

How visual metaphors can contradict verbal occurrences: a cross-linguistic and multimodal analysis of the *IMPRINT* of climate change

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ABSTRACT: 144 words

We investigate the different interpretations related to the metaphorical *IMPRINT* of climate change in English and French media discourses. This cross-linguistic perspective is motivated by the particularities of both languages which have been assumed to promote different understandings of climate change-related concepts. We focus on the metaphor *CARBON FOOTPRINT* whose meaning can be compared to another climate change metaphor in English: *FINGERPRINT*. These two source domains share a highly specific and concrete meaning interpreted from lexical constructions enabled by the English language. In French, however, such a specification cannot be interpreted from the meaning of the metaphor *EMPREINTE CARBONE* (*CARBON IMPRINT*) which defines a similar concept. We rely on visual representations of these metaphorical expressions in English and French to discuss the common knowledge associated with each source domain: we show that visual metaphors can contradict expectations emerging from the interpretations of verbal metaphors.

1. Introduction

In this paper, we investigate climate change metaphors in discourse with several corpora. We aim at identifying the relevant features of particular source domains to understand the prevalence of specific cross-domain mappings across media and languages. Our focus on a scientific topic – climate change – guides our analysis of the explanatory function of metaphors (Deignan 2005: 16; Damele 2016: 80-1). These explanatory metaphors describe scientific findings according to the stance of popular sources of information. Their use promotes and popularises particular understanding of the topic, which can produce interpretative issues: the non-scientific use of the metaphor can fulfil various functions which may differ from its scientific function (Knudsen 2003: 1248).

Climate change is represented with metaphors describing risks and uncertainty (Nerlich & Hellsten 2014: 27). *CARBON FOOTPRINT* is a key metaphor which illustrates this representation (Koteyko 2010; Nerlich & Hellsten 2014). Its occurrence across different discourses about climate change establishes a scope through which the topic is presented: this scope informs the population about procedures to “assess” and “manage” the risk and limit its impact (Nerlich & Hellsten 2014: 28). Additionally, the global relevance of the topic supports our hypothesis that such metaphors re-occur across languages and cultures.

We focus on two languages – English and French – and two modalities – verbal and visual – to interpret the relevant features of the metaphor *CARBON FOOTPRINT* / *EMPREINTE CARBONE*. This investigation stems from the distinction of the source domain *FOOTPRINT* from the semantically related source domain *FINGERPRINT*,

which both occur in English environmental discourse. The structure of the French language prevents this distinction: *footprint* and *fingerprint* are not part of the French vocabulary. However, French environmental discourse shows that the use of the metaphor *EMPREINTE CARBONE* (*CARBON IMPRINT*) can be compared with the English use. This comparison is performed with verbal occurrences from French and English newspapers and short animated videos about climate change. We investigate the role of source domains and multimodality (Forceville 2016;2017) in the promotion of readers and viewers' understanding of the topic.

2. The explanatory characteristics of a metaphor

The particularities of scientific metaphors may lead to various expectations regarding the mappings they involve. Metaphors can ease recipients' understanding because of the “concrete” aspects of the source domain mapped with the “complex” aspects of the target domain (Deignan 2005: 16; Damele 2016: 80-1). In the case of scientific metaphors, the shared features, or the “ground” of the metaphor (Black 1962: 38-9; Goatly 2007: 11; Musolff 2016: 33), may not be as significant for “lay” people as it is for scientists (Schafer & Schlichting 2014: 3). In specialist discourse, metaphors are “ordinary scientific concepts” used to hypothesise and explain scientific claims. Comparatively, in non-specialist discourse, these metaphors are emphasised and explicated to promote explanation of scientific observations (Knudsen 2003: 1255; 1260). Deignan, Semino, and Paul (2019) compare the use of climate change metaphors in scientific papers, in educational texts, and in students' talks. Their results show that the meaning of such metaphors has been adapted to fit a particular context, interest, or

experience. Hence, the understanding of the topic can influence the selection of features when metaphors are adapted in different discourses.

Here, we consider this adaptation from a cross-linguistic and a multimodal perspectives. Forceville (2016; 2017; see also Forceville & Urios-Aparasi 2009) has notably demonstrated that visual metaphors can serve a persuasive function as part of the companies' advertising strategy. Silaški & Durovic (2019) focus on metaphors in political cartoons about Brexit in the media. They demonstrate a visual emphasis on specific features of the source domain (e.g., a *CRASHING PLANE*) to promote particular political opinions. In climate change studies, Pérez-Sobrino (2013) notices visual occurrences of *greenwashing* in an advertisement relying on the colour green to induce a belief in the environmental benefits of the product. Doyle (2007) highlights Greenpeace's communicative strategies which rely on alarmist visual metaphors (e.g., *CLIMATE AS A TIMEBOMB*). Deignan (2017) adopts a different approach: she analyses scientific graphs and diagrams and establishes that associated verbal metaphors guide the readers to interpret these visual representations. Here, we first analyse verbal metaphors and we rely on visual metaphors to establish the relevant features involved in the mappings occurring in French and English environmental discourses.

We focus on a specific metaphor, *CARBON FOOTPRINT*, which illustrates the impact of carbon pollution on the environment and identifies appropriate actions (Nerlich & Hellsten 2014: 28). To analyse the features of the source domain, we take into account the metaphor user's communicative goals (Charteris-Black 2004: 133; Goatly 2007: 30). The selection of features can differ depending on the metaphor user's stance but our main focus is on the role played by the linguistic particularities of French and English.

We draw on existing studies which show that the selection of features promotes the congruity of particular source domain(s) in context (Becker 1997: 244; Gineste, Indurkha & Scarf 2000: 119; Utsumi 2005: 162). The explanatory function of the metaphor *CARBON FOOTPRINT* can be altered in biased descriptions performed by journalists. The editorial stances of newspapers can influence the selection of features to favour different viewpoints on the topic. These viewpoints have to be taken into account because climate change is a topic from which arise different opinions (e.g., scepticism / activism). Critical Metaphor Analysis (Charteris-Black 2004) demonstrates that metaphors rely on a shared system of values and emotive force, favouring ideological use (2004: 12). In our research, we acknowledge the evaluative features of the source domains: verbal and visual metaphors may promote different opinions on the topic.

Existing research has shown that the metaphor *CARBON FOOTPRINT* can be ideologically adapted. The metaphor favours people's understanding of management policies to protect the environment (Koteyko 2010: 664; Koteyko, Thelwall, and Nerlich 2009: 30-9). Its adaptation in online communication demonstrates a reliance on additional source domains to emphasise the link between pollution and humans' daily activities (e.g., *carbon diet*; Koteyko, Thelwall, and Nerlich 2009:40). Additionally, the source domain *FOOTPRINT* has been extended to share a strong criticism addressed to polluters: the metaphor *CARBON BIGFOOT* (2009:43) echoes the metaphor *CARBON FOOTPRINT* but this adaptation focuses on the *OWNER OF THE FOOTPRINT* rather than on the *FOOTPRINT* itself.

From a different stance, researchers have demonstrated that the relevant features of particular metaphors vary across cultures. Notably, Kövecses (2005; 2010) compares the conceptual metaphors *HAPPINESS IS FLOWERS IN THE HEART* in Chinese to

BEING HAPPY IS BEING OFF THE GROUND in American English. The different mappings are explained in terms of “introverted/ extrovert” characters of the metaphor users (2005: 70-1). Kövecses highlights that, despite these different mappings, metaphorical production respects the similarity of the source and target domains (2010: 77-9). Such a similarity promotes the recurrence of particular metaphorical expressions across cultures. This cross-cultural aspect has been documented by Musolff (2016): he analyses the metaphorical expression *body politic* in a survey involving participants from various countries. His results show culture-specific interpretations: Chinese participants focused on the geographical features involved in the mapping (e.g., geographical shapes related to the anatomy) whereas European, Israeli, and American participants focused on *body politic* as a functional whole (2016: 123-4). In climate change discourse, such a distinction between cultures has also been discussed by (Author: 2019): the metaphorical expression *MOTHER EARTH/ NATURE* occurring in English (UK/US), French, and Spanish media demonstrates culture-specific features. These features convey different personalities to the *MOTHER* which vary depending on the language of production. Here, we demonstrate that the selection of features also depends on the modality: verbal and visual metaphors in English and French rely on different features, contradicting expectations arising from knowledge of the source domain.

3. Methodology

Our research involves different corpora which can illustrate the relevant features of the metaphors *CARBON FOOTPRINT*, *FINGERPRINT*, and *EMPREINTE CARBONE* in English and French climate change discourses.

Our research starts with the analysis of verbal occurrences. We use the “Nexis” database to observe metaphorical occurrences in newspaper articles. This database gives access to newspaper articles from various countries (e.g., “The Guardian”, “Daily Mirror”, “Le Monde”, “Le Figaro”) which have been released within a 40-year timespan. We delimit our research to newspaper articles published between January 1984 (when the expression *carbon footprint/ empreinte carbone* was first used in relation to climate change) and October 2019 (when our research has started). We use the search terms *carbon footprint* OR *fingerprint*, AND *climate change* OR *global warming* (and in French *empreinte carbone* AND *changement climatique* OR *réchauffement global*) which are included in the headlines and lead sections of our selected articles. We specify the selection with the “environment and natural resources” section of the database. However, we do not restrict our selection to particular newspapers because the editorial stances can influence the metaphorical meaning.

We include 1,342 articles from British newspapers (average number of words per article: 714.05) and 527 articles from French newspapers (average number of words per article: 752.1; see details of the corpora in notes).

We look for occurrences of *carbon footprint*, *fingerprint*, and *empreinte carbone* in the selected articles. Our initial observations allow us to perform a subsequent selection: we aim at observing the features of the source domain at play when the expression is used in newspapers. We thus exclude occurrences whose contextual uses do not characterise the *FOOTPRINT/ FINGERPRINT/ EMPREINTE*, e.g. articles where the metaphorical expressions are used as the sole expression in a headline or sub-headline, when the metaphorical meaning is uncertain (e.g., not enough contextual information), or in extracts such as:

(1) *Legrand est engagé depuis longtemps dans une démarche de préservation de l'environnement. (...) depuis 2011, Legrand publie chaque année son empreinte carbone*. “PR Newswire” “Lutte contre le réchauffement climatique” 1 décembre 2016.

Translation (Author): Legrand has long been dedicated to adopt a strategy to preserve the environment. (...) Legrand has published his carbon imprint every year since 2011.

In (1), the characteristic attributed to *carbon footprint* is related to its yearly publication. This characteristic cannot indicate the relevant features of the source domain. This extract has thus not been considered for our research.

This procedure limits the number of verbal occurrences discussed in this research to 385 occurrences of *carbon footprint*, 31 occurrences of *fingerprint*, and 470 occurrences of *empreinte carbone*. These occurrences show a wide variety of source features which help us to compare cross-linguistic and multimodal metaphors.

We rely on two electronic corpora, the “British National Corpus” and “French Opus 2” (from SketchEngine, Kilgarriff 2014) to investigate the different features of the source domains. We use the words *fooprint*, *fingerprint*, and *empreinte* as search terms, with the functions “WordSketch” which presents a list of the most frequent collocates of a search term across contexts, and the “Concordance tool” which presents contextual information including the search term. These functions can identify the features which are frequently attributed to the source concepts and establish a semantic link between the metaphor and its collocates in newspapers.

We then analyse the visual representations of the metaphorical concepts: we investigate the link between verbal realisations of the metaphor, information from electronic corpora, and the features highlighted in visual realisations of the metaphor in short animated videos available on the website “Youtube”. Our video corpus answers particular criteria: it is composed of short animated videos which last up to 15 minutes (average length: 4:37 minutes in English and 4:47 minutes in French). These videos may only partly rely on animations (e.g., a presenter describes animated pictures). The providers of the videos (information displayed by “Youtube”) often correspond to existing news agencies such as *Le Monde* or *the BBC*, and a minority of the videos are unrelated to the news media (e.g., TedX animations, subscribers’ videos). We select these videos with search terms – *climate change/ changement climatique* OR *global warming/ réchauffement global* AND *carbon footprint* OR *fingerprint* OR *empreinte carbone* – which are identified in the titles or descriptions of videos. Each video uses the source domain *FOOTPRINT*, *FINGERPRINT*, or *EMPREINTE* at least once during the presentation. Videos in which the metaphor verbally occurs but is not visually represented have not been selected, e.g. no visual item is used to represent the concept.

Our selection results in 11 videos on *carbon footprint*, 3 videos on *fingerprint*, and 22 videos on *empreinte carbone*.

We start our analysis with English and French uses of the metaphors in newspapers. We then focus on visual representations to compare occurrences.

4. Verbal metaphors in English and French

4.1. The *CARBON FOOTPRINT* and *FINGERPRINT* metaphors in English

British newspaper articles about climate change have revealed occurrences of two semantically related source domains which illustrate the environmental impact of pollution. On the one hand, the *CARBON FOOTPRINT* metaphor is expectedly frequent in our corpus (385 occurrences). In the BNC, “WordSketch” results include *footprint* in contexts which describe an action or movement producing a mark on a place (with verbs like *yield*, *produce*, and *leave* as frequent collocates). The BNC results also emphasise the visibility of the concept with adjectives such as *clear*, *large*, and *evident*.

TABLE 1 ABOUT HERE

The use of *CARBON FOOTPRINT* in British newspapers allows journalists to attribute a visible and measurable feature to the effects of humans’ activities. Our English corpus shows that collocations can highlight the relevant features of the source domain:

(2) *Canada and Australia - who also have heavy carbon footprints and a history of sceptical climate policies - are next furthest advanced in CCS (carbon capture and storage)*. “The Guardian” Damian Carrington “Whatever happened to carbon capture in the fight against climate change?” May 9, 2012

In (2), the journalist attributes a *WEIGHT* feature (*heavy*) to the source concept: he opposes the adoption of the CCS system by Canada and Australia to their respective *HEAVY* pollution and sceptical policies. The features of the source domain are adapted to emphasise the effect of pollution. The journalist implicitly refers to the *BODY* which left the *FOOTPRINT*. This interpretation recalls Koteyko's observation (2010) of the conceptual link between the metaphor *CARBON FOOTPRINT* and metaphorical concepts characterising unhealthy lifestyle, i.e. *CARBON POLLUTION AS AN UNHEALTHY DIET* (2010: 665).

Other occurrences of the metaphor in our corpus highlight related *SIZE* and *SHAPE* features of the source domain such as *large, small, deep, cut, reduce* (*SIZE/SHAPE OF FOOTPRINTS*: 350 occurrences).

Some occurrences characterise the movement at the origin of the *FOOTPRINT*:

(3) *The chief executive of the world's biggest retailer yesterday stepped up the pace in the race to be green with a series of initiatives to cut its own giant carbon footprint - and those of its suppliers, customers and staff.* "The Guardian" Julia Finch "Financial: Climate change" February 2, 2007

Extract (3) shows that the *SIZE OF THE FOOTPRINT* ("gigantic"; "cut") can be described with instances of the *JOURNEY* metaphor ("*stepped up the pace in the race*") which can refer to the movement producing a *FOOTPRINT*. The journalist emphasises that the chief executive's position in the *RACE* depends on his capacity to *CUT THE COMPANY'S FOOTPRINT*. Although the association of the movement and the *FOOTPRINT* remains indirect in (3), we notice a recurrent association of *JOURNEY*

metaphors and *CARBON FOOTPRINT* in our corpus (JOURNEY and *FOOTPRINT*: 19 occurrences).

The *FOOTPRINT* can also be attributed dangerous features (16 occurrences), with collocates such as *damaging*, *killing*, and *threatening*.

On the other hand, the use of the metaphor *FINGERPRINT* is more limited in our corpus (31 occurrences). This metaphor is more frequent in scientific communication and occurrences in newspapers mainly refer to scientific findings. The BNC results for the word *fingerprint* highlight particular contextual characteristics: *fingerprint* seems to be linked to various fields of expertise. We identify frequent collocates such as *molecular*, *DNA*, *genetic*, *brain-resonance* which include *fingerprint* in a medical frame. Additionally, the collocates *blood* and *detective* include the *fingerprint* within crime descriptions.

TABLE 2 ABOUT HERE

While some of the collocates in this table seem semantically related to both *footprint* and *fingerprint* (e.g., *shoe*), concordances in the BNC accentuate crime-related characteristics:

(4) Anderson replied: 'I did not murder my wife. </s><s> I gave you clothing, my shoes, fingerprints, blood, anything else you asked for.' </s><s> The detective chief-inspector said he believed he could connect the accused to the charges. (BNC token: 12496264).

The concordance of *footprint* and *fingerprint* (2 examples) also occurs in crime descriptions with words like *victim*, *police* and *weapon*. The contextual link between *fingerprint* and crime or medicine descriptions reveals that this imprint is mostly observed and used by experts.

In British newspapers articles about climate change, the *FINGERPRINT* metaphor explicitly refers to the semantic field of crime (27 crime-related occurrences and 4 occurrences emphasising human origins, see extract 6):

(5) *The unmistakable fingerprint of extreme weather event [sic] at the crime scene of global warming seems intuitively obvious: consider that Houston is reckoned to have been hit by three "500-year floods" in three years.* “The Guardian”: “See you in court” September 10, 2017

In (5), the journalist identifies *extreme weather event* as the *OWNER OF THE FINGERPRINT*. This *CRIME* storyline links meteorological events and climate change which is, here, identified as a *CRIME SCENE*. This extract shows that *FINGERPRINT*, in climate change discourse, enables to identify a *CRIMINAL*, i.e. the cause of events. Other extracts depict these events as a *CRIME* committed by polluters or nature, depending on the stance of the article.

Compared to *FOOTPRINT*, the *FINGERPRINT* does not bear the same visible features. This particular *IMPRINT* requires specific material and knowledge to be observed which explains its relation with *CRIME* (and medicine in the BNC) and its predominance in scientific discourse. Extract (5) indirectly involves the role of scientists

who have the appropriate knowledge to establish whether a weather event is associated with climate change or not.

While occurrences of *FOOTPRINT* in our corpus attribute various characteristics to the concept – different weights (light, heavy), different heights (deep, small, big), different origins (global, national, individual) and different movements (steps, directions) – the interpretation of *FINGERPRINT* in newspapers seems limited to scientific observation of *incriminating* clues, which can produce an emphasis on the human origin of the *FINGERPRINT*.

(6) *The science claims that once you adjust for what we know about natural variation, the human fingerprint becomes clearer, leading to the IPCC¹ concluding that it is 90% probable that we are responsible for 50%+ of recent warming. “The Telegraph” James Delingpole “Some common sense on global warming” July 14, 2010*

On the one hand, *CARBON FOOTPRINT* is mainly used by journalists to produce a more concrete picture of the effect of pollution. They refer to the *visible* feature of the source and emphasise this feature to fulfil different arguments (mocking environmentalists).

(7) *My carbon footprint will be not a giant clown's shoe but a dainty Cinderella slipper. Honestly. “The Daily Telegraph” Sarah Lonsdale “The green gospel according to Dave” March 25, 2006*

On the other hand, the *FINGERPRINT* metaphor links events to climate change: journalists use the *less visible* feature of the source domain to discuss scientific findings.

¹Intergovernmental Panel on Climate Change

These features require particular knowledge to be identified: an event may or may not be related to climate change. *FINGERPRINT* is closely related to climate science. The emotive features of *CRIME* depictions favour argumentative views on the topic.

FINGERPRINT is used by British journalists to discuss less obvious information (communicated by scientists) while *CARBON FOOTPRINT* refers to more obvious information (i.e., information acknowledged by different communities).

4.2. EMPREINTE CARBONE: a footprint or a fingerprint?

While English language specifies the origin of the *IMPRINT* (with compounds that respect a similar formation: *PART OF THE BODY* + “print”), the structure of French language prevents this specification. French language users need an adjective (e.g., *empreinte digitale; fingerprint*) or a prepositional group (e.g., *empreinte de pas; footprint*) to identify the origin of the *IMPRINT*. Additionally, *carbon footprint* in English is a nominal compound while in French, *carbon (carbone)* is an adjective qualifying the noun *imprint (empreinte)*. The use of *carbon* as an adjective also prevents the specification of the *BODY PART*: the combination of the adjective *carbone* – which is related to the target domain – with an adjective like *digitale (finger-)* – which is related to the source domain – would result in a zeugma which cannot be interpreted by French readers/ listeners.

Since the structure of French language prevents well-delineated characterisation of *CARBON IMPRINT* allowing us to identify it as a *FOOTPRINT* or as a *FINGERPRINT*, we analyse the word *empreinte (imprint)* in the French dictionary *Larousse* (online version). Definitions do not specify the origin that can be attributed to

the *imprint*: “a hollow or embossed print applied through a pressure on a surface”.

However, while the French translation of *footprint* (*empreinte de pas*) is only mentioned as an exemplary instance of *imprint*, the translation of *fingerprint* (*empreinte digitale*) has been attributed its own definition. Hence, *fingerprint* may be more commonly described in French compared to *footprint*.

To test this claim, we use an electronic corpus, “French Opus2”, accessed from SketchEngine (Killgariff 2014). “WordSketch” can demonstrate whether the French search term is more frequently used to define a *footprint* or a *fingerprint*. The results reveal that the most frequent collocates of *empreinte* characterise the concept as a *fingerprint*. Indeed, *digital (finger-)* is the most frequent adjective qualifying the search term (1,264 occurrences, frequency: 12.80 per million). The examples available for the phrase *empreinte de pas (footprint)* are limited to 158 occurrences (frequency: 0.17 per million).

We identify other collocates which include *empreinte* within crime-related or medicine-related contexts. These descriptions can be compared to BNC descriptions of *fingerprint*. These French collocates are *sanglant* (bloody), *ADN* (DNA), *radiographie* (radiography), and *échantillon* (sample). We can claim that the most common understanding of *empreinte* in French refers to a *fingerprint*, following these contextual similarities.

TABLE 3 ABOUT HERE

Some collocates can either refer to a *footprint* or a *fingerprint* (or other *body-imprints* such as *retinal*). We investigate the contextual information provided by “Opus2”: the collocations *empreinte* and *venir* (come), *aller* (go), or *donner* (give) refer to the identification of participants (*l'empreinte vient de nous donner son nom*; the imprint just gave us his/her name, token 3194088625) or to a crime scene (*je pense à un meurtre*; I think this is a murder, token 310376200). The collocation *empreinte* and *partielle* (partial) refers to different body imprints (*empreinte partielle d'un pouce*; the partial imprint of a thumb; *empreinte partielle de chaussure*; partial imprint of a shoe). However, these examples mostly describe crime scenes with words such as *arme* (weapon) and *meurtre* (murder). “Opus2” shows that *empreinte* is frequently associated with scientific, medical, and criminal contexts.

We now investigate the metaphorical expression *empreinte carbone* in French newspaper articles about climate change. Among 470 occurrences, collocates do not often allow the identification of *empreinte* as a specific *BODY-PRINT*.

(8) “*L'intelligence artificielle est l'un des seuls moyens pour transformer les industries et leur permettre de réduire leur empreinte carbone conformément aux objectifs mondiaux de lutte contre le réchauffement climatique*” Agence France Presse “*L'intelligence artificielle, moyen de lutte contre le réchauffement*” 25 mai 2018

Translation (Author): Artificial intelligence is one of the only ways to transform industries and to let them reduce their carbon imprint in accordance with global objectives to fight global warming.

In (7), we cannot infer that *empreinte* defines a *FOOTPRINT* or a *FINGERPRINT*: none of the collocates are semantically related to the *BODY*. A frequent collocate in our corpus is *réduire* (reduce), which occurs 258 times. We also identify semantically related collocates such as *minimiser* (minimise), *limiter* (limit), *diminuer* (diminish). Other *SIZE/SHAPE* collocates include *étendue* (extensive), *agrandir* (extend), and *élargir* (widen), *lourd* (heavy), *léger* (light). These collocates cannot specify the meaning of *empreinte* (*SIZE/SHAPE OF IMPRINTS*: 464 occurrences).

Some journalists rely on specific features of the source domain, as in “*les empreintes de pas laissées par les pollueurs*” (*footprints left by polluters*; “L’Orient Le Jour”: “L’empreinte écologique” November 30, 2012). This specification has only been observed in one article which explains the vocabulary associated with the topic (it also refers to the English expression *carbon footprint*). Different collocates may also specify the origin of the *IMPRINT* in sentences like:

(9) *Même un simple achat laisse une empreinte carbone invisible*. “News Aktuell” “Une carte de credit respectueuse du climat”, May 27, 2013

Translation (Author): even a simple purchase can leave an invisible carbon imprint,

We can speculate that the journalist describes a *FINGERPRINT* characterised by its *invisible* feature whereas a *FOOTPRINT* is easier to observe (*INVISIBLE IMPRINT*: 5 occurrences).

While the frequent *SIZE/SHAPE* collocates of *empreinte carbone* recalls the collocations the English metaphor *carbon footprint*, none of the French occurrences

from newspapers can be undoubtedly interpreted as *footprint* or *fingerprint*. However, verbal occurrences have permitted relevant observations:

- the BNC and British newspaper corpus showed that *FOOTPRINT* is mainly characterised according to its size/shape.
- the BNC and British newspaper corpus showed that *fingerprint* is associated with different areas of expertise: scientific, medical, or criminal.
- OPUS2 and “Le Larousse” showed that *empreinte* is mostly interpreted as a *fingerprint* across contexts.
- the French newspaper corpus showed that *EMPREINTE* is mainly characterised with size/shape features.

While *FOOTPRINT* and *EMPREINTE* are both characterised by their size/shape in newspapers, such a characterisation does not occur in the journalistic use of *fingerprint* which is mostly associated with CRIME metaphors.

Our question regarding the meaning of *empreinte carbone* remains unanswered. We now test the contextual similarities of *footprint* and *empreinte* observed in French and English newspapers. Visual representations of each metaphorical concept can reveal additional features.

5. *FOOTPRINT, FINGERPRINT, and EMPREINTE* in short animated videos about climate change

5.1. How English visual metaphors reflect source-specific selection of features

Our investigation of visual representations of *CARBON FOOTPRINT* and *FINGERPRINT* metaphors starts with the analysis of “Youtube” short animated videos. English visual representations demonstrate how metaphors can be represented when their verbal occurrences already specify the meaning of the source domain (*PART OF THE BODY* + “print”).

Among the 11 videos representing the concept *CARBON FOOTPRINT*, we can establish that the specificity of the source domain prevents any creative elaboration of the visual metaphor: these 11 videos present images of human footprint(s) which either involve a metaphorical movement around the Earth or on the Earth (a small-scale planet with footprint(s) applied on it). However, visuals emphasise the features of the climate change metaphor: while verbal occurrences imply that the *FOOTPRINT* has human origins (e.g., “the company's footprint” which refers to human activities performed for this company), all visuals in our video corpus present a *HUMAN FOOTPRINT*. Visuals highlight the human origin as a feature shared by source and target domains.

The visual representations of *FINGERPRINT* reveal more diverse features. Among the 3 collected videos, only one explicitly represents a fingerprint. Comparatively, in the two other videos, the representations are more general. Occurrences emphasise the role played by humans in the evolution of climate change. *FINGERPRINT* is used verbally to refer to an imprint of an exemplary human body

part. These verbal occurrences are associated with simultaneous visual occurrences of a human body: one video presents Leonardo Da Vinci's *Vitruvian man* and the second video presents a human body associated with pollution rates. Video producers rely on a *PART FOR THE WHOLE* conceptualisation: the comparison of visual and verbal metaphorical occurrences in videos reveal representations of *FINGERPRINT FOR THE HUMAN BODY*. Contextual information in videos shows that the *HUMAN BODY* is used to represent human polluting activities. This representation is explicit in the second video and, in the *Vitruvian man* video, the contextual information about climate change emphasises human responsibility. We can thus observe a more complex conceptualisation: *FINGERPRINT FOR THE HUMAN BODY FOR HUMAN POLLUTING ACTIVITIES*. The reference to the *Vitruvian man* may visually establish the association of *fingerprint* and different fields of expertise (section 4.1.), acknowledging Leonardo Da Vinci's insight on science. Leonardo Da Vinci is cited as a scientific and an artistic reference.

The comparison of the visual metaphors *CARBON FOOTPRINT* and *FINGERPRINT* in videos about climate change shows that the selection of visual features depends on the concept. On the one hand, visual representations of *CARBON FOOTPRINT* focus on the specific features of the source. In verbal occurrences, these features are derived with contextual information. In videos, the relevance of these features is emphasised: the *FOOTPRINT* is a *HUMAN FOOTPRINT*. On the other hand, visual representations of *FINGERPRINT* demonstrate a different selection of features: producers focus on general features of the source, *FINGERPRINT* is conceptualised as an *IMPRINT OF HUMAN BODY*. This unspecific representation of the concept relies on artistic/scientific references (Leonardo Da Vinci) or references to human

responsibilities, i.e. there is a gradation between the verbal occurrence *FINGERPRINT*, the visual representation of a *HUMAN BODY*, and the context referring to humanity. The single visual representation of a *FINGERPRINT* in our videos is a picture of a *HUMAN FINGERPRINT*: the *HUMAN ORIGIN* is emphasised.

5.2. The French contradiction: *EMPREINTE CARBONE* and its visual representations

Previous observations show that the meaning of *empreinte* in climate change discourse remains ambiguous.

The 22 French videos display visual clues which specify the meaning of *empreinte*. Among these videos, 8 animations present pictures of *HUMAN IMPRINT* to describe the concept. The *HUMAN IMPRINT* is associated with pollution rates or polluting activities. The human origin of the *IMPRINT* emphasises human responsibilities. Among these 8 videos, 7 represent a *HUMAN FOOTPRINT* and one represents a *HUMAN HANDPRINT*. The absence in our corpus of visual occurrence of *FINGERPRINT* supplements our observations from French newspapers: in climate change discourse, the relevant features of *EMPREINTE* correspond to the features of the source domain *FOOTPRINT*. Video producers may favour the features of the source *EMPREINTE* which are perceivable to any metaphor recipient while the features of *FINGERPRINT* are associated with experts' knowledge (according to electronic corpora and occurrences in newspapers). This focus on perceivable features is not surprising since the videos all share an educative purpose and are aimed at children (e.g., child as narrator).

The visual occurrence of a *HUMAN HANDPRINT* in French videos relies on a more complex conceptualisation. The specification of the source domain as a *HANDPRINT* relies on the metonymy *HAND FOR ACTIVITY* (Kövecses 2010: 238-43). This metonymy is relevant because the French video represents the *HANDPRINT* with other animations representing pollution from human activities. The *HANDPRINT* represents a specific occurrence of *EMPREINTE* to produce a visual metaphor based on the metonymy: *HAND FOR ACTIVITY* and *IMPACT OF ACTIVITY AS HANDPRINT*.

The visual representation related to the metonymy raises new questions about the features of the source domain *HANDPRINT* which seem more relevant to the context, compared to the features of other *IMPRINTS*. However, *handprint* only occurs once in our English newspaper corpus, in an article describing an artefact produced by an environmental activist. *Empreinte de main* or *empreinte palmaire* (handprint) does not occur in French newspapers.

Our research for additional metaphorical representations of *empreinte carbone* in French videos reveals that video producers can focus on the *carbon* component of the concept and downplay its relation with the source domain *EMPREINTE*. The metaphorical representation shapes carbon as *BLACK SMOKE/CLOUD* progressively surrounding the planet. This conceptualisation is observable in 14 French videos and emphasises the global effect of pollution. The damaging features of (excessive) carbon are highlighted with the colour black (see Barcelona 2003: 40; Forceville & Paling 2018).

Existing literature establishes that cross-domain mappings rely on “common” knowledge about the source domain so that metaphor recipients understand the meaning

(Semino 2008: 87; Kövecses 2010: 176; Musolff 2016: 8; 25). However, the features of the metaphor *EMPREINTE CARBONE* in climate change discourse contradict this common knowledge. The electronic corpus and dictionary entries establish that “common knowledge” about the source domain *EMPREINTE* defines the referent as a *FINGERPRINT*. Comparatively, visual occurrences of *EMPREINTE CARBONE* do not rely on this common knowledge about the source domain.

We can explain this contradiction in terms of cross-linguistic influence: French metaphor users have translated the English metaphorical expression *carbon footprint* (popularised by the 4th IPCC report in 2007; Nerlich & Hellsten 2014:31). The particularity of the scientific topic and the educative purpose of the videos can also explain this contradiction: to facilitate viewers' understanding, metaphor users rely on a source domain whose features can be identified by a large number of people (non-experts). Comparatively, the illustration of a scientific topic with a source domain whose features are mostly observed and relied on by experts may not be effective in educative visual communication.

6. Discussion

In this paper, we approach multimodal metaphors with a focus on the source domains *FOOTPRINT*, *FINGERPRINT*, and *EMPREINTE* in English and French environmental discourses. While existing literature has established the ideological functions of visual and verbal metaphors, we compared visual and verbal metaphors to identify the features which characterise each source domain. Unlike existing studies, we analyse the flexibility of source domains in multimodal occurrences to interpret their meanings in climate change discourse.

In English newspapers, the source domain *FOOTPRINT* occurs more frequently (385 occurrences) than the related source domain *FINGERPRINT* (31 occurrences). This frequency constitutes a first clue to interpret the more general source domain *EMPREINTE*: we can infer that the frequency in English reflects the relevance of specific features at play in the mapping of *FOOTPRINT* and *POLLUTION*, such a relevance may be more limited with *FINGERPRINT*.

To test this claim, the collocates of the metaphorical expressions *carbon footprint* and *fingerprint* in English newspapers were compared to the collocates characterising *empreinte* in French newspapers. We noticed that the collocates of *carbon footprint* and *empreinte carbone* were related to *SIZE/SHAPE* in newspapers, while the collocates of *fingerprint* were related to *CRIME* and science. Additional analysis was necessary to establish whether these common collocations in newspapers were valid indicators of the meaning of *EMPREINTE*.

To overcome remaining ambiguity, we looked at visual representations of each concept in short animated videos. The analysis of English videos has further distinguished the source domains: while *CARBON FOOTPRINT* displayed a range of similar visual metaphors (*HUMAN FOOTPRINT*), *FINGERPRINT* has only yielded one visual representation.

While the French dictionary and French electronic corpus favour an interpretation of *EMPREINTE* in terms of *FINGERPRINT*, visual representations of *EMPREINTE CARBONE* establish that the features at play in French discourse about climate change are associated with the concept (*HUMAN*) *FOOTPRINT*.

These results show that the cross-domain mapping at play in the interpretation of *empreinte carbone* contradicts common knowledge about the source domain. The rare visual representations of the concept *FINGERPRINT* in English videos and the prevalence of *carbon footprint* in English may have influenced the French meaning.

Additionally, the BNC results and our newspaper corpus established an association between *FINGERPRINT* and experts' communication: the educative purpose of the collected videos can favour visual representations of *FOOTPRINT* because this concept is not as closely linked to science as the concept *FINGERPRINT* is.

Hence, our results contradict existing claims about metaphorical mappings involving features related to the common knowledge about the source domain (Semino 2008: 87; Kövecses 2010: 176; Musolff 2016: 8; 25): in French, common knowledge about *EMPREINTE* defines the concept as a *FINGERPRINT*. However, the use of the source domain in climate change discourse (*empreinte carbone*) characterises the concept as a *FOOTPRINT*.

Our research establishes the context-dependency of the selection of metaphorical features. A highly specific context, such as climate change, eventually transgresses the common knowledge associated with the source domain.

Our research raises additional questions regarding the ideological features of the source domains. Reijnierse, Burgers, Krennmayr, and Steen (2015) convincingly demonstrate that the metaphorical extension allowed by the selection of a particular source domain of a metaphor used in context can effectively share a particular ideology regarding the topic discussed. The association of *FINGERPRINT* and *CRIME* metaphors and the prevalence of the source domain *FOOTPRINT* could be tested in a

variety of contexts to investigate the ideological function of each source. The features of the concept *HANDPRINT* are also of interest to explain why metaphor users avoid this source domain in environmental discourse.

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Youtube: <https://www.youtube.com/>

NOTES:

English newspapers :

The Guardian, The Independent, The Times, The Telegraph, The Mail, The Sun, The Express, Birmingham Post, Scotsman, The Observer, Daily Post, The Herald, The Mirror, The Chronicle, Metro, The Echo, Western Daily Press, Aberdeen Press, Yorkshire Post, Daily Examiner, Kidderminster Shuttle, South Wales Argus, The Citizen Gloucester, The National, Bristol Post, Evening News, Leicester Mercury, The Bolton News, York Press, Eastern Daily Press, Peterborough Today, Scotland on Sunday, West Briton, Business Telegraph, Daily Star, Edinburgh Evening News, Hemel Today, Irish Examiner, Kent Messenger, Nottingham Post, Stourbridge News, The Comet, The Safron Walden Reporter, The Scottish Farmer

French newspapers :

Le Monde, Le Télégramme, Les Echos, Midi Libre, La Tribune, Ouest-France, Sud Ouest, L'Est Républicain, La Voix du Nord, La Dépêche du Midi, Le Figaro, Le Point, L'Indépendant, Le Dauphiné Libéré, Centre Presse, La Croix, News Aktuell, PR Newswire, Agence France Presse, L'Humanité, AGEFI, La Montagne, Courrier International, L'Obs, Le Cercle, L'Express, La Correspondance, Challenges, Charente Libre, L'Equipe, L'Eveil, Le Populaire du Centre, Le Républicain, Eclair, Nord Littoral, AWP, L'Expansion, L'Union, La Dordogne Libre, La Vie, Le Courrier Picard, Le Temps, Nice Matin, Var Matin

Short animated videos:

English videos:

FOOTPRINT:

<https://www.youtube.com/watch?v=KJbRnv7rMkk>

<https://www.youtube.com/watch?v=Dwkh46MZuIc>

<https://www.youtube.com/watch?v=VTfgNFz1DBM>

https://www.youtube.com/watch?v=8q7_aV8eLUE

https://www.youtube.com/watch?v=d07B3_aFzK8

<https://www.youtube.com/watch?v=YdijV0vya5Y>

<https://www.youtube.com/watch?v=uAybZOFCN6g>

<https://www.youtube.com/watch?v=nP1nzCqoT9g>

<https://www.youtube.com/watch?v=AGRlo87oAUg>

https://www.youtube.com/watch?v=YseZXXfT_yY

<https://www.youtube.com/watch?v=Xdl5Vht0sO8>

FINGERPRINT:

https://www.youtube.com/watch?v=kzwyfnq_u5c

Vitruvian Man: <https://www.youtube.com/watch?v=JDrTSFv-Ig0>

Human: <https://www.youtube.com/watch?v=paVTJtgGFFU>

French videos:

FOOTPRINT:

<https://www.youtube.com/watch?v=PHbZmem0ME0>

<https://www.youtube.com/watch?v=vFKL1PNbNIM>

<https://www.youtube.com/watch?v=UqqBlS AUwfk>

https://www.youtube.com/watch?v=w_QyQt25oQM

<https://www.youtube.com/watch?v=HL8HDjlnqfw>

<https://www.youtube.com/watch?v=PEgt7wTrhIc>

<https://www.youtube.com/watch?v=Asth40jN8IU>

HANDPRINT:

<https://www.youtube.com/watch?v=jDuZQNxLo6o>

CLOUD/ SMOKE:

<https://www.youtube.com/watch?v=W2s2qzh7UY0>

<https://www.youtube.com/watch?v=wGdOJsVurdE>

<https://www.youtube.com/watch?v=egu1-cFQIJ0>

- <https://www.youtube.com/watch?v=opennvORwKU>
<https://www.youtube.com/watch?v=lquOaDNF2Us>
<https://www.youtube.com/watch?v=nVydG2DFU0>
<https://www.youtube.com/watch?v=T4LVXCCmIKA>
<https://www.youtube.com/watch?v=28qJueH5tRQ>
<https://www.youtube.com/watch?v=EZblJnY5ZuA>
https://www.youtube.com/watch?v=Jtu_oRCptfs
<https://www.youtube.com/watch?v=d9pNduQedZk>
<https://www.youtube.com/watch?v=TNiWOdEFWIA>
<https://www.youtube.com/watch?v=wx7NJEtOjeQ>
<https://www.youtube.com/watch?v=NfaoCORuzk>

Table 1. Most frequent collocates of *footprint* (from WordSketch)

Modifiers	Object of	Subject of	“footprint” and/or	Adjective predicates
muddy	Yield	point	fingerprint	evident
observed	Observe	suggest	mark	clear
wet	notice			
desktop	produce			
isolated	leave			
clear	indicate			
faint	obtain			
left	find			
	follow			
	show			
	see			
	make			

Table 2. Most frequent collocates of *fingerprint* (from WordSketch)

<u>Modifiers</u>	<u>Nouns and Verbs modified by "fingerprint"</u>	<u>Object of</u>	<u>Subject of</u>	<u>"fingerprint" and/or</u>
Retina-scan	Brain-resonance	smudge	trap	Brain-resonance
smudge	bureau	erase	assess	Retina-scan
Blood-stained	expert	smear	check	footprint
receipt	fibre	recur	request	soot
scent	blood	wipe	link	elimination
Glove	nothing	rub	identify	clue
DNA	recognition	check	prove	detective
greasy	description	match	find	thread
shoe	idea	clean	provide	palm
giant	evidence	store		receipt
genetic	software	touch		admission
molecular		leave		