

Lexicon-driven Approach for Terminology: specialized resources on the environment in Brazilian Portuguese

Flávia Lamberti Arraes

Departamento de Línguas Estrangeiras e Tradução
Instituto de Letras, Universidade de Brasília, ICC – Ala Sul –
Sala B1 167/63 - Campus Universitário Darcy Ribeiro – Asa Norte –
Brasília/DF CEP: 70910-900, Brazil
flavialamberti@unb.br, flavialamberti@gmail.com

Abstract

This paper presents a terminological research carried out to account for terms of the environment in Brazilian Portuguese based on a lexico-semantic perspective for Terminology (L’Homme, 2015, 2016, 2017, 2020; L’Homme et al., 2014, 2020). This work takes place in the context of a collaboration for the development of *DiCoEnviro* (*Dictionnaire Fondamental de l’Environnement* – Fundamental Dictionary on the environment), a multilingual terminological resource developed by the *Observatoire de Linguistique Sens Texte* at the *University of Montreal*, Canada. By following a methodology especially devised to develop terminological work based on a lexicon-driven approach (L’Homme et al., 2020), the terminological analysis reveals how the linguistic behavior of terms may be unveiled and how this is effective for identifying the meaning of a term and supporting meaning distinctions.

Keywords: Lexicon-driven approach, Terminology, Explanatory Combinatorial Lexicology, Frame Semantics, Environment

1. Introduction

This paper presents a terminological research carried out to account for terms of the environment in Brazilian Portuguese based on a lexico-semantic perspective for Terminology (L’Homme, 2015, 2016, 2017, 2020; L’Homme et al., 2014, 2020). This work takes place in the context of a collaboration for the development of *DiCoEnviro* (*Dictionnaire Fondamental de l’Environnement* – Fundamental Dictionary on the environment), a multilingual terminological resource developed by the *Observatoire de Linguistique Sens Texte* at the *University of Montreal*, Canada.

The perspective taken is innovative when compared to other specialized resources on the environment in Brazilian Portuguese. Existing resources on the environment (e.g. *Glossário do Meio Ambiente*, 2022) usually present lists of terms and multiword terms that show no relation between terms. It also includes compositional expressions (i.e. the whole meaning of the expression corresponds to the sum of its parts) that would have not been included as a whole had a lexicon-driven approach (LDA), for instance, been adopted in the analysis. An expression, such as *conservação ambiental*, is analyzed based on the relations each lexical unit establishes between themselves.

Taking a linguistic perspective to carry out terminological research, the LDA accounts not only for nouns, but also verbs, adjectives and adverbs. It also suggests criteria to identify terms and to support meaning distinctions by capturing the linguistic properties of terms, i.e. their predicative structure and lexical relations they establish between themselves. This is an effective approach to unveil the specialized knowledge of a domain. This knowledge is uncovered from running texts and is not based on predefined delimitations of concepts. By applying this

approach, *DiCoEnviro* presents an expression of the domain of the environment through a web of relations in six languages, i.e. French, English, Spanish, Portuguese, Italian and more recently Chinese.

This paper shows how two specific lexical semantics frameworks can be applied to terms and help us to describe their linguistic properties: Explanatory Combinatorial Lexicology (Mel’čuk et al., 1995) and Frame Semantics, and its application in the FrameNet Project (Fillmore, 1982; Fillmore et al., 2003; Fillmore and Baker, 2010) (Section 2). In Section 3 we present the methodology used for the development of *DiCoEnviro*, with special reference to the corpus, term extraction and criteria to identify terms that refer to the Brazilian Portuguese version. In Section 4, we present a specific case analysis of a polysemious lexical item, *ambiental*, that led to meaning distinctions based on the shared relations between terms. We conclude by providing some figures regarding the work we have done up to now and mention some directions we wish to take in the future.

2. Theoretical frameworks

The lexicon-driven approach is of special assistance to terminological work as its focus is placed on the analysis of linguistic units, more specifically lexical units, as opposed to concepts as abstract generalizations of items of knowledge (L’Homme, 2020: 27). As a consequence, the approach is semasiological: it consists in delimiting lexical units that convey specialized meaning, often called terms, in running texts. The approach is ‘relational’: it consists in delimiting meaning of lexical units based on the relations they share with other units (L’Homme, 2020: 26). This last aspect is also especially important to support meaning

distinctions. For instance, consider the lexical item *terra* in the following sentences:

Mas, enquanto a TERRA é uma unidade formada por ecossistemas altamente integrados, o Mundo se apresenta, ao contrário, como uma realidade composta de sistemas culturais, sociais, políticos e naturais, (...)

Atualmente existem estimativas com base em 6 categorias de uso da TERRA: terra degradada ou consumida (por exemplo, aquela sob áreas construídas), terra sob jardins, terra agrícola.

In the first sentence, the meaning of TERRA can be connected to that of other terms, such as *planeta* (planet), a generic term, *mundo* (world), a related meaning, and *sol* (sun) a contrastive one, whereas, in the second sentence, TERRA can be linked to *solo* (soil), a meronym, and to combinations such as *~ degradada*, *~ consumida*, *~ agrícola*. This evidence tells us that we are dealing with two different meanings. DiCoEnviro presents two different entries to account for these two meanings: *Terra*₁ and *terra*₂.

The terminological analysis will examine different types of relations expressed via a number of what is called linguistic properties of terms. DiCoEnviro applies two specific lexical semantics frameworks that are especially equipped to capture the linguistic properties of the predicative terms: Explanatory Combinatorial Lexicology - ECL (Mel'čuk et al. 1995) and Frame Semantics, together with its application *FrameNet Project* (Fillmore, 1982; Fillmore et al., 2003; Fillmore and Baker, 2010)¹.

The linguistic properties of terms are captured by i) delimiting lexical meaning, i.e. determine if we are dealing with terms that are non-predicative, predicative or a quasi-predicative ones, as defined in Polguère (2016: 162), and ii) identifying lexical relations established between terms (paradigmatic and syntagmatic relations). Non-predicative terms does not require participants for the expression of their meaning; examples are terms such as Earth, water, air, planet, plant, tree, etc. Predicative terms, on the other hand, are expressed generally by verbs, nouns, adjectives, adverbs; their essential feature is that they require participants for the expression of their meaning. Predicative units require actants or arguments and can combine with optional participants (i.e. circumstantials). Obligatory participants (arguments) are stated in a structure called argument structure. DiCoEnviro presents the argument structure of predicative terms in each entry: e.g. a predicate term with two arguments, X and Y, in *absorver*: X (e.g. árvore) absorve Y (e.g. gás). Quasi-predicative terms share similarities with predicative units because they also require participants. Following we show the example of *terra*₂ in DiCoEnviro:

*terra*₂

uma terra: ~ utilizada por X (e.g. pelo homem) para atuar em Y (e.g. plantaçãO₂).

Based on ECL (Mel'čuk et al. 1995: 125-152), DiCoEnviro also provides details on the types of lexical relations terms establish with other terms: i) paradigmatic relations are semantic relations that connect lexical units, such as terms that are semantically related or are opposites. For instance, the verbs *emitir*₁ and *liberar*₁ are semantically related, but *absorver*₁, and *emitir*₁, on the other hand, are opposite meanings, and ii) syntagmatic relations (most preferred combinations with other lexical units), such as syntagmatic relations that express a property of *terra*₄ (e.g. *terra agrícola*, *terra consumida*, *terra degradada*) and also combinations, e.g. *preparar a ~*, *cultivar a ~*, *manejar a ~*. Lexical relations are represented with a system called lexical functions (LFs) (Mel'čuk et al. 1995: 125-152).²

Frame Semantics (Fillmore, 1982; Fillmore and Baker, 2010) aims to establish a connection between language and abstract background knowledge. This connection is developed based on a methodology devised for the FrameNet projet (Fillmore et al. 2003; Ruppenhofer et al. 2016). This methodology has been applied, with adaptations, to develop specialized resources (L'Homme, 2015, 2016 ; L'Homme et al., 2020)³.

As stated by L'Homme (2020: 45):

In Frame Semantics, this background knowledge is structured in the form of *semantic frames*. More precisely, a frame can be defined as the schematic modeling of a prototypical *situation* that includes *participants*, which constitute its *frame elements (FEs)*.

Furthermore, L'Homme (2020: 45) adds:

In Frame Semantics, the meanings of LUs are understood, analyzed and described according to background knowledge captured in semantic frames : LUs are said to 'evoke' a frame.

By applying the methodology proposed in FrameNet and adapted for the development of specialized resources (L'Homme et al. 2020), the meaning of a term is described via annotation of contexts, which is a step within the terminological work methodology presented in the next section.

3. Methodology

The methodology applied to the Portuguese data follows the steps that are applied to other languages. It is bottom-up: in other words, terminological work starts from running texts based on which all the analysis is carried out. It comprises 8 steps, as outlined in L'Homme et al. (2020):

Compiling terminological entries:

¹ See L'Homme (2020: 39-50) for a detailed explanation.

² See L'Homme (2020), chapter 8.

³ In Portuguese Frame semantics has been applied, for example, to the fields of football (Dicionário da Copa do Mundo 2014) and to Law (Pimentel 2013). See also FrameNet Brazil.

1. Compilation of specialized corpora
 2. Identification of terms (semi-automated)
 3. Selection and extraction of contexts
 4. Definition of the argument structure
 5. Annotation of contexts
- Finding frames among lexical entries:
6. Definition of semantic frames
 7. Encoding of frames
 8. Definition of relations between frames
- (L’Homme, Robichaud and Subirat, 2020)

The Brazilian Portuguese specialized corpus, on the subdomain of deforestation, has been compiled by Botta (2013) and is composed of scientific and journalistic texts published between 1981 and 2012. It contains approximately 277,000 words. Texts are queried with in Intercorpus⁴, an online concordancer, which help us analyze and extract contexts.

A term extraction software, TermoStat (Drouin, 2003), is applied to the corpus and generates a list of candidate terms. The list is further analyzed manually to select terms based on criteria devised by L’Homme (2004: 64-66). For instance, *floresta*, *desmatamento*, *espécie*, *mata*, *vegetação*, *sustentabilidade*, are all selected based on the fact that these lexical units are related to the specialized domain. Other criteria are applied when the link with the specialized domain is not easily or clearly established. For instance, verbs and activity nouns (e.g. *manejar*₁, *manejo*₁) and adjectives (e.g. *ambiental*₁) require the application of a second criteria: the analysis of the nature of the semantic arguments that interact linguistically with the lexical unit in focus. If the arguments are terms validated by the first criterion (i.e. they are related to a specialized domain), the lexical unit in focus is also a term. For example, the verb *manejar*₁ requires two arguments: 1. someone (e.g. *homem*, *produtor*) that *maneja*; 2. the thing that is *manejado* (e.g. *floresta*, *mata*, *vegetação*). If arguments are validated as terms by the first criterion, the predicative unit is also considered a term. *Manejar* is considered a term because *homem*, *produtor*, *floresta*, *mata*, *vegetação* are regarded as terms. Other criteria are i) a morphological relationship with a term; for example, the adjective *manejado*₁ (e.g. *floresta* ~; *mata* ~; *vegetação* ~), is morphologically and semantically related to the verb and noun (*manejar*₁ and *manejo*₁); and ii) a paradigmatic relationship with the term. For example the term *ambiental*₁ holds a semantic relationship of quasi-synonym with *ecológico*₁ and a related meaning relation with *ambiental*₂.

Up to 20 contexts are then selected and extracted from the corpus and registered in a XML file in a database powered by Oxygen XML Editor. In this file, the argument structure is defined for predicative and quasi-predicative terms. Arguments are labeled with semantic roles. For instance, the arguments of *manejar* are: Agent *maneja* Patient; then a typical term, a recurrent term that instantiates the

argument, is indicated: homem maneja floresta.

Based on the methodology developed within the FrameNet project, contexts are then annotated to specify semantic roles and syntactical functions. Below we present a sample of the annotated contexts for the term *manejar*.

O setor florestal brasileiro_[Agent] vem adotando este conceito, **MANEJANDO as florestas**_[Patient] **com práticas e técnicas que visam o equilíbrio entre o desenvolvimento econômico e a manutenção dos recursos naturais**_[Means] [XYZ FatoseNumerosdoBrasilFlorestal_sbs 0 MGB 11/04/2013]

Uma empresa que produziu lâminas faqueadas e desenroladas deveria **MANEJAR sua floresta**_[Patient] para produzir madeira de densidades média a leve. [XYZ MANEJOFLORESTAL_1996 0 MGB 11/04/2013]

A summary table is established after the annotations are finished presenting all the semantic roles and syntactical functions identified in the contexts.

MANEJAR 1		
Actantes		
Paciente	Objeto (SN) (10) Sujeito (SN) (4) Relação_indireta (Pro) Relação_indireta (SN) Sujeito (Pro)	floresta (8) vegetação (2) amazônia área este{uma vegetação já consolidada} gado pastagem qual sistema
Agente	Relação_indireta (Prop) Relação_indireta (SN) Relação_indireta (SV) Sujeito (SN)	empresa produtor quem setor

Figure 1: Summary table of the annotated contexts for *manejar*₁.

The last 3 steps of methodology (i.e. definition of frames; encoding of frames and definitions of relations between terms) are dedicated to connect the linguistic properties described to a conceptual background. As an example, we focus on the *Judgement_of_impact_on_the_environment* frame⁵, which is evoked by terms in English (e.g. *clean*₁, *environmental*₂, *green*₁) French (e.g. *écologique*₂, *environnemental*₂, *propre*₁, *verti*₁) and Portuguese (e.g. *ambiental*₂, *ecológico*₂). This frame was defined based on i) the same number of arguments: all the terms have one argument; and ii) the nature of their semantic role: the arguments are labelled as Instrument, Cause and/or Means, and are instantiated by terms that denote an instrument, a

⁴ Chièze, E.; Polguère, A. (no date) available at <<http://olst.ling.umontreal.ca/intercorpus/>>.

⁵ See L’Homme et al. (2014) and L’Homme (2015) for more details on discovering frames in specialized domains.

cause and/or means: Instrument: en. *car, vehicle*, etc; fr. *voiture*, etc; Cause: en. *action, activity, conservation*, etc; fr. *action, étiquetage, protection*, etc; pt. *consciência, educação, gestão*, etc; Means: fr. *papier, contenant*, etc).

Based on the annotated contexts, it is possible to establish that the terms evoke the same situation (*Judgement_of_impact_on_the_environment*) whereby an instrument, a cause and/or means 'is designed to have minimum impact on the environment'⁶. Figure 2 below shows how this frame appears in the interface named *Framed DiCoEnviro*⁷.

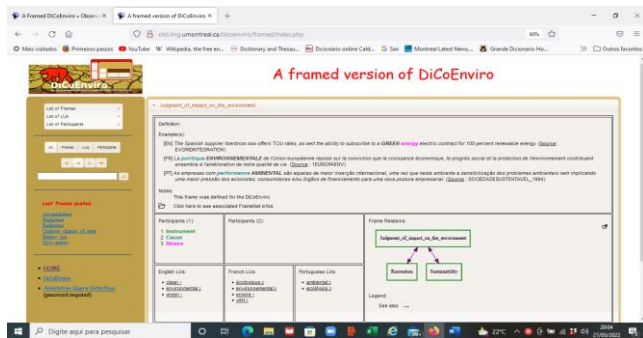


Figure 2. Frame *Judgement_of_impact_on_the_environment* in the Framed Version of DiCoEnviro.

Based on L'Homme et al. (2020), the encoding of the frame accounts for the following:

- i) the name of the frame: for example, *Judgement_of_impact_on_the_environment*;
- ii) a definition formulated for the field of the environment stating the obligatory participants: this has not been done yet for the frame in i);
- iii) example(s) for each of the languages described:

[EN] *The Spanish supplier Iberdrola now offers TOU rates, as well the ability to subscribe to a GREEN energy electric contract for 100 percent renewable energy.* (Source : EVGRIDINTEGRATION)

[FR] *La politique ENVIRONNEMENTALE de l'Union européenne repose sur la conviction que la croissance économique, le progrès social et la protection de l'environnement contribuent ensemble à l'amélioration de notre qualité de vie.* (Source : IEUROPAENV)

[PT] *As empresas com performance AMBIENTAL são aquelas de maior inserção internacional, uma vez que neste ambiente a sensibilização dos problemas ambientais vem implicando uma maior pressão dos acionistas, consumidores e/ou órgãos de financiamento para uma nova postura empresarial.* (Source : SOCIEDADESUSTENTAVEL_1994)

- iv) An indication of the reference to FrameNet with a

⁶ L'Homme (2020: 29-30) defined the explanation 'that is designed to have a minimum impact on the environment' for the adjectival terms that evoke this frame (e.g. en. *environmental*₂, fr. *environnemental*₂ fr. *écologique*₂, pt. *ambiental*₂, and others).

hyperlink to FrameNet wherever relevant: the frame in focus has no reference to FrameNet; it was defined for the DiCoEnviro only.

- The list of participants (obligatory and optional ones): the participants listed are **Instrument**, **Cause** and **Means**, and they are all obligatory;
- The list of terms that evoke this frame in different languages: English (e.g. *clean*₁, *environmental*₂, *green*₁) French (e.g. *écologique*₂, *environnemental*₂, *proper*₁, *vert*₁) and Portuguese (e.g. *ambiental*₂, *ecológico*₂); the

number on the right of each term indicates they are all entries in DiCoEnviro; hyperlinks to the DiCoEnviro are provided to visualize terminological entries and contextual annotations.

The last step, 'Definition of 'relations between frames'', connects situations in different ways. For instance, the *Judgement_of_impact_on_the_environment* is linked via a See also relation with the *Recreation* frame (with terms such as en. *renewable*₁, fr. *renouvelable*₁, sp. *renovable*₁) and *Sustainability* frame (with terms such as en. *sustainability*₁; fr. *durable*₁; sp. *sostenibilidad*₁). Once linked, frames can lead to larger scenarios. For instance, *Sustainability* frame is linked via a property relation (is a property of) with *Human_activity* frame (with terms such as en. *activity*₁; fr. *activité*₁ and chinese 活动₁).

4. Specific case analysis

By following the methodology we presented, the terminological analysis revealed how the linguistic behavior of terms may be unveiled and how this is effective for identifying the meaning of a term. Furthermore, this type of analysis supports meaning distinctions of the same lexical item.

In the analysis of the lexical item *ambiental*, some annotated contexts showed a different nature of semantic roles; this suggested we were probably dealing with two groups of terms and with two different meanings of a polysemous items, *ambiental*: 1. 'that concerns the environment' (as in environmental impact) and 2. 'that is designed to have minimum impact on the environment' (as in environmental policy). The following table shows how the meanings of the items are linked to different lexical units:

TERM	EXPLANATION	SHARED RELATIONS
------	-------------	------------------

⁷ L'Homme (2015: 38) presents an outline referring to each information given in the semantic frames.

<i>ambiental</i> ₁	'that concerns the environment'	<i>ameaça</i> ₁ ~, <i>crime</i> ~, <i>custo</i> ~, <i>dano</i> ~, <i>degradação</i> ₁ ~, <i>desequilíbrio</i> ~, <i>destruição</i> ~, <i>ecológico</i> ₁ , <i>ambiental</i> ₂ , <i>meio ambiente</i> ₁ , en. <i>environmental</i> ₁ , sp. <i>meioambiental</i> ₁ , fr. <i>environnemental</i> ₁
<i>ambiental</i> ₂	'that is designed to have minimum impact on the environment'	<i>atividade</i> ₁ ~, <i>consciência</i> ~, <i>conservação</i> ₁ ~, <i>educação</i> ~, <i>gestão</i> ~, <i>manejo</i> ₁ ~, <i>performance</i> ~, <i>ecológico</i> ₂ , <i>ambiental</i> ₁ , <i>meio ambiente</i> ₁ , en. <i>environmental</i> ₂ , sp. <i>meioambiental</i> ₂ , fr. <i>environnemental</i> ₂

Table 1: Relations shared by *ambiental* with other terms in the field of environment

Following we present the relations shared by *ambiental* in a graphical representation called *Neovisual*, a tool that provides access to the relations encoded in DiCoEnviro. The method used to develop this tool is described in L’Homme et al. (2018).

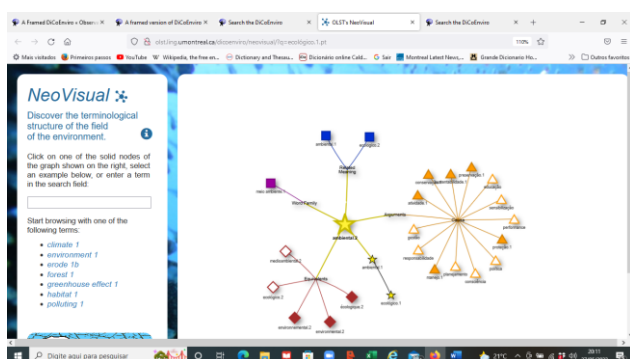


Figure 3. Terminological relations shared by *ambiental*₂ in Neovisual

The terminological relations we can extract from the graph are: i) the arguments of *ambiental*₂ (e.g. *atividade*₁ ~, *consciência* ~, *conservação*₁ ~, *educação* ~, *gestão* ~, *manejo*₁ ~, *performance* ~), ii) related meanings (e.g. *ecológico*₂, *ambiental*₁), iii) word family (e.g. *meio ambiente*₁), iv) equivalence (e.g. en. *environmental*₂, sp. *meioambiental*₂, fr. *environnemental*₂).

5. Conclusion

This article presented a terminological research carried out to account for terms of the environment in Brazilian Portuguese based on the lexico-semantic approach for Terminology (L’Homme, 2020). The descriptions are placed in two terminological resources, DiCoEnviro (2022) and Framed DiCoEnviro (2022). We showed that these resources are developed following a lexicon-driven approach that regards terms as lexical unit and intends to

unveil the specialized knowledge in running texts. This perspective is innovative in terminological work developed in Brazilian Portuguese as existing resources on the environment usually present list of terms and multiword terms that shows no relations established among themselves. Based on two theoretical and methodological frameworks, ECL and Frame Semantics, the specialized meaning is captured based on the relations terms share with other terms. The analysis consists in delimiting the linguistic properties of terms, i.e. their predicative structure and lexical relations. This is also especially effective to support meaning distinctions as properties captured show different relations. The users of these resources are provided with entries that show a number of key information (e.g. argument structure, lexical relations, annotated contexts) and with semantic frames, evoked by specific terms, that characterize specialized knowledge on the environment. All this may be visualized both in textual format and in a graphical display (NeoVisual, 2022). The research reported here is ongoing. Portuguese has accounted for a total of 103 entries and 1.649 relations. Compared to other languages, especially French and English, we understand this work shall be expanded to unveil the specialized knowledge on the environment in Portuguese.

6. Acknowledgements

This work is supported by Fundação de Apoio à Pesquisa do Distrito Federal (FAP/DF), a research support institution of the Federal District in Brasília, Brazil. We would also like to thank the *Observatoire de Linguistique Sens-Texte* (OLST), at the University of Montreal, Canada, for providing the all the necessary means for the development of the terminological resources described here. We would also like to especially thank professor Marie-Claude L’Homme for providing useful feedback for this article.

7. Bibliographical References

- Botta, M. G. (2013). Comportamento dos termos do meio ambiente em textos de vulgarização. *TradTerm*, 22(1):185-210.
- Drouin, P. (2003). Term Extraction Using Non-Technical Corpora as a Point of Leverage. *Terminology*, 9(1): 99–117.
- Fillmore, C. (1982). Frame Semantics. In *Linguistics in the Morning Calm*. The Linguistic Society of Korea. Seoul: Hanshin, pp.111-137.
- Fillmore, C.J., and Baker, C. (2010). A Frames Approach to Semantic Analysis. In B. Heine and H. Narrog (Eds.), *The Oxford Handbook of Linguistic Analysis*. Oxford: Oxford University Press, pp. 313-339.
- L’Homme, M.C. (2015). Découverte de cadres sémantiques dans le domaine de l’environnement: le cas de l’influence objective. *Termin@lia*, 12:29-40.
- L’Homme, M. C. (2016). Terminologie de l’environnement et sémantique des cadres. SHS Web of Conferences, 5°. Congrès Mondial de Linguistique Française, France.
- L’Homme, M. C. (2017). Maintaining the balance between knowledge and the lexicon in terminology: a methodology

based on Frame Semantics. *Lexicography, Journal of Asialex*, 4(1).

L’Homme, M. C., Robichaud, B. and Subirats, C. (2014). Discovering frames in specialized domains. In *Proceedings of the Ninth International Conference on Language Resources and Evaluation (LREC14)*. Reykjavik, Iceland.

L’Homme, M.C., Robichaud, B. and Prével, N. (2018). Browsing the Terminological Structure of a Specialized Domain: A Method Based on Lexical Functions and their Classification. In *Language Resources and Evaluation, LREC 2018*. Myazaki, Japan.

L’Homme, M. C. (2020). *Lexical Semantics for Terminology: an introduction*. Amsterdam/Philadelphia. John Benjamins Publishing Company.

L’Homme, M. C., Robichaud, B., and Subirats, C. (2020). Building multilingual specialized resources based on FrameNet: Application to the field of the environment. *International FrameNet Workshop 2020. Towards a Global, Multilingual FrameNet*. Marseille, France.

Mel’čuk, I., Clas, A., and Polguère, A. (1995). *Introduction à la lexicologie explicative et combinatoire*. Duculot: Louvain-la-Neuve.

Pimentel, J. (2013). Methodological bases for assigning terminological equivalents. A Contribution. *Terminology*, 19(2): 237-257.

Polguère, A. (2016). *Lexicologie et sémantique lexicale : notions fondamentales*. Les Presses de l’Université de Montréal.

Ruppenhofer, J., Ellsworth, M., Petruck, M., Johnson, C., Baker, C. and Scheffczyk, S. (2016). *FrameNet II: Extended Theory and Practice*. (https://framenet.icsi.berkeley.edu/fndrupal/index.php?q=the_book).

8. Language Resource References

A Framed Version of DiCoEnviro
(http://olst.ling.umontreal.ca/?page_id=2364)
Accessed May 26, 2022.

Dicionário da copa de mundo
(<https://www.ufjf.br/framenetbr/dicionario/>).
Accessed May 26, 2022.

DiCoEnviro. Dictionnaire fondamental de l’environnement
(<http://olst.ling.umontreal.ca/cgi-bin/dicoenviro/search.cgi>). Accessed May 26, 2022.

FrameNet (<https://framenet.icsi.berkeley.edu/fndrupal/>).
Accessed May 26, 2022.

FrameNet Brasil. Juiz de Fora, MG: Universidade Federal de Juiz de Fora. (<https://www.ufjf.br/framenetbr-eng/>)
Accessed May 26, 2022.

Glossário do Meio Ambiente
(<https://antigo.mma.gov.br/biodiversidade/biodiversidade-brasileira/gloss%C3%A1rio.html>)
Accessed May 20, 2022.

NeoVisual
(<http://olst.ling.umontreal.ca/dicoenviro/neovisual/>)
Accessed May 26, 2022.

