatives of their times, social representations remain a form of knowledge that is par excellence accessible and easy to appropriate. Therefore, they often have a transformative effect on individual points of view, contributing to the social production of knowledge by uniting the particular points of view of different members of social groups. Taking into account that collective thinking is, as he put it, “inherently polyphasic” from a cognitive point of view, Moscovici observes that the predominance of mass culture and the informational dynamism of contemporary societies lead to common representations that are not necessarily coherent and non-contradictory [22,23]. The naivety and spontaneity of common sense, as a form of thought unconstrained by the epistemological imperatives of scientific discourse, imply that opposing ideas are not always mutually exclusive [24].

In these circumstances, representations of climate change can be described as modes of shared knowledge that integrate academic views into the logic of common sense. Because climate

change is not yet evidently experienced in the most direct everyday way, the object of representation is not a material but a cultural-symbolic one.

From a socio-cognitive point of view, mass communication establishes a relationship between sender and receiver that can no longer remain unidirectional. It can be seen as a socio-historical process, in which representations are constructed and reconstructed based on information gathered through scientific methods but whose interpretation is influenced by pro-environmentalist civil society lobbies, government policies, etc. [25,26]. Environmental science discourse remains relatively inaccessible to common sense because of the level of abstraction involved in the inevitably specialized concepts with which it operates.

Information about climate change is present in the media and environmental sensitivities are activated through education. The processes of social representation are, in our case, concerned with the way in which abstract objects of knowledge, proposed by science, are cognitively reinvented, are transformed from something initially alien into something familiar enough to be incorporated into common sense thinking [21]. Representations become the concrete content of a collective thinking effort consisting in the symbolic reconstruction of objects that are not (yet) present. In this sense, as an object of social representation, climate change, although not yet fully experienced, appears to us as a global event, widely anticipated. The meanings attributed to it emerge through interactions between members of the scientific community and the general public, interactions mediated by socializing instances such as educational institutions and the media.

Given these premises, we will now analyze the phenomenon of climate change as a social object of representation.

3.Conditions for the emergence of climate change representations

3.1. Epistemologically relevant psychosocial factors

With regard to the conditions for the emergence of social representations, Moscovici identifies two categories of factors: psychosocial, related to the relationship between the community and the represented object, and macro-social or structural, related to the social determinations of these representations [22,23, 27].

Psychosocial factors are: the degree of social dispersion of information about the object of representation, focusing processes and inferential pressure.

An analysis of the degree of social dispersion of information on climate change confirms Moscovici's finding that in contemporary societies, the increasing diversity of scientific approaches to knowledge contributes to the emergence of representations, creating new objects of social interest. The greater the degree of cultural dispersion of information about a given social object, the more the emergence of a social representation about it is favored. Specialized information about climate change is almost ubiquitous, at least in developed Western societies.

The overabundance of information we have at our disposal to form a representation on the multitude of social objects that come to our attention implies the specialization of scientific knowledge, meaning that the reference data in the construction of the representation are usually insufficiently understood. Hence, the terminological inaccuracies and misunderstandings of argumentation that arise in the formation of representations [26]. In the case of climate change, scientific information is assimilated from the outset on the basis of criteria considered relevant in various socio-cultural contexts by communities that are more or less sensitive to ecological issues and interested in legitimizing their own interpretations based on widely shared values and visions of life.

The emergence of representations depends on the presence of emotional-cognitive focusing processes. Social objects enter into collective concerns only to the extent that they come to matter to the majority of a community, or, in the case of mass culture, to a quantitatively significant part of it. With regard to climate change, the global implications of the phenomenon are such that, amid the information overload, it is likely to lead to a remarkable focus.

Moscovici points out that the distance of a community from a social object, which measures its degree of involvement with it, can vary [22,23]. Once the object's features trigger the community's interest, it will gradually reduce its cognitive distance from it, trying to incorporate it, initially from an imaginary point of view, evaluating and re-evaluating its significance or relevance. This cognitive tension involved in the construction of representations manifests itself as a spontaneous dialectical debate within social groups as the relevance of the social object increases. Sensibly different, sometimes antagonistic, views are expressed publicly about the object that the community is trying to mentally appropriate. In the construction of representations of climate change, the issue of congruence between the values related to the relationship with nature prevailing in different communities and the pro-environmentalist discourse may arise at this stage.

The unfamiliarity and novelty of the social object entering the field of collective attention triggers inferential pressure [22,23,27]. The community must not only reflect but also deliberate on new realities in a timely manner. With regard to climate change, the scientific relevance of informational material is widely acknowledged. The implications of climate warming mean that the pressure to infer comes with a sense of urgency.

The emergence of social representations is also determined by socio-structural, socio-economic or educational factors, although, because they are inter-subjectively constructed, these macro-social factors are not directly relevant to their internal organization. With regard to representations of climate change as a social object of interest, the information accessible to members of specific communities, their ideational reference systems, their axiological beliefs and their normative benchmarks can play a role as cognitive and perceptual filters. The risks of climate change may be considered relevant from the outset or may remain irrelevant to the concerns of a particular community.

Social groups may redefine their identities in relation to their own representations of new knowledge objects emerging as products of the assimilation of scientific culture. These can transform inter-subjective life, triggering social processes of identity redefinition and restructuring human communities. As a complex, unknown and threatening reality, climate change has the potential to become through conceptual appropriation what Moliner calls a “structural” social object [28,29] in the sense that, by re-producing it through re-signification, human communities tend to redefine themselves in relation to nature, re-evaluating their relationship with the environment.

3.2 The role of visual language in cognitive appropriation

The mass media are a key contributor to the emergence of representations of the consequences of climate change by decisively influencing the interaction between public opinion, the scientific community and national environmental policies. For several decades, global media have been proliferating an imagery that visually accompanies abstract information on climate change, as a result of the intention to transform a phenomenon, scientifically quantifiable but still distant from immediate perception, into a reality that is sufficiently tangible for common knowledge.

Scenes presented in film such as the melting of the polar ice caps and irreversible changes in the Arctic habitat have come to be symbolically associated with the transformations brought about by climate warming. However, although these images have long acquired significant representational value, pro-environmentalist discourse in the media still fails to effectively connect the eminently abstract concept of environmental risk with the concrete everyday experience of the audience [30,31].

Linked to the informative-scientific objectivity of media discourse, the visual representations accompanying the discourse on climate change assume from the outset the existence of persuasive intention, highlighting aspects considered extremely relevant (photos of the polar bear drifting, etc.) that illustrate an ideologically committed view of the subject. The stake is to transform the neutral viewer into a witness of a global process that directly concerns him. In this respect, the indexicality of the media image, whether photographed or filmed, makes an essential contribution to accepting the veracity of the conclusions presented [32]. Peirce's concept allows the interpretation of visual language as a coherent system of signs that can have iconic, symbolic or indexical value [33,34]. The iconic quality of the image implies similarity with its prototype; the symbolic quality is related to the universality of language, being based on the normativity of a common interpretation, and the indexical quality to the existence of an implicit causal relationship between the visual content and the object to which it refers.

Compared to other means of visual representation, the filmed or photographed image is indexical primarily for technical reasons: the phenomenon it represents can be encoded as electronic information and then rendered with a degree of fidelity to the original that an abstract graphic representation could never achieve. This means that the object represented is perceived as real and present, reducing from the outset, in the way the image is interpreted, the epistemological distance required by the rigors of scientific objectivity. Inserted into the discourse, a photograph appears to us, from the outset, psychologically convincing because we intuit the direct causal link between the representation and its object. Unlike scientific imagery, which is designed to visually highlight logically demonstrated aspects, its significance does not need to be added to, or expressly specified within the discourse. It convinces us not because it documents effectively, because it illustrates accurately and scrupulously, but because, by giving us a sense of reality, it makes it possible for us to participate emotionally in that carefully chosen perspective on reality that its creator proposes [34].

Working with a nationally representative sample of six countries: the United States, the United Kingdom, India, Singapore, South Africa and Australia, Lester and Cottle analyzed the visual content that accompanies media discourse in news broadcasts about events involving a particular social perception of risk [35]. Three content categories were identified in media rhetoric: spectacular, symbolic and iconic.

Spectacular content is defined as news that visually presents catastrophic, extreme weather events in the context of global warming, eliciting intense emotional responses such as the awe or fear associated with contemplating the destructive force of nature unleashed.

The symbolic content of the news is that in which the visual language accompanying the discourse relies, beyond the indexicality of the image itself, on a strong association between the image of phenomena and their anthropogenic causes. For example, the effects of industrial pollution such as 'smokestacks' presented in association with images of the urban universe.

Iconic content is found in news stories where the rhetorical intent is perceptible, unnoticed: the images are simply visual representations meant to illustrate the argument. For example, images of flooded Pacific villages serve as “proof” of the effects of sea level rise on island communities [35].

Through its indexicality, due to the recording process that allows a maximum approximation to reality, the filmed or photographed image tends to be perceived as identical to that reality [35]. Based on this observation, various visual techniques have been developed to foster a cognitive approach to the concept of climate change, largely alien in its abstractness to everyday experience. One of them is the panning shot as a way of creating for the viewer the illusion of movement in a landscape in which familiar places appear as naturally connected to distant places, filmed at different times. Edited with intentions of expressive drama, they can create an immersive effect that helps to attribute familiar qualities to places that are geographically intangible. For example, the camera lens instantly shifts from the interior of a crowded market to the Himalayan Mountains, capturing the melting glaciers that threaten the security of the Indian subcontinent's water supply, etc. [35].

In conclusion, the indexicality of the image tends to be associated in common knowledge with the notion of self-evident truth rather than with that of a hypothetical assertion more or less experimentally confirmed. The imagery of climate change is symbolic and indexical in nature, and this contributes crucially to the construction of representations of climate change.

Another way to capture climate change is through visual comparison. Under similar conditions, the same natural landscape is recorded at time intervals that are considered significant, and the differences are then highlighted in a filmic manner. Analyzing the imagery used in Greenpeace campaigns, Doyle notes that, due to the strong indexicality of the visual material, the changing landscapes can be interpreted as representing the natural world as a whole, threatened by human irresponsibility. Paired images of the polar ice cap before and after glacier melt are dramatically presented, indicating the accelerated melting of the ice cap. The stated intention is to make the uninterested viewer an informed witness to a distant event, but one in which he or she nevertheless feels involved [36]. Even if the change cannot actually be reproduced visually, it can be inferred not so much from the rational evaluation of scientifically measurable developments as from the emotional impact of the contrasts highlighted.

The imagery present in the media discourse on climate change has symbolic qualities that derive from its indexical nature [35,36]. Their symbolism is based both on an inherent indexicality due to the recording process and on the presence of the authors' narrative intention. Associated with feelings of regret and nostalgia, this type of imagery tends to become universalized, contributing to the construction of hegemonic representations of the consequences of global warming.

4. Climate change objectivation and anchoring of the figurative core

4.1. Cognitive effects of natural thinking

The information we take in from the media about climate change and its global effects comes from climate analyses and estimates etc. which, when penetrating public space, are 'translated', or made intelligible in common language. This is why they tend to be assimilated in an uncritical way, their scientific content in fact continuing to elude our lay understanding of the matter. Our knowledge is therefore subject to cognitive effects, which are omnipresent at the level of common sense [19]. One of the most relevant to the problem of climate change is the false consensus effect.

Representations emerge through objectification and anchoring, understood as socio-cognitive processes whose interdependence highlights the epistemological conditioning of common knowledge. New representations emerge on previously thought ground, latent or explicit [17,18]. As an operation proper to social thought, with regard to climate change, objectification

involves the materialization of scientific concepts or the concrete re-production of abstract notions by bringing together those particular aspects related to them that are culturally read with preference. The overabundance of information is gradually being depleted, and those aspects whose degree of complexity natural language does not support are deliberately excluded. This leads to the inevitable loss of their original meaning, as groups become familiar with the new notions, reconstructing them according to their own evaluation criteria.

Objectification implies a selective de-contextualization of scientific discourse as a form of knowledge expressed in a specialized language [21,23]. Group members disregard from the outset some information about climate change and its anticipated consequences and retain others, attempting to cognitively integrate them into their own universe of shared beliefs, intuitions, beliefs and values that pertain to common conditions of enculturation. The initial information, always communicated in an artificial, alien language, undergoes a process of conceptual familiarization, with the relevant filtered aspects first removed from their initial context and then being re-situated against the epistemological background of everyday life so that they can be cognitively appropriated in a way that involves a minimum of conscious effort. The end result is that puzzle, that informational schema that emerges through their spontaneous reorganization: the figurative core or central node of the representation [21]. Its formation allows a concentrated visualization of what comes to be considered as absolutely essential with regard to the object of representation "understood" in terms of everyday life through the assimilation of this schematic figuration. The rest of the information, however scientifically relevant, whose presence or absence is considered non-essential, does not disappear completely, but remains placed at the much more fluid, more changeable periphery of the representation. This law of the minimum necessary, acting in socio-cognitive appropriation, makes scientific uncertainty difficult to assimilate.

The pace of objectification processes depends on the group's distance from the object of representation. The perceived proximity of the phenomenon, its proximity, accelerates the process which ends in the naturalization of the conceptual scheme: the figurative core and, to a much lesser extent the peripheral representational elements, acquire the status of self-evident truths. In this sense, Jodelet observes that one of the effects of naturalization is that collective thought will not question the fact that the respective representation does not adequately or completely describe the social or natural phenomenon that triggered it [18]. Having begun in scientific thought, the path of representation on climate change is completed in common sense by the knowledge synthesized in

the bundle of representational elements forming the figurative core, knowledge that will be transposed into the practice of everyday life.

The concept of anchoring captures how representations emerge at the intersection of the social and subjective levels of human collective life, based on the observation that individuals spontaneously interpret the meaning of social objects of common interest, meanings that become rooted in collective thinking, inspiring new social practices [20]. Anchoring describes the process by which a representation becomes part of the inter-subjective universe of ideas, norms and values of communities. This process is epistemologically governed by the principle of non-contradiction. With regard to climate change, new and new considerations will tend to confirm, rather than deny, that knowledge which has already become part of common history.

As evidence of common sense, the knowledge on which we base our understanding of climate change does not come so much from direct experience as from the processes of educational socialization of scientific culture, pro-environmentalist campaigns or public debate. In the media, this information is not presented in an objective – neutral manner but is pre-interpreted, ideologically loaded with the intention of legitimizing environmental policies. This fosters the false consensus effect which is due to the presumption that the way we think and act is much more similar to that of our fellow human beings than it actually is [37]. We constantly overestimate our degree of agreement with others in order to convince ourselves that we come to the right conclusions because we judge as they do, i.e. “normal”. In our case, because of the fact that the anticipated implications of climate change become increasingly plausible through repetition in public discourse, we will tend to take the anticipated catastrophic effects of climate change as self-evident to everyone else.

4.2. Cognitive discomfort of uncertainty

Climate change tends to be presented in media as an all-encompassing, universalistic narrative, based however on scientific predictions whose degree of uncertainty, which is unavoidable in scientific discourse [38], remains difficult to accept by common sense as a form of knowledge that reasons on the basis of indisputable evidence.

In order to be accepted as evidence, a conception or belief must meet two conditions: it must be shared by the community and it must not be in flagrant contradiction with the logic of common sense. Scientific argumentation is assimilated to the extent that it does not reach

counterintuitive conclusions, and situations that radically contradict beliefs verified in everyday experience are usually not taken into account. Between two equally valid arguments that cannot reach certain or necessary conclusions, the one in which the degree of probability is expressed more precisely will be preferred. Because common sense has a minimal tolerance for uncertainty, imprecision will be associated with ambiguity [39,40].

There is a relevant difficulty in the formation of social representations related to the interpretation of scientific discourse, namely the low degree of epistemological tolerance that common sense has to uncertainty due to the uncomfortable cognitive ambiguity that it implies. In pro-environmental discourse, statistical data are currently used to convince the audience of the reality and actuality of the phenomenon. Predictions of climate futures are frequently based on mathematical modeling. Walker proposes a systematic analysis of how uncertainty is assessed, analytically integrated and communicated in this type of argumentation. The predictability of natural phenomena appears to lie between the upper limit of statistically estimable probability and the lower limit of acknowledged or even complete ignorance [41]. The following two types of uncertainty are relevant to the present approach.

The first type of uncertainty is that which can be measured as the probability associated with outcomes and expressed statistically. Starting from the assumption that the reference data are representative for the situation under study and that the modeling algorithm used allows the description of the evolution in time of the systems analyzed, the sources of this type of uncertainty, unavoidable in the natural sciences, arising from the lack of accuracy of the determinations, the imprecision of the estimates, etc., are transparently assumed by the authors and communicated to the public [41]. It is, from the point of view of common sense, the most manageable type of uncertainty because the probability of the results, their degree of confidence, can be estimated with sufficient precision. Moreover, the statistical-visual communication of uncertainty, which allows for its precise estimation, tends to be associated with competence and honesty, while its verbal expression diminishes confidence in the conclusions of the argument [42, 43]. Still, any form of graphic visualization of the uncertainty of the results poses problems of interpretation, since social cognition remains a motivated psychosocial process [44,45]. Confidence in the correlation between phenomena may remain low due to insufficient familiarity with probabilistic reasoning, and previous beliefs on climate change may influence the interpretation of the data [44,45]. When conclusions based on the analysis of statistical indicators conflict with previous beliefs, any

representation of uncertainty increases cognitive discomfort reducing the persuasiveness of the message [46].

The second type of uncertainty is related to the anticipated scenario itself on the plausibility of which the scientific community has not yet reached a consensus. Because the laws of evolution of the phenomena are not yet sufficiently known, although there are scientific data to start from, the confidence of the anticipated results cannot be estimated [41].

In conclusion, communicating climate change predictions raises the issue of public reaction to a particular type of uncertainty. It is not only about accepting the limits of our knowledge of the surrounding world but the realization that we simply cannot know how far global warming will negatively affect our daily life. Realizing that increases the inferential pressure accelerating the emergence of new social representations of climate change.

Scientific community discourse on climate change reveals new and potentially alarming uncertainties about the future, which the media present in two alternative ways.

The consequences of climate warming are usually presented in news broadcasts in a simplified and intensely emotionally charged manner, deliberately associated with suggestive images: devastated landscapes, endangered species, oil spills in the oceans, etc., portraying nature as the collateral victim of irresponsible human action that must be stopped before it is too late. The media debate tends to focus on the design and implementation of strategies to manage the anticipated consequences [31,32]. Accepting the inevitability of global warming as an indisputable fact may contribute to the emergence of hegemonical social representations [47].

At the other end of the spectrum, the results of environmental studies can be relativized, and the exploratory nature of scientific knowledge carefully capitalized on for economic policy reasons in order to show that the anthropogenic origin of global warming remains a questionable hypothesis [48].

In these circumstances, according to Social Representations Theory, the public will act as a referee, selecting elements from both discourse variants and constructing its own representation of the consequences of climate change, always starting from intuitions that are part of its everyday experience, geographically and culturally-historically contextualized.

5. Conclusions

Climate change imagery is ubiquitous in media discourse, contributing to the construction of representations of the dramatic consequences of climate change. It visually accompanies abstract scientific information as a result of the intention to transform a scientifically quantifiable, but still sensory distant phenomenon, into an epistemological reality that is sufficiently tangible to common knowledge. Due to its indexicality, filmed or photographed image is associated in media discourse with the notion of self-evident truth. Accepting global warming as an indisputable fact may contribute to the emergence of hegemonical social representations.

Because the anchoring process is epistemologically governed by the principle of non-contradiction, newly emerging considerations will tend to confirm, rather than refute, the already common knowledge that climate warming has indeed long-term catastrophic effects. The sense of urgency associated with this knowledge triggers the pressure to infer that leads to the forming of new representations.

Perceived imprecision in scientific predictions will be associated by the general public with a difficult to accept ambiguity due to the low degree of epistemological tolerance that common sense has to uncertainty. Communicating climate change predictions raises the issue of public reaction to a particular type of uncertainty. It is not only about accepting the limits of our knowledge of the surrounding world but the realization that we simply cannot know how far global warming will negatively affect our daily life. That realization also increases the inferential pressure accelerating the emergence of new social representations of climate change.

The process of objectification involves a selective de-contextualization of scientific discourse. A law of maintaining the bare minimum of necessary information governs socio-cognitive appropriation. As a consequence, depending on the various conditions of group enculturation, large amounts of scientifically relevant information about climate change will not be cognitively integrated into one's own universe of convictions, intuitions, beliefs, and values.

As a complex, unknown and threatening reality, climate change has the capacity to become, through cognitive appropriation, a structural social object in the sense that, by re-producing it through re-signification, communities tend to redefine themselves in relation to nature, radically re-evaluating their relationship with the environment.

References

1. Cornell S. E., Berkhout F., Tuinstra W., Tàbara J. D., Jäger J., Chabay I., de Wit B., Langlais R., Mills D. K., Moll P., Otto I. M., Petersen A. C., Pohl C., & van Kerkhoff L., Opening up knowledge systems for better responses to global environmental change. Environmental Science & Policy 2013, 28, 60-70. Available online: https://doi.org/10.1016/j.envsci.2012.11.008 (accessed on 3 January 2023)
2. Nowotny H., Democratizing expertise and socially robust knowledge. Science and Public Policy 2003, 30, 151–156. Available online: https://www.researchgate.net/publication/250198724 (accessed on 15 January 2023)
3. Spangenberg J. H., Sustainability science: A review, an analysis and some empirical lessons. Environmental Conservation 2011, 38 (3), 275–287. Available online: https://doi.org/10.1017/S0376892911000270 (accessed on 11 December 2022)
4. Yearley, S., Sociology and climate change after Kyoto: What roles for social science in understanding climate change? Current Sociology 2009, 57(3), 389–405. Available online: https://doi.org/10.1177/0011392108101589 (accessed on 1 December 2022)
5. Aufenvenne P., Egner H., von Elverfeldt K. On climate change research, the crisis of science and second-order science. Constructivist Foundations 2014 10(1), 120–129. Available online: http://constructivist.info/10/1/120 (accessed on 21 December 2022)
6. Oreskes N., Conway E.M., Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming, Bloomsbury Press: New York (US) 2010.
7. Boykoff M.T., Boykoff J. M., Balance as Bias: Global Warming and the US Prestige Press. Global Environmental Change 2004 14 (2), 125–136. Available online: https://doi.org/10.1016/j.gloenvcha.2003.10.001 (accessed on 15 November 2022)
8. Coady D., Corry R.,The Climate Change Debate: An Epistemic and Ethical Enquiry, Palgrave-Macmillan: New York (US), 2013
9. Cooke R., Messaging climate change uncertainty. Nature Climate Change 2015 5 (1), 8–10. Available online: https://doi.org/10.1038/nclimate2466 (accessed on 12 October 2022
10. Lam V., Majszak M. M., Climate tipping points and expert judgment, WIREs Clim Change 2022 13 (6) 1-15 , Available online: https://doi.org/10.1002/wcc.805 (accessed on 8 October 2022)
11. Pongiglione F., Martini C., Climate Change and Culpable Ignorance: The Case of Pseudoscience. Social Epistemology: a journal of knowledge, culture and policy 2022 36 (4), 425-435. Available online: https://doi.org/10.1080/02691728.2022.2052994 (accessed on 13 October 2022)
12. Moloney G., Leviston Z., Lynam T., Price J., Stone-Jovicich S., Blair D. Using social representations theory to make sense of climate change: what scientists and nonscientists in Australia think. Ecology and Society 2014, 19(3), 19 Available online: http://dx.doi.org/10.5751/ES-06592-190319 (accessed on 3 October 2022)
13. Durkheim É., Les formes élémentaires de la vie religieuse. Presses Universitaires de France: Paris (FR), 2003.
14. Moscovici S. The phenomenon of social representations. In Social Representations; Farr R. M., Moscovici S. Eds. Cambridge University Press, Maison des Sciences de l'Homme: Cambridge (UK), Paris (FR), 1984; pp. 3-69.

15. Moscovici S., Psychologie des minorites active, Presses Universitaires de France: Paris (FR), 1979.
16. Moscovici S., The Myth of the Lonely Paradigm: A Rejoinder, Social Research 1984 51 (4), 939-967.
17. Jodelet D., La representación social: fenómenos, concepto y teoría. In Psicología Social, II ; Moscovici S. Ed. Paidós Iberica: Barcelona (SP), 1985; pp. 469 – 494.
18. Jodelet D., The Movement of Return toward the Subject and the Approach of Social Representations. Connexions 2008 89 (1), 25-46. Available online: https://doi.org/10.3917/cnx.089.0025 (accessed on 18 September 2022).
19. Bourdieu P., Langage et pouvoir symbolique, Éditions du Seuil: Paris (FR), 2001.
20. Bourdieu P., Wacquant L., Réponses : pour une anthropologie réflexive, Éditions du Seuil: Paris (FR), 1992.
21. Moscovici S., Hewstone M., De la science au sens commun. In Psychologie sociale; Moscovici S. Ed., Presses Universitaires de France: Paris (FR), 1984; pp. 539-566.
22. Moscovici S., Psychologie des minorites active, Presses Universitaires de France: Paris (FR), 1979.
23. Moscovici S., Notes towards a Description of Social Representations. European Journal of Social Psychology 1988 18, 211-250. Available online at: https://doi.org/10.1002/ejsp.2420180303 (accessed on 16 September 2022)
24. Wagner W., Duveen G., Farr R., Jovchelovitch S., Lorenzi-Cioldi F., Marková I., Rose D. Theory and method of social representations. Asian Journal of Social Psychology 1999 *2*(1), 95–125. Available online at: https://doi.org/10.1111/1467-839X.00028 (accessed on 16 September 2022)
25. Moloney S., Horne R., Low Carbon Urban Transitioning: From Local Experimentation to Urban Transformation? Sustainability 2015; 7(3) 2437-2453. Available online at https://doi.org/10.3390/su7032437 (accessed on 12 September 2022)
26. Smith N., Joffe H., How the public engages with global warming: A social representations approach. Public Understanding of Science 2013 22; 16–32. Available online at https://www.researchgate.net/publication/247157530 (accessed on 13 September 2022)
27. Moscovici S., Psychoanalysis. Its image and its public, Macey D. Trans., Polity Press: Cambridge (UK), 2008.
28. Moliner P., Tafani E., Attitudes and social representations: a theoretical and experimental approach, European Journal of Social Psychology 1997 27 (6); 687-702 Available online at https://www.researchgate.net/publication/262824887_Attitudes_and_social_representations_A_theoretical_and_experimental_approach (accessed on 12 October 2022)
29. Moliner P., Psychologie sociale de l'image, Presses universitarire de Grenoble: Grenoble (FR), 2016.
30. Manzo K., Beyond polar bears? Re – envisioning climate change, Meteorological Applications, Science and Technology for Weather and Climate 2010 17 (2), 196-208.
31. Manzo K., Imaging Vulnerability: The Iconography of Climate Change, Area 2010 42 (1), 96-107.
32. Messaris P., Abraham L., The role of images in framing news stories. In Framing Public Life - Perspectives on Media and Our Understanding of the Social World, Reese S.D., Gandy

O.H.J., Grant A.E., Eds., Routledge: New York (US), 2001, pp. 215–226. Available online at https://doi.org/10.4324/9781410605689 (accessed on 3 October 2022).

33. Atkin A., Pierce on The Index and Indexical Reference. Transactions of the Charles S. Peirce Society 2005 41 (4),161-188. Available online at https://www.researchgate.net/publication/254965984_Peirce_on_the_Index_and_Indexical_Reference (accessed on 7 October 2022).
34. Bate D., The indexical imagination. In A Companion to Photography; Bull S. Ed. John Wiley & Sons Ltd. 2019, pp. Available online at https://doi.org/10.1002/9781118598764.ch6 (accessed on 3 October 2022).
35. Lester L., Cottle S., Visualizing climate change: television news and ecological citizenship. Int J Commun 2009 3, 920–936.
36. Doyle J., Seeing the climate? The problematic status of visual evidence in climate change campaigning. In Ecosse: Images, Rhetoric and Nature; Dobrin S., Money S. Eds., State University of New York Press: New York, 2009, pp. 279–297
37. Ross L., Greene D., House P. The "false consensus effect": An egocentric bias in social perception and attribution processes, Journal of Experimental Social Psychology 1977 13 (3), 279–301. Available online at: doi:10.1016/0022-1031(77)90049-X (accessed on 3 February 2022)
38. Oreskes N., The Scientific Consensus on Climate Change. Science 2004 306 (5702), 1686–1686. Available online at: https://doi.org/10.1126/science.1103618 (accessed on 8 February 2022).
39. Schneider B., Image politics: picturing uncertainty. In Climate Change and Policy; Gramelsberger G., Feichter J., Eds. Springer-Verlag: Berlin, 2011, pp. 191–192.
40. Camerer C., Weber M., Recent developments in modeling preferences: Uncertainty and ambiguity. J. Risk Uncertainty 1992 5 (4), 325–370. Available online at: http://www.jstor.org/stable/41755006 (accessed on 8 February 2022).
41. Walker W., Harremoës P. E., Rotmans J. , van der Sluijs J. P., van Asselt M.B.A, Janssen P., Krayer von Kraus M.P., Defining Uncertainty: A Conceptual Basis for Uncertainty Management in Model-Based Decision Support. Integrated Assessment 2003 4(1), 5-17. Available online at: https://doi.org/10.1076/IAIJ.4.1.5.16466 (accessed on 8 February 2022).
42. Ho E., Budescu V.D., Climate uncertainty communication. Nature Climate Change 2019 9 (11), 802-803. Available online at: https://www.researchgate.net/publication/336539000 (accessed on 15 February 2022).
43. Clark D. A., Verbal uncertainty expressions: A critical review of two decades of research. Curr. Psychol. 1990 9, 203–235. Available online at https://doi.org/10.1007/BF02686861 (accessed on 12 January 2022).
44. Dieckmann N. F., Gregory R., Peters E., Hartman R., Seeing what you want to see: How imprecise uncertainty ranges enhance motivated reasoning. Risk Anal. 2017 37 (3), 471–486. Available online at https://doi.org/10.1111/risa.12639 (accessed on 18 January 2022)
45. Kraft P. W., Lodge M., Taber C. S., Why People "Don't Trust the Evidence": Motivated Reasoning and Scientific Beliefs. The Annals of the American Academy of Political and Social Science 2015 658 (1), 121-133. Available online at: https://doi.org/10.1177/0002716214554758 (accessed on 18 January 2022)

46. Keren G., Gerritsen L. E. M., On the robustness and possible accounts of ambiguity aversion. Acta Psychol. 1999 103 (1-2), 149–172.
47. T. Magioglou, Coen S., The construction of a hegemonic social representation: Climate crisis and the role of COVID-19 in defining survival. European Psychologist 2021 26(3), 230–240. Available online at: https://doi.org/10.1027/1016-9040/a000442 (accessed on 21 January 2022)
48. Boykoff M. T., Boykoff J. M., Balance as Bias: Global Warming and the US Prestige Press. Global Environmental Change 2004 14 (2), 125–136. Available online at: http://dx.doi.org/10.1016/j.gloenvcha (accessed on 11 January 2022)