Semantic prosody and semantic preference in multi-word terms

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Abstract Multi-word terms (MWTs), in the form of noun compounds (NCs), are frequently used in specialized texts (Nakov 2013). They consist of juxtaposed terms with underlying semantic structures that limit the combination of arguments (Pinker 1989). However, NCs formed by more than two terms have received little attention. This study focuses on English and Spanish three-term endocentric NCs used in Coastal Engineering. To explore the presence of semantic preference and semantic prosody in these MWTs, a set of terms has been extracted from a Coastal Engineering corpus. The structure of the MWTs has been disambiguated and the semantic relations between their components have been specified. Verb paraphrases have also been elicited from field experts and the web, and then semantically analyzed. The results show that semantic preference and semantic prosody play an important role in the formation of MWTs and should be taken into account when rendering a text into another language.

Keywords terminology, specialized translation, multi-word terms, noun compounds, semantic preference, semantic prosody

1 Introduction

Multi-word terms (MWTs), in the form of noun compounds (NCs), are often used to designate specialized concepts (Nakov 2013). They are characterized by the juxtaposition of more than one term and the existence of underlying semantic structures that constrain the combination of arguments (Pinker 1989). These semantic restrictions are closely related to semantic preference or the semantic category of a word's collocates (for instance, the verb *commit* tends to appear with words designating crimes or socially unacceptable acts, such as *commit suicide*; Stubbs 2001: 64); and semantic prosody or the positive/negative nature of a word's collocates (for example, the verb *tackle* usually co-occurs with negative items, as in *tackle a problem*; Bednarek 2008: 130) (Sinclair 1996; see below Section 2.2). Previous research (Cabezas-García/Faber 2017) on the formation and meaning of specialized NCs identified semantic restrictions in these MWTs. This study thus focuses on semantic constraints and the role of semantic preference and semantic prosody in the selection of NC constituents.

Up until now, NCs formed by more than two terms (and their semantics) have received little research attention. All too frequently, semantic preference and semantic prosody are disregarded (Bednarek 2008) when research solely targets idioms and collocations. In scientific and technical texts, neither has been considered (Stubbs 2009: 130). Nevertheless, semantic preference and semantic prosody in MWTs are worth addressing because positive/negative information is present in both general and specialized language.

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This is also relevant to the translation of these units. Even though the *lingua franca* of the scientific world is English, the demand for the translation of scientific and technical texts has skyrocketed (Krüger 2015: 40). It would thus be useful to establish mapping rules between English and Romance languages, such as Spanish, where the translation of MWTs is one of the main problems in scientific and technical translation (Pecman 2014).

For example, in English, NCs are created by 'stacking' nouns, but when MWTs are translated into Romance languages, the relations between components must be made explicit. More concretely, *direct drive permanent magnet generator* is translated into Spanish as *generador de imanes permanentes sin caja multiplicadora*, a term that takes a more negative perspective and describes the generator as not having a gear box (*sin caja multiplicadora*). The translation of such MWTs is thus far from straightforward. The study of semantic preference and semantic prosody in a set of related MWTs can provide insights into how this can be accomplished.

Nevertheless, until now, research on semantic preference and semantic prosody has largely focused on English. Consequently, there have been few contrastive studies involving other languages (Xiao/McEnery 2006, Dam-Jensen/Zethsen 2008). The same is also true of Spanish with Munday (2011) as one of the few exceptions. In fact, information on semantic preference and semantic prosody is rarely found in lexicographic and terminographic resources (Stubbs 2001, Hoey 2005, Dam-Jensen/Zethsen 2008, Buendía Castro/Faber 2015), although it can be an important factor in the description of specialized knowledge.

This paper explores English and Spanish three-term endocentric MWTs in the domain of Coastal Engineering, such as *wave energy propagation* and *propagación de la energía del oleaje*. We analyze the meaning of a set of MWTs and specify the semantic relations between the head and its modifiers. Their semantic preference and semantic prosody are also analyzed to identify possible correspondences between English and Spanish.

The rest of the article is structured as follows: Section 2 provides an overview of NCs and of semantic preference and semantic prosody. Section 3 outlines the methodology that led to the analysis of semantic preference and semantic prosody. In Section 4 the results for the English and Spanish MWTs are presented and discussed. Finally, Section 5 summarizes the conclusions that can be derived from this research.

2 A frame-based view of semantic preference and semantic prosody in noun compounds

2.1 Noun compounds

Noun compounds (NCs) have been defined as a sequence of nouns that act as a single noun (Downing 1977), as in *wave energy conservation*. Most such compounds are endocentric, where one member is the head and the other is a modifier that attributes a property to the head (Nakov 2013). Endocentric NCs are hyponyms of the head (for example, *wave energy conservation* is a type of *conservation*). When the NC is not a hyponym of one of its elements, the NC is said to be exocentric (Bauer 2008). This is the case of *fire rainbow*, where the phenomenon referred to is neither a fire nor a rainbow, but occurs when light refracts through ice crystals.

The meaning of NCs has been the focus of much research (e. g. Downing 1977, Levi 1978, Warren 1978, Vanderwende 1994, Rosario/Hearst/Fillmore 2002, Nakov 2013). Their understanding depends to a certain extent on being able to access their underlying predicates (Levi 1978). Such predicates designate actions, processes, events and states, which provide a frame that links typical participants in the action. This signifies that NCs should be studied from the

perspective of their concealed predicates as well as their argument structure (Faber/Mairal 1999).

These concealed propositions can be inferred by two main formation processes, namely, predicate deletion and predicate nominalization (Levi 1978). In NCs formed by predicate deletion (*power plant*, instead of *a plant produces power*), modifiers are usually the object of the omitted predicate. In predicate nominalization (*energy storage*, instead of *energy is stored*), the head of the NC is a nominalized verb, whose modifiers are either the subject or object of the predicate though there are some NCs where both functions are present (as in *cyclone detection algorithm* > *an algorithm detects cyclones*). The propositions underlying the NCs take the form of a predicate with its arguments (Tesnière 1976). Verb paraphrases, which represent the sentence structure of an NC and make the underlying proposition explicit, have been recently proposed as the most effective way of understanding NC semantics (Nakov/Hearst 2013).

Nevertheless, arguments are not randomly combined since their co-occurrence is the result of semantic constraints (Warren 1978, Pinker 1989, Maguire/Wisniewski/Storms 2010). These become evident in the micro-contexts of NCs. In a micro-context, the head of an NC has an argument structure (Rosario/Hearst/Fillmore 2002). In other words, the head opens slots that are filled by lexemes belonging to specific conceptual categories (Rosario/Hearst/Fillmore 2002, Maguire/Wisniewski/Storms 2010) (such as INSTRUMENT or SUBSTANCE), which have a semantic role (AGENT, PATIENT, etc.). The micro-context of an NC encompasses this semantic information. For example, *generation* opens three slots: an AGENT (usually an INSTRUMENT) that produces the generation, a PATIENT (normally ENERGY) that is produced, and a SOURCE (usually a NATURAL or ARTIFICIAL RESOURCE) from which the PATIENT is produced. This micro-context gives rise to the formation of specialized NCs or MWTs such as *tidal energy generation*, *diesel generation system,* or *electricity generation technology*.

From a Cognitive Linguistics perspective, Evans/Green (2006) highlight predicate nominalizations as an example of the fuzzy boundary between noun and verb categories. There is also the problem of compositionality since the conceptual relations between the constituents of an NC are usually difficult to infer based on the surface form of the head and modifiers (Ó Séaghdha/Copestake 2013). Nakov (2013: 322) illustrates this problem with the example of *museum book*. Although the meaning of the NC seems to be determined by the meaning of its constituents, this is really not the case since *museum book* could mean 'a book about a museum', 'a book on display in a museum', or 'a book published by a museum'. This ambiguity also occurs in domain-specific MWTs and is an obstacle to finding translation correspondences. The explicitation of context is thus extremely important. Although lexical units have semantic potential, it is only in context that they acquire meaning (Fauconnier 1994). For this reason, a study of semantic preference and semantic prosody cannot be separated from context.

2.2 Semantic prosody and semantic preference in Corpus Linguistics

The notion of *semantic prosody* was first introduced by Sinclair (1987) and gained currency in Louw (1993). Sinclair (1991: 112) observed that "many uses of words and phrases tend to occur in a certain semantic environment". For example, the word *happen* is often associated with unpleasant things such as accidents. This assertion was subsequently backed up by corpus data (Stewart 2010). After Sinclair (1987) and Louw (1993), semantic prosody received the attention from authors, such as Stubbs (2001), Xiao/McEnery (2006), Morley/Partington (2009), Stewart (2010), and Tang/Rundblad (2015). However, these studies mainly focus on sentences,

idioms, and collocations. Semantic prosody in complex nominal forms in specialized texts has not been addressed in any depth.

Semantic prosody is one of the categories of extended lexical units proposed by Sinclair (1991), as well as collocation, colligation, and semantic preference. Extended lexical units, which are crucial in scientific and technical translation (Monzó Nebot 2015, Buendía Castro/Faber 2015), allude to the co-occurrence of lexical units, thus shifting attention from single lexemes to larger units of meaning that can only be studied in context (Dam-Jensen/Zethsen 2008). Although semantic prosody has sometimes been confused with semantic preference (Bednarek 2008), Sinclair (1996: 87) states that semantic preference is the semantic field of a word's collocates, whereas semantic prosody alludes to the positive/negative character of these collocates. Although semantic preference and semantic prosody are different, they can also interact, as reflected in the fact that the set of semantic preferences of a word shape its semantic prosody (Partington 2004). For instance, *danger*, *risk*, *peril*, and *hazard* are lexical units that frequently occur with *fraught with*, a predicate with negative semantic prosody (Morley/Partington 2009). However, evaluation should not be confused with semantic prosody. Whereas semantic prosody refers to the positive/negative nature of a word's collocates, evaluation deals with the positive/negative characteristics of an item itself.

Therefore, semantic prosody represents the human predisposition to classify entities either as good or bad (Morley/Partington 2009). It is also true that to create a striking effect, such as irony, a speaker/writer may intentionally ignore semantic prosody (Louw 1993, Hoey 2005). However, when there is an unawareness of it, the result is less fortunate (Hoey 2005). This can be a source of translation errors. For example, *utterly* has a negative prosody (Louw 1993) (as in *utterly ridiculous*). However, in Spanish, *completamente* and *totalmente* usually co-occur with positive items (as in *completamente gratuito* [*completely free*]). This cannot be ignored in the translation process.

Despite their importance, semantic preference and semantic prosody are not usually included in dictionary entries (Stubbs 2001, Hoey 2005, Dam-Jensen/Zethsen 2008). Fortunately, such information can be obtained with corpus analysis (Stewart 2010). Semantic preference, semantic prosody, and Corpus Linguistics are indeed mutually interdependent since these semantic phenomena are important topics in Corpus Linguistics and, at the same time, this discipline is key to the study of extended lexical units (Xiao/McEnery 2006, Stewart 2010, Tang/Rundblad 2015). Nevertheless, there is an ongoing debate as to whether corpora or human intuition is the best way of accessing semantic preference and semantic prosody (Louw 1993, Sinclair 2003). Since meaning goes beyond the lexeme level (Dam-Jensen/Zethsen 2008), it is necessary to focus on larger building blocks (Stubbs 2001, Dam-Jensen/Zethsen 2007). We agree with Fillmore (1991: 35) that both are necessary. Corpora and intuition are complementary since the intuitive trigger activates the corpus search and then determines data processing (Stewart 2010).

2.3 Frame-Based Terminology (FBT)

The theoretical framework in this research is Frame-Based Terminology (FBT). FBT is a cognitive approach to terminology, which directly links specialized knowledge representation to cognitive linguistics and cognitive semantics (Faber 2012, 2015). It shares many of the premises of the Communicative Theory of Terminology (Cabré 1993, 1999) and the Sociocognitive Theory of Terminology (Temmerman 2000, 2001), such as the study of terms as they are used

in real texts. Nevertheless, FBT also combines premises from the Lexical Grammar Model (Martín Mingorance 1989, Faber/Mairal 1999) and Frame Semantics (Fillmore 1985, 2006). This research uses premises from Lexical Grammar Model to extract and represent conceptual and collocational relations in specialized language. In FBT, the meaning of MWTs is accessed through the semantic explicitation of the predicate-argument structures underlying these units. Frame Semantics (Fillmore 1985, 2006) facilitates the representation of multidimensionality (León-Araúz 2009: 26) and the representation of larger knowledge configurations.

FBT organizes knowledge in frames, which are representations based on experience that provide the background knowledge and motivation for the existence of words in a language as well as the way those words are used in discourse (Faber 2009: 123). Specialized knowledge units or terms acquire their meaning in context, more specifically within a frame in which their role in a process, activity, or event is highlighted and related to other concepts in the same frame. Understanding an entity or group of entities depends on having access to the information needed to activate the right knowledge structure in which the word or term should be processed. Frames make the semantic behavior of terms explicit by describing conceptual relations and term combinations (Faber 2009). Although FBT was initially inspired by the lexical frames in Fillmore (1985, 2006), which are language-dependent, the frame-like representations in FBT have been adapted to the structure of specialized knowledge units and are non-language-specific (Faber 2015). Therefore, they are similar to Minsky's vision of frames in artificial intelligence (1975: 212), which initially inspired Fillmore's proposal (Fillmore 1977), and are described as data structures representing a stereotyped situation (León-Araúz 2009).

FBT focuses on the following: (i) conceptual organization; (ii) the multidimensional nature of terminological units; (iii) the extraction of semantic and syntactic information from multilingual corpora as well as from specialized knowledge resources and experts (Faber 2009: 123). The practical application of FBT is EcoLexicon (www.ecolexicon.ugr.es), a terminological knowledge base on environmental science, which is currently being expanded to include extended units of meaning such as MWTs.

3 Materials and methods

A top-down and bottom-up approach has been used to access the meaning of a set of MWTs and study semantic preference and semantic prosody in these units. Data have been first extracted from a Coastal Engineering corpus in English and Spanish as well as from the EnTenTen and EsTenTen corpora in Sketch Engine, in a bottom-up approach. Term candidates have been extracted from the Coastal Engineering corpus and their concordances have been analyzed. In contrast, the general language corpus has been used to analyze semantic preference and semantic prosody. This corpus methodology has been complemented by the elicitation of information from specialized knowledge resources as well as from experts, in a top-down approach.

3.1 Corpus compilation and term extraction

A comparable corpus on Coastal Engineering has been downloaded from EcoLexicon (http://ecolexicon.ugr.es/). It consists of an English corpus of 9 million tokens and a Spanish corpus of 2 million tokens. The corpus texts are papers from high-impact specialized journals (*Coastal Engineering, Ingeniería hidraúlica y ambiental,* etc.). The Coastal Engineering corpus has

been then uploaded to Sketch Engine (https://www.sketchengine.co.uk/) (Kilgarriff et al. 2004, Kilgarriff 2014). Since the Spanish subcorpus was smaller than the English one, it has been expanded by means of the WebBootCat function of Sketch Engine, which allows the rapid compilation of a corpus from the web. The MWTs selected as term candidates all designate Coastal Engineering processes (36 English MWTs and 46 Spanish MWTs). To facilitate the detection of semantic preference and semantic prosody, the MWTs either have the same head or the same modifiers.

Terms have been extracted with the Word List function of Sketch Engine, which allows the specification of the number of components. For English, the search attribute has been set to "lemma" and the number of n-grams has been three. In contrast, for Spanish term extraction, the search attribute has been set to "word", because extraction by lemma did not show the naturally occurring forms of terms in texts[1]. The number of n-grams has also been five or six because of the postmodification in Romance languages, typically in the form of prepositional phrases such as *control de la contaminación del agua* [*water pollution control*]. Finally, a stop list has been used to eliminate irrelevant words.

3.2 Structural disambiguation and assignment of predicate-based semantic relations

Once the terms had been selected, they have been parsed and bracketed. This structural disambiguation has made it possible to identify the internal groups in NCs (Nakov 2013). For instance, the internal structure of *water table fluctuation* is *[water table] fluctuation*. The semantic relations between constituents have been then identified.

Our approach combines a traditional inventory of semantic relations with a set of superordinate general language verbs. Since all of our MWTs are nominalizations that encode processes, verbs are central to their meaning. For this reason, a set of generic verbs (such as *change, move, use, say,* etc.) have provided additional semantic relations. These generic verbs are conceived as hierarchically-structured semantic classes whose members have the same nuclear meaning.

In contrast to previous research (Cabezas-García/Faber 2017), in which the verbs underlying the MWTs were classified in the five coarse-grained semantic relations in Nastase/Szpakowicz (2003) (CAUSALITY, PARTICIPANT, QUALITY, SPATIAL, and TEMPORALITY), the generic verbs in this research have been organized in the lexical domains of the Lexical Grammar Model (LGM) (Faber/Mairal 1999).

In the LGM, a lexical domain is a subdivision of semantic space derived from the factorization of the meaning definitions of its members, and validated by corpus. The superordinate terms of these lexical domains are considered to be semantic near primitives or conceptual invariants. LGM lexical domains are the result of the analysis of the definitional structure of 12,000 verbs, first in English and subsequently in Spanish (Faber/Mairal 1999). The results led to the following general semantic classes and their superordinate terms: EXISTENCE (*be, happen*), CHANGE (*become, change*), POSSESSION (*have*), SPEECH (*say, talk*), EMOTION (*feel*), ACTION (*do, make*), COGNITION (*know, think*), MOVEMENT (*move, go, come*), PHYSICAL PERCEPTION (*see, hear, taste, smell, touch*), MANIPULATION (*use*), CONTACT/IMPACT (*hit, break*) and POSITION (*put, be*). Other lexical domains include verbs that designate LIGHT, SOUND,

[1] In Spanish, word formation differs more from lemmas than in English (for example, the search by lemma showed contractions such as *del* [*of the*] in their decomposed form *de+el*).

BODY FUNCTIONS, WEATHER, etc. The basic premise is that the semantic information shared by verbs within the same lexical domain or subdomain can be used to predict the syntactic behavior of these predicates (Faber/Mairal 1999).

The micro-context of the MWTs also includes the qualitative valence of predicate arguments, which have been classified in domain-specific semantic categories. Figure 1 shows the set of categories as well as examples of the terms belonging to them.

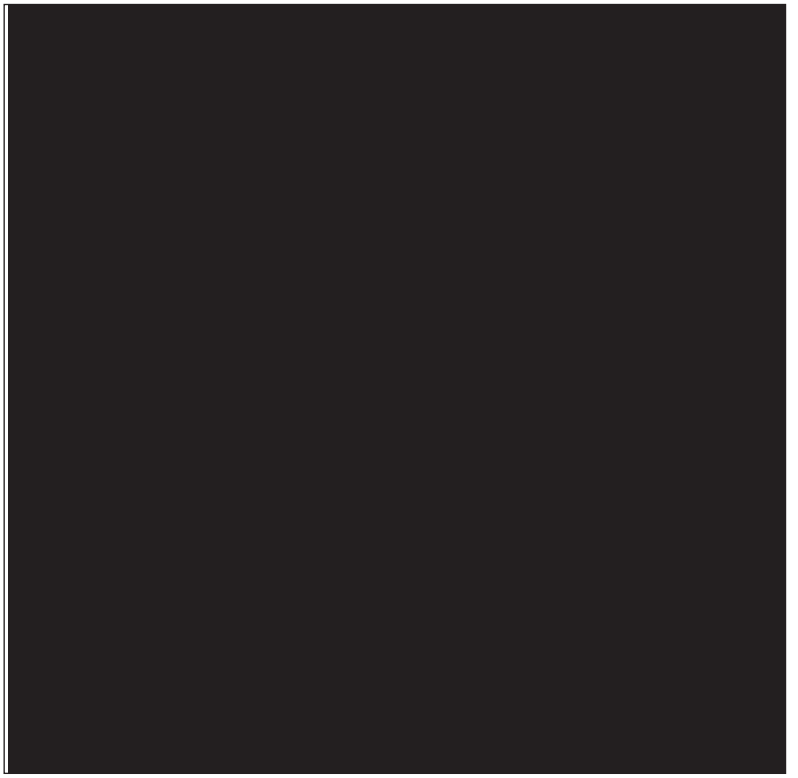


Figure 1: Semantic categories designating the qualitative valence of the verbs

When necessary, an attribute has been added. For instance, in *wave height analysis*, the attribute *height* has been added to the WATER_WAVE category in order to further specify this semantic tag.

The combination of the generic verbs in the LGM lexical domains as well as the semantic categories in Figure 1 has produced conceptual propositions that make the micro-context explicit and account for the meaning of the MWTs. For example, propositions such as X *studies* NEG_SITUATION [MOVEMENT_WATER], which is lexicalized in MWTs such as *flood risk analysis* and *flood risk assessment*, help to represent their meaning.

3.3 Paraphrase analysis

Paraphrase analysis has further specified the semantic relations and categories in the previous stage. Verb paraphrases represent the MWT in the form of a sentence, whose meaning is based

on their underlying predicates (Nakov 2013). For instance, *dune erosion* can be paraphrased as *dunes are eroded/breached/destroyed/degraded/damaged* (cf. Table 1).

To elicit verb paraphrases, we have recruited a group of experts (three men and two women with a mean age of 30). The participants are coastal engineers, researchers, and professors with 3–10 years of experience in their profession. All of them are native speakers of Spanish with an excellent[2] command of English, who are affiliated with the Andalusian Institute of Earth System Research. All of them have filled out a questionnaire, in which they have been asked to define the terms, provide verb paraphrases that make the underlying proposition explicit, and express their opinion of the questionnaire. A few paraphrases have been eliminated because of spelling or grammatical errors.

More paraphrases have been extracted from the Web as Corpus because, even if better processed linguistically, no corpus can compete with the vastness of the web (Nakov/Hearst 2013). Tools such as WebCorp (http://www.webcorp.org.uk/live/), which generate corpus concordances, have been found to have too many restrictions. For this reason, Google (www.google.es/) has been used to obtain a larger quantity of data.

To extract paraphrases from the web, we have first performed searches such as "flood risk management" AND "flood risk" in order to elicit terms with semantic roles such as AGENT or LOCATION. The procedure has depended on whether the complement in the MWT is a grammatical object or subject. When the object is explicit, such as in *flood risk management* (where *flood risk* is the direct object of the verb *manage*), we have searched "flood risk management" "to * the flood risk"/"that * the flood risk" to elicit the subject and predicates that could specify the meaning of the MWT. If the complement in the MWT is the subject as in *wave energy conservation* (where *wave energy* is the subject of the verb *conserve*), the search has been "wave energy conservation" "wave energy is *"/"wave energy can *" in order to elicit different verbs. When no information has been retrieved, the search has been changed to "to * the wave energy". In all cases, the first five result pages have been consulted.

The same process has been used to obtain Spanish paraphrases. However, for the extraction of the generic verbs, we have issued queries such as "tren de ondas se *", which can signal both a passive sentence and a reflexive passive sentence regarding *wave train* [*tren de ondas*] in Spanish. We have also searched "que * un tren de ondas", to elicit both the subject and the verb. The paraphrases extracted from the web have also been analyzed (cf. Table 1).

[2] Experts are native speakers of Spanish, given the difficulty of finding Coastal Engineering experts that are native speakers of English. However, their competence in English has been confirmed by the C1 level of English (Common European Framework of Reference) required for affiliation with the Andalusian Institute of Earth System Research.

Table 1: Paraphrase analysis for seguimiento de la calidad del agua [water quality monitoring]

Conceptual proposition	X *study*			WATER (attribute: goodness)
Paraphrase	(X) estudio	sigue monitoriza mide controla realiza un seguimiento	((de) la)	calidad del agua
		MWT		

A wide range of information has been included in the analysis: (i) the information in the MWT; (ii) the conceptual proposition showing the semantics of the MWT (X *study* WATER – attribute: GOODNESS); (iii) the paraphrases that expand the meaning of the MWT (such as *un estudio monitoriza la calidad del agua* [*a study monitors water quality*]); (iv) function words (*de la [of the]*).

Semantic relations (for example, *study*) have been further specified by their hyponyms. Paraphrases have been especially useful for accessing the meaning of the head, which is a nominalized verb designating an environmental process. The meaning of an MWT such as *seguimiento de la calidad del agua* [*water quality monitoring*] has not only been represented by semantic relations (for example, *study*) but also by paraphrases, which convey additional nuances of the underlying verb (as in *un estudio sigue/monitoriza/mide/controla/realiza un seguimiento de la calidad del agua* [*a study monitors/measures/controls water quality*]). At the same time, implicit predicate arguments have been made explicit. For example, such arguments have revealed that water quality monitoring is performed by means of a study [*estudio*].

3.4 Semantic prosody and semantic preference analysis

After encoding the meaning of MWTs in terms of semantic relations and paraphrases, we have analyzed their semantic preference and semantic prosody. MWTs with the same head and those that shared the same modifiers have been placed in the same set (9 sets in English, and 7 sets in Spanish).

To detect semantic prosody, we have then indicated whether the terms that usually collocated with the head or the modifiers are positive (+), negative (–), or neutral (?). These positive, negative or neutral tags have also been assigned to the head or modifiers to show the connotations of these items. This evaluative classification has been based on introspection and on textual information such as positive or negative markers in concordance lines (for instance, *benefit from* and *favoured by* are usually followed by beneficial items). Evaluative information has also been extracted from the definitions in EcoLexicon (http://ecolexicon.ugr.es/) and other specialized resources, which despite lacking specific information on evaluation, can serve as conceptual resources from which evaluative information can be derived. For example, *tidal wave* is defined in Termium Plus (http://www.btb.termiumplus.gc.ca) as a "very large and destructive wave, generally caused by a tremendous disturbance in the ocean, such as an undersea earthquake or volcanic eruption". Thus, this definition, which used negative words such as

destructive and *disturbance*, has led us to assign a negative tag to this term, which is part of the MWT *tidal wave propagation*. In other cases, the meaning of the MWT has been elicited. This has helped us to determine the positive, negative, or neutral nature of the whole MWT and to detect whether the evaluation of specific components of the MWT is transmitted to all of it.

In contrast to previous studies (Cabezas-García/Faber 2017), in which only specialized corpora were used, the analysis of semantic prosody in this research has also been based on a replicable concordance analysis[3] carried out in a general language corpus (the EnTenTen and EsTenTen corpora in Sketch Engine). This corpus is composed of approximately 19 billion words in English and more than 9 billion words in Spanish. The objective is to obtain a wider range of results and validate the positive, negative or neutral nature of concepts previously elicited from introspection and specialized resources.

As for semantic preference, we have indicated the lexical domain or conceptual category to which each collocate belongs. Nominalized verbs have been assigned a lexical domain (for instance, *management* belongs to the lexical domain of MANIPULATION) whereas non-predicating nouns have been assigned a conceptual category (for example, *flood hydrograph* belongs to the category of WATER_REPRESENTATION). Table 2 shows an example of semantic preference and semantic prosody analysis.

Table 2: Semantic preference and semantic prosody analysis for the modifier flood risk.

MODIFIER: flood risk (–)			
HEADS	assessment	+	COGNITION/MENTAL PERCEPTION
	management	+	MANIPULATION
	analysis	+	COGNITION/MENTAL PERCEPTION
Semantic preference: COGNITION/MENTAL PERCEPTION Semantic prosody: +			

Finally, mapping relations between English and Spanish equivalent MWTs have been established, thanks to EcoLexicon, with a view to exploring interlinguistic correspondences regarding semantic preference and semantic prosody.

4 Results and discussion

Our results show that semantic preference and semantic prosody are present in the MWTs, both from the head to the modifiers and from the modifiers to the head. In other words, a positive/negative semantic prosody is established when the head co-occurs with positive/negative modifiers, or vice versa, when the modifiers appear with positive/negative heads. Semantic preference is found when the head combines with modifiers from a specific semantic category (for instance, combined with WATER, WATER_WAVE or WATER_REPRESENTATION, which are related to water), and when the modifiers accompany a head that belongs to a certain lexical domain (such as CHANGE).

[3] For this purpose, we have looked up definitions and concordances both of the head and modifiers separately and in combination.

Semantic prosody is present in a great number of MWTs sharing the same head, namely 67 % in English and 75 % in Spanish. Semantic preference is also observed in most MWTs that share the same head: 83 % in English and 100 % in Spanish. On the other hand, it is also found that 100 % of the MWTs in both languages whose modifiers are the same show a certain semantic prosody toward the head. As for semantic preference, 67 % of English and Spanish MWTs sharing the same modifiers are found to have semantic preference. Therefore, no significant differences are found between MWTs sharing the same head or modifiers. These semantic phenomena are equally established from the head to the modifiers and vice versa in both languages. Tables 3 and 4 show the semantic prosody and semantic preference analysis for the head *disipación* [*dissipation*] and the modifiers *riesgo de inundación* [*risk of flooding*].

Table 3: Semantic prosody and semantic preference analysis for the head disipación [dissipation]

MODIFIER: disipación (+ – ?)			
HEADS	energía del oleaje	+	ENERGY
	energía por fricción	+	ENERGY
Semantic preference: ENERGY Semantic prosody: +			

Table 4: Semantic prosody and semantic preference analysis for the modifiers riesgo de inundación [risk of flooding]

MODIFIER: riesgo de inundación (–)			
HEADS	percepción	?	GENERAL PERCEPTION
	adaptación	+	CHANGE
	cambio	?	CHANGE
	reducción	+	CHANGE
	prevención	+	CHANGE
Semantic preference: CHANGE Semantic prosody: +			

As can be observed, these larger meaning units also occur within specialized knowledge units that were not regarded as having semantic preference and semantic prosody. Table 3 shows the semantic prosody and semantic preference analysis for the head *disipación* [*dissipation*], which is the nominalization of *disipar* [*dissipate*]. It is also found that *disipación* can have a positive, negative or neutral evaluation, depending on its combination with other elements. In Coastal Engineering, it generally combines with positive terms and thus has a positive semantic prosody. *Disipación* also shows a semantic preference for the semantic category of ENERGY, because that is the entity generally dissipated.

Until now, semantic preference and semantic prosody have been studied based on the semantic networks that a verb has with its collocates (e. g. Sinclair 1991, Stubbs 2001, Xiao/McEnery 2006, Morley/Partington 2009). Nevertheless, our results show that these phenomena also occur in the opposite direction, namely in noun complements that take a positive/negative verb.

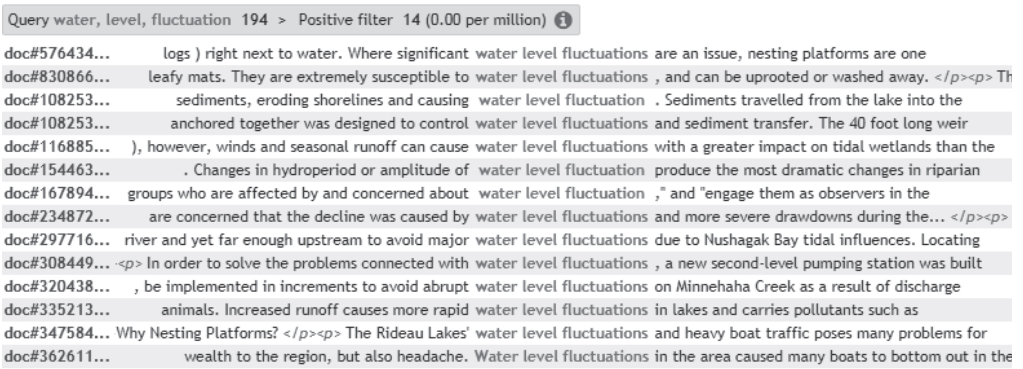
Table 4 shows the analysis of *riesgo de inundación* [*risk of flooding*], which has negative connotations and usually appears with nominalizations of positive verbs that partially mitigate the negative consequences of the modifiers. For instance, the concordances of one of the possible heads, *adaptación* [*adaptation*], highlight its positive nature, as in *medidas para lograr la adaptación* [*measures to achieve adaptation*] or *estrategias de adaptación* [*adaptation strategies*]. Therefore, *riesgo de inundación* [*risk of flooding*] has a positive semantic prosody, given the co-occurrence of these modifiers with the nominalizations of positive verbs. More specifically, three of the five verbs are positive, whereas the other two are neutral. These verbs also determine the semantic preference of *riesgo de inundación* for the lexical domain of CHANGE.

Semantic preference is characterized by the primacy of WATER and water-related concepts. Our results show that 16 of the 26 non-predicating nouns in English are water-related concepts, such as WATER, WATER_WAVE or WATER_REPRESENTATION. This is also the case in Spanish, where 15 of the 22 non-predicating nouns are related to *water*. Given the specialized knowledge field, this may not seem surprising, but it is also true that Coastal Engineering does not only focus on water, but on a wide range of other semantic categories as well. In any case, the knowledge field, text category and register (Hoey 2005, Xiao/McEnery 2006, Bednarek 2008, Stewart 2010, Tang/Rundblad 2015) can all have an impact on semantic preference and semantic prosody.

As reflected in our results, the positive/negative evaluation of certain terms is found to stem from their combination with the other constituent of the MWT. This means that neutral terms can acquire a positive or negative evaluation because of their co-occurrence with another constituent of the MWT. This highlights the relevance of micro-contexts and confirms the importance of context in MWT interpretation (Meyer 1993).

For instance, *fluctuation* has a neutral evaluation, as evidenced in its definitions, which refer to variation but do not specify any positive or negative features. However, when it combines with modifiers (even neutral ones, such as *water level* or *water table*), *fluctuation* acquires a negative nuance. This is due to the fact that the fluctuation of certain entities, such as the water level, can have negative consequences. The whole NC thus acquires a negative evaluation, because the verb transmits its evaluation to the whole NC, as will be discussed below. The negative evaluation of *water level fluctuation* is reflected by items such as *issue, cause*, *control*, *affected by*, or *avoid* (cf. Figure 2).[4]

[4] The negative nature of the MWT has been confirmed after observing a significant number of concordances transmitting negativity in different texts of the Coastal Engineering corpus as well as the general language corpus.



Query water, level, fluctuation 194 > Positive filter 14 (0.00 per million)

doc#576434...	logs) right next to water. Where significant	water level fluctuations	are an issue, nesting platforms are one
doc#830866...	leafy mats. They are extremely susceptible to	water level fluctuations	, and can be uprooted or washed away. Th
doc#108253...	sediments, eroding shorelines and causing	water level fluctuation	. Sediments travelled from the lake into the
doc#108253...	anchored together was designed to control	water level fluctuations	and sediment transfer. The 40 foot long weir
doc#116885...	), however, winds and seasonal runoff can cause	water level fluctuations	with a greater impact on tidal wetlands than the
doc#154463...	. Changes in hydroperiod or amplitude of	water level fluctuation	produce the most dramatic changes in riparian
doc#167894...	groups who are affected by and concerned about	water level fluctuation	," and "engage them as observers in the
doc#234872...	are concerned that the decline was caused by	water level fluctuations	and more severe drawdowns during the...
doc#297716...	river and yet far enough upstream to avoid major	water level fluctuations	due to Nushagak Bay tidal influences. Locating
doc#308449...	In order to solve the problems connected with	water level fluctuations	, a new second-level pumping station was built
doc#320438...	, be implemented in increments to avoid abrupt	water level fluctuations	on Minnehaha Creek as a result of discharge
doc#335213...	animals. Increased runoff causes more rapid	water level fluctuations	in lakes and carries pollutants such as
doc#347584...	Why Nesting Platforms? The Rideau Lakes'	water level fluctuations	and heavy boat traffic poses many problems for
doc#362611...	wealth to the region, but also headache.	Water level fluctuations	in the area caused many boats to bottom out in the

Figure 2: Negative corpus concordances of water level fluctuation *in the EnTenTen corpus*

Other terms, such as *propagación* [*propagation*], can be positive, negative or neutral depending on the collocates. Specifically, the head *propagación* is positive when the entity being propagated is beneficial (as in *energía del oleaje* [*wave energy*]). It is negative when the collocates are adverse (such as *ola de un tsunami* [*tsunami wave*]), and neutral when the propagation does not have any positive or negative consequences (*tren de ondas* [*wave train*]). These examples highlight the usefulness of a fine-grained conceptual organization that groups concepts together whose evaluation can vary when they combine with concepts of a certain evaluative nature (as in *propagación* or *reduction*).

Nevertheless, it should be highlighted that one MWT constituent does not necessarily acquire the connotations of the others. In our opinion, the negative/positive connotations of the head or the modifiers are not necessarily transmitted to the other constituent. In other words, if the head has a positive evaluation, it will not automatically become negative even though the modifiers have these characteristics.

This is the case of *gestión del riesgo de inundación* [*flood risk management*] (Figure 3), as well as in *prevención del riesgo de inundación* [*flood risk prevention*], where the head (*prevención*) has a positive evaluation. In fact, its definition by the Real Academia Española [http://dle.rae.es] highlights its function of avoiding risks. Nevertheless, its modifiers are negative (*riesgo de inundación* [*flood risk*]), as reflected in the EsTenTen corpus, which refers to *flood risk* as a problem to be avoided, reduced, etc. Thus, the co-occurrence of a term with positive/negative terms does not necessarily entail its acquisition of those connotations (Partington 2004, Bednarek 2008). This contradicts Louw's (1993) idea of the emotive coloring of the item as a result of its co-occurrence with positive/negative items.

This border between the constituents of the MWT is also related to the phenomenon of *nesting*, which Hoey (2005) introduces as part of his theory of lexical priming. *Nesting* refers to the different collocations of each constituent of a priming or word combination. These constituents do not have an influence on each other or on the priming.

Regarding the evaluation of the whole MWT, Morley/Partington (2009) point out that if there is a relation of opposition or detraction between the item and its collocates, then the combination does not acquire the positive/negative evaluation of the collocates. In our study, verbs are considered to be at the core of MWT meaning. In other words, an MWT has a positive or negative evaluation depending on its verb, which can be placed in different positions of the MWT (Figure 3). This has been confirmed by all of our MWTs (36 English MWTs and

46 Spanish MWTs). Although the relevance of verbs to MWT formation has been highlighted in previous studies (Cabezas-García/Faber 2017), this research goes a step further and applies the study of predicates to the evaluation of MWTs.

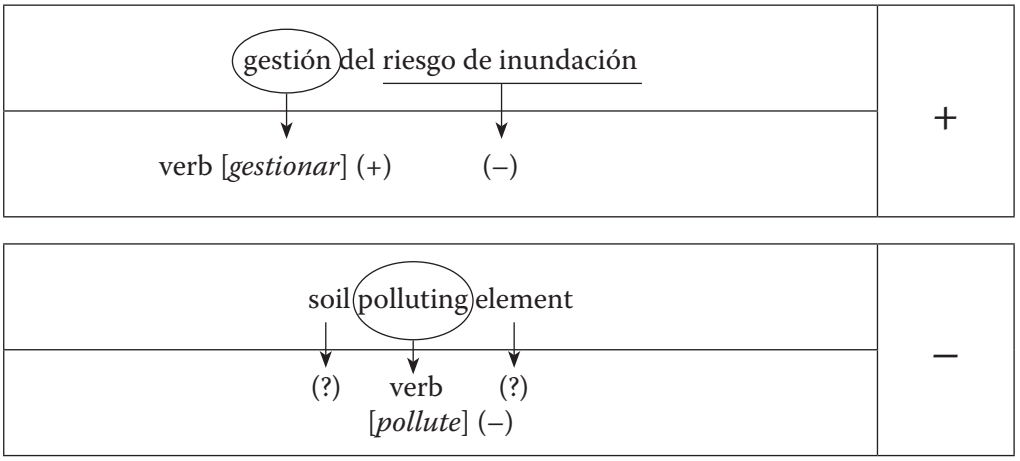


Figure 3: Role of verbs in MWT evaluation

As part of the meaning of a lexical unit, semantic preference and semantic prosody must be taken into account when translating. These semantic phenomena have been observed both in English and Spanish MWTs. Semantic correspondences have been usually found in equivalent terms. As shown in Figure 4, MWTs sharing the same head or modifiers usually combine with terms from the same semantic category and have the same semantic prosody. This is true of both languages.

propagation
Semantic preference: WATER_WAVE
Semantic prosody: ?

propagación
Semantic preference: WATER_WAVE
Semantic prosody: ? –

flood risk
Semantic preference: COGNITION/MENTAL PERCEPTION
Semantic prosody: +

riesgo de inundación
Semantic preference: CHANGE
Semantic prosody: +

Figure 4: Interlinguistic correspondences regarding semantic preference and semantic prosody

As can be observed, both the English head *propagation* and its Spanish equivalent *propagación* have a semantic preference for items belonging to the category of WATER_WAVE, which are mainly neutral. On the other hand, the modifiers *flood risk* and their equivalents *riesgo de inundación* have a positive semantic prosody, and thus tend to co-occur with positive terms. Thus, the combination of *flood risk* and *riesgo de inundación* with a positive head in some MWTs results in an MWT with a positive evaluation because the verb transmits its evaluation to the whole, even though *flood risk* and *riesgo de inundación* maintain their negative connotations.

Nevertheless, these semantic phenomena may not necessarily match in interlinguistic correspondences (as reflected in the different prosodies of *propagation* and *propagación* or the dissimilar semantic preferences of *flood risk* and *riesgo de inundación*). For this reason, the consideration of combination restrictions, such as semantic preference and semantic prosody, is crucial in the translation process. Not doing so could result in *infelicitous translationese* (Tognini-Bonelli 2002: 85).

Successful translation thus depends on an awareness of all aspects of the meaning of the source-language unit. This involves dealing with possible disagreements between the semantic preference and semantic prosody of certain terms whose function may initially appear to be comparable (Tognini-Bonelli 2002). Consequently, an analysis of semantic preference and semantic prosody is helpful in order to establish mapping relations, especially since this type of semantic phenomena accounts for the restriction combinations of MWTs.

Semantic roles (such as AGENT or PATIENT) have also been found to influence semantic prosody and semantic preference. The case of the modifiers *storm surge* highlights the importance of semantic roles in terms with a negative evaluation. Two dimensions are observed, which depend on the semantic role of these modifiers. The first dimension is activated when *storm surge* is at the origin of the process (understood as an AGENT). In this case, the modifiers acquire a negative semantic prosody and appear with negatively-evaluated terms, such as *elevation* and *inundation*, which are the adverse consequences of *storm surge*. This negative prosody is evident in the paraphrases, where verbs such as *cause* and *lead to* are usually followed by negative concepts (Hoey 2005, Xiao/McEnery 2006, Dam-Jensen/Zethsen 2008). More specifically, a storm surge *causes* inundations or a storm surge *leads to* water elevation. A semantic preference for heads designating nominalizations of MOVEMENT verbs is also observed.

In the second dimension, the *storm surge* receives the action denoted by the process. In these cases, there is a positive semantic prosody since *storm surge* combines with heads that have a positive evaluation, such as *prediction*. In this sense, it alludes to the beneficial actions that mitigate the negative meaning of *storm surge*. Moreover, a semantic preference for heads designating ACTION verbs is observed. Table 5 shows the double dimension in the semantic preference and semantic prosody of *storm surge*.

Table 5: Semantic preference and semantic prosody analysis for the modifiers storm surge

MODIFIER: storm surge (–)			
HEADS	elevation	–	MOVEMENT
	prediction	+	SPEECH
	modeling	+	ACTION
	simulation	+	ACTION
	inundation	–	MOVEMENT
Dimension 1 (consequences due to the modifiers' action) Semantic preference: MOVEMENT Semantic prosody: –			
Dimension 2 (methods to mitigate/prevent those consequences) Semantic preference: ACTION Semantic prosody: +			

As previously mentioned, *storm surge* does not acquire a negative evaluation because of its co-occurrence with negative terms (when *storm surge* is the AGENT). The evaluation of the whole MWT is thus positive or negative, depending on the verb.

In conclusion, the results of this research highlight that semantic preference and semantic prosody are relevant to the combinatorial potential of MWTs. These semantic phenomena can be explored by analyzing micro-contexts, which were addressed in previous studies (Cabezas-García/Faber 2017) for different purposes, namely, meaning access and characterization.

5 Conclusion

This research focuses on the semantic content of MWTs. The objective is to determine the presence of semantic preference and semantic prosody in a set of English and Spanish MWTs in the domain of Coastal Engineering. For this purpose, we have used a Coastal Engineering corpus for term extraction and concordance analysis, as well as a general language corpus for the analysis of semantic preference and semantic prosody. This methodology has been complemented by the use of specialized resources from which evaluative information has been derived, as well as by the elicitation of definitions and paraphrases of the MWTs from Coastal Engineering experts and the web. We have followed Nakov/Hearst (2013), who claim that the best way of accessing the meaning of MWTs is by means of verb paraphrases, which reveal the propositions underlying them. Although Terminology generally focuses on nouns (Buendía Castro/Faber 2015), general language verbs clarify the meaning of MWTs. Our results show that the verb paraphrases used provide valuable insights into the semantic universe of these units and help to specify the semantic relations between their components.

Another aspect worth exploring is the semantic content of MWTs, which are very frequent in specialized texts (Nakov 2013). Nevertheless, up until now MWTs formed by more than two terms have received little attention. This research has analyzed their semantic prosody and semantic preference, which have been found to be present in their meaning.

An awareness of the semantic preference and semantic prosody of words is very important for foreign language students, translators, or anyone who wishes to write texts in another language. When translating, one must not only know the denotative meaning, but also the evaluative meaning of the source and target texts, since the evaluation of words is crucial so that the target text meets the language conventions (Bednarek 2008, Dam-Jensen/Zethsen 2008, Stewart 2010). Since semantic preference and semantic prosody do not often appear in definitions, Corpus Linguistics is a valuable resource for analyzing the usage of MWTs.

This research study has detected the presence of semantic preference and semantic prosody in MWTs. Both are established from the verb (in the form of a nominalized head) to the modifiers and from the modifiers to the verb. In other words, the head or the modifiers co-occur with positive/negative items belonging to a specific semantic category. To the best of our knowledge, this is an aspect that has not been previously explored.

Moreover, certain terms acquire a positive/negative/neutral evaluation in combination with the other constituents of the MWT. However, this does not imply that the positive/negative nature of the head or the modifiers is automatically transmitted to the other constituent of the MWT. The overall evaluation of the MWT is positive/negative/neutral depending on the verb.

Interlinguistic correspondences regarding semantic preference and semantic prosody have been observed although they do not always match in English and Spanish. For this reason, combinatorial restrictions should be considered when translating or producing a text in a different language. Additionally, semantic roles (such as AGENT or PATIENT) have been found to have an influence on the semantic preference and semantic prosody of an MWT's constituents.

In future research, we plan to use a parallel corpus to find equivalent MWTs and explore the correspondences in the semantic preference and semantic prosody of these units, with a view to including them in the phraseological module of EcoLexicon.

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