



Building the Legal Knowledge Graph for Smart Compliance Services in Multilingual Europe

D2.2 Intermediate Report on Lynx Acquired Vocabularies

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EXECUTIVE SUMMARY

This deliverable constitutes an intermediary report on the vocabulary resources generating the Lynx project. These cover both general language and legal terminology, including resources that already exist and others to be added. It is part of Working Package 2, which is concerned with the acquisition and management of linguistic data for Lynx and includes the collection of existing data and extraction of new data from legal domain corpora, and their conversion into linked data formats. Both types of legal and general vocabularies will play a vital role in the Legal Knowledge Graph that is at the heart of Lynx, to enable and facilitate its monolingual and crosslingual services.

The existing vocabularies ensue mainly from two Lynx partners (TILDE and KD) along with some open access terminological resources in particular, and are complemented by resources specifically created to meet use case needs. Additional resources will also be obtained via linked data methods. This process has met with considerable success so far, as shown by the substantial number and high quality of vocabularies reported upon in this document. In view of these achievements, now it is proposed to add a fifth language to the four major European languages included in the original plan of Lynx (namely Dutch, in addition to English, French, German and Italian). The aim is to further reinforce, enhance and improve the legal knowledge services provided by Lynx, and align more closely with its three use case partners. The Lynx partners would thus be able to offer and assure even higher standards for its linguistic infrastructure regarding both general language and legal terminology.

The report is supplemented by three appendices (1) containing a table of all the datasets harvested in Lynx Data Portal and describing the current legal-domain resources that have been converted to RDF, (2) listing the existing domain independent vocabularies of KD, and (3) providing data samples of KD resources in different formats.

This document will be superseded in M24 (November 2019) by the Final Report on Lynx Acquired Vocabularies (D2.5).

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ACRONYMS

API	Application Program Interface
CEF	Common European Framework of Reference for Language
CKAN	Web-based management system for the storage and distribution of data
CSV	Comma-separated values (file format)
DDV	Domain-Dependent Vocabularies
DIV	Domain-Independent Vocabularies
DOC, DOCX	Filenames extension for document files
ELRA	European Language Resources Association
ELRC-SHARE	European Language Resource Coordination
eTTB	e-Translation Termbank
EU	European Union
FAIR	Findable, Accessible, Interoperable and Reusable
HTML	Hypertext Markup Language
IPR	Intellectual Property Rights
JPG/JPEG	Joint Photographic (Experts) Group (compression for digital images)
JSON(-LD)	Java Script Object Notation (-Linked Data)
KD	K Dictionaries Ltd
LD	Linked Data
LLOD	Linguistic Linked Open data
LOD	Linked Open Data
LRs	Language resources
MT	Machine Translation
OCR	Optical character recognition
PDF	Portable Document Format
PNG	Portable Network Graphics (image file format)
RDF	Resource Description Framework
SKOS	Simple Knowledge Organization System
SPARQL	Semantic (RDF) query language for databases
TBX	TermBase eXchange
TMX	Translation Memory eXchange (file format)

TR	Terminology resources
TSV	Tab-separated values
TXT	A filename extension for text files
UPM	Universidad Politécnica de Madrid
URI	Uniform Resource Identifier
W3C	World Wide Web Consortium
WP2, WP3	(Lynx) Working Package 2, Working Package 3
XLS, XLSX	Filenames extension for Microsoft Excel sheet format
XML	Extended Markup Language
XSL	Extensible Stylesheet Language
XSLT	Extensible Stylesheet Language Transformations (for transforming XML)

1 INTRODUCTION

This intermediate report on Lynx Acquired Vocabularies provides a current account of the various linguistic resources (LRs) to be made available for the Legal Knowledge Graph (LKG), which is at the heart of the Lynx project. The final report (D2.5) is due in one year (M24, November 2019), and will offer a full account of these resources.

The two reports are connected to each other and are part of Working Package 2 (WP2), dealing with the acquisition and management of vocabularies used in Lynx. In addition to classifying and describing these LRs, we present some of the techniques and methodologies for their processing to prepare the common services infrastructure needed for Working Package 3 (WP3).

Work in WP2 includes the collection of data from existent multilingual vocabularies and terminologies relevant to the Lynx goals, as well as the creation of new ones extracted from corpora from the legal domain, and the conversion into Linked Data (LD) formats. Corpora of relevant documents are also collected, not only for vocabulary extraction but for their later semantic annotation and integration (as part of Task 2.4), and translation corpora are also created to enable the later translation mechanisms in Lynx (Task 2.5).

The LRs for Lynx are divided into two main groups: Domain Dependent Vocabularies (DDV), which consist of terminologies (monolingual, bilingual and multilingual), as well as legal corpora of documents, directives, industry standards and norms; and Domain Independent Vocabularies (DIV), which consist of dictionaries (monolingual, bilingual and multilingual), along with morphological lists of inflected word forms.

DDV include the reuse of open terminology data, as well as the creation of terminologies from scratch. For this aim, an exhaustive search of existing DDV has been performed in a first stage. As a result, resources of potential interest for Lynx have been documented in the CKAN-based Lynx data portal (<http://data.lynx-project.eu>) to be easily accessed and updated. The main source of open terminological data to be reused in Lynx comes from the new EuroTermBank terminology repository (<http://www.eurotermbank.com/>). Resources identified here will be managed through TILDE's Terminology service, which also allows the management of private term collections. A workflow has been defined to convert resources in heterogeneous formats to RDF (Resource Description Framework), the Web of Data format, for their future inclusion in the Lynx LKG and the Linguistic Linked Open Data cloud (LLOD) (<http://linguistic-lod.org/>).

DDV are also supported by the creation of Lynx use case specific terminologies. In this sense, a parallel workflow has been designed for the creation, documentation, conversion, and linking of such terminologies. The creation of new vocabularies has been semi-automatically performed starting from corpora provided by Lynx consortium members. Resulting terminological data has been transformed into RDF and linked to popular resources on the LLOD cloud.

Tilde Machine Translation (MT) systems, which are integrated in Lynx, will benefit from DDV by improving automated translation quality and adjusting MT systems to specific domains and use cases.

DIV include the use of KD's Lexicala API (<https://api.lexicala.com/>) that will enable access to lexicographic data in RDF format. It will be enriched by additional sources such as DBpedia, BabelNet, etc., and integrated into the Lynx system. Tailored data converters are being developed for the different types of inputs. Some of the KD data is already available in RDF and JSON-LD formats and more conversion is underway as part of this project.

Lynx set out to focus on four major European languages, namely *English*, *German*, *Spanish*, and *Italian*. However, in order to better accommodate one of our use case partners (DNV GL) and thus increase the

project's practicality and efficiency, we propose to add *Dutch*. The LRs acquired for the DIV and DDV tasks would not be harmed by such addition, but enriched, since the main vocabulary providers (TILDE and KD) have appropriate resources also for *Dutch*.

2 VOCABULARY IDENTIFICATION: DOMAIN-DEPENDENT AND DOMAIN-INDEPENDENT VOCABULARIES

The identification of DDV and DIV, as well as of corpora-derived LR, is part of the work carried out in WP2 with the aim of enabling optimal data acquisition and management. It includes the collection of existent LRs and the creation of new ones extracted from corpora in the legal domain, and their subsequent conversion to LD formats and linking with data sources in the Linked Open Data (LOD) cloud (<https://lod-cloud.net/>). In this process, the data extraction will be followed by its semantic annotation and integration. In addition, translation corpora are going to be created to facilitate the Lynx translation mechanisms later on. Overall, the WP2 objectives are listed as follows:

1. Provide and continuously update the Lynx Data Management Plan.
2. Provide a framework of unique identifiers for legal documents.
3. Harvest Lynx relevant data and information, including:
 - a. Domain Dependent Vocabularies (DDV);
 - b. Domain Independent Vocabularies (DIV);
 - c. Corpora of documents of legal documents, directives, industry standards and norms.
4. Create translation corpora to be used for machine translation in WP3.

The first two objectives are covered in the deliverables regarding the Data Management Plan, namely D2.1, D2.4 and D2.8. In this report, we focus on the third objective of domain dependent vocabularies (DDV) and domain independent vocabularies (DIV) as part of WP2. The fourth objective will be handled in D2.3 and D2.6.

2.1 DOMAIN DEPENDENT VOCABULARIES (DDV)

2.1.1 Existing DDV

The workflow of existing DDV includes the use of ready terminology services. The main resource in this sense is EuroTermBank portal (www.eurotermbank.com), a network of stakeholders for publishing and hosting EU-related open terminology data. Another platform is Tilde Terminology platform which provides services and tools (e.g. term annotation, automatic extraction) as well a platform for managing private term collections. Thus, Lynx can benefit from EuroTermBank by getting public and open resources, as well as from Tilde Terminology by using its services (automatic terms extraction, translation lookup).

EuroTermBank was an initial EU project whose purpose was to gather information related to EU-linked terminology. As the EuroTermBank project focus was on harmonization and consolidation of terminology work in EU member states, transferring experience from other EU terminology networks and accumulating competencies and efforts of the accessed countries. EuroTermBank currently provides terminology in 34 languages and wide domain coverage, and it is perfectly suitable to addressing the harvesting process of DDV in Lynx. Conversely, Lynx will also contribute to this project, since all existing DDV now have the option of being converted into RDF format, as explained in the next section. .

2.1.2 Harvesting DDV

To acquire new domain vocabularies, the consortium looked at different data sources to harvest new terminology resources that deal with legal vocabulary. Various paths were followed to identify and explore relevant resources for Lynx, including:

- General web search
- Lookup of resources described in papers from specialized literature
- Search in data portals specialized in language resources

The latter includes the ELRC-SHARE repository, a repository created by the European Language Resource Coordination (<http://www.lr-coordination.eu/>) to improve the quality of automated translation solutions

in the EU, and used for documenting linguistic resources in Europe; the ReTeLe catalogue created by the network of excellence for language technologies in Spain (<http://catalogo.retele.linkeddata.es/>); and the ELRA Language Resource Catalogue (<http://catalogue.elra.info/en-us/>), a unified portal for language resource.

The main focus was in identifying vocabularies containing terms from the legal domain, but some other resources that gather terms from different domains (social sciences, economics and general domain, for instance) were also taken into account. Some resources were already published as Linked Data as part of the LLOD cloud. These are especially interesting for the generation of what we have termed in D2.1 the Linguistic *Legal* Linked Open Data cloud, that is, a sub-cloud of linguistic resources in the legal domain that are of interest for the Lynx project.

In this sense, it is worth mentioning TILDE's E-Translation Termbank (eTTB, <https://www.tilde.com/news/european-commission-entrusts-tilde-ettranslation-integration>), one of TILDE's ongoing terminology-acquiring projects, which will provide over 150 new terminological resources to the language resource pipeline of CEF eTranslation (<https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eTranslation>), covering all official languages of the EU plus Icelandic and Norwegian for three sector-specific domains – health, legal (business legislation) and customer protection. The eTTB project ends in February 2019, so the resources gathered during this project will be made available also for Lynx using the EuroTermBank platform.

Within the eTTB project, a new workflow has been created to harvest new resources, which has also been adopted for Lynx. The workflow is illustrated in Figure 1 and is explained below. Basically it allows resources in heterogeneous format to be analysed with regard to IPR, cleared and converted into TBX and RDF. The RDF conversion is in process, and will be reported in detail (including the model) in the Final Report (D2.5, M24).

Some data come in a structured form (XML or other easy-to-parse formats), whereas others are not fully organized and need to undergo a structuration process before the extraction of terms is possible. Best practice is to collect and provide terminology resources in already **structured formats**, e.g. TBX, XLS, XLSX, TMX, CSV, TSV. Some new terminology resources are available only via Application Program Interface (API), and such requests are also considered. Terminology resources in **semi-structured** and **unstructured formats**, e.g. DOC, DOCX, TXT, PDF, HTML, are also considered and undergo a three-stage conversion process that involves being converted to TSV, then to TBX, and finally to RDF. Finally, they may be enriched with further linguistic data and translation equivalents before being linked to other resources in the Lynx knowledge graph.

In the following we refer to the general processes followed for the different types of resources depending on the input format, that is, structured, semi-structured and unstructured format.

- For **structured formats**, e.g. XML, we use scripts, which allow easy and fast processing of structured format and are customised according to the required processing of content. Some formats can be processed manually first, e.g. XLSX might have columns for different terminological data categories, which should be defined according to the TBX standard and can then be converted automatically into TBX or saved as CSV or TSV.
- To process **semi-structured formats**, e.g. DOCX, we use advanced scripts developed in Microsoft PowerShell and customised according to the necessary processing of semi-structured content. Terminological data in semi-structured formats need additional, sometimes considerable, human processing, e.g. terms might be formatted in bold and/or italic within term entries or separated from other terminological data, e.g. definitions, in another paragraph, or might be given within the same paragraph and separated with hyphens or colons. In such case, terminological data should be structured first with advanced parsers and human processing.

- The most challenging and resource-consuming part of the extraction task is to process **unstructured terminological data**. To process terminology resources in unstructured formats, e.g. PDF containing scanned content, optical character recognition (OCR) is used first. Then additional processing – human or machine – is needed. The quality of the OCR result depends on the software and human knowledge. For this task professional OCR software is being used, Adobe Acrobat Pro, which is the most reliable programme nowadays, also used for image processing, e.g. JPG and PNG. On top of machine processing, human processing is required to validate the result given by the OCR, e.g. to correct unrecognised characters and spelling errors, structure content and apply appropriate formatting. For this task, linguistic knowledge is needed. Applying linguistic knowledge might take vast amounts of time (even several days) to process a single document.

DOCX format saved in PDF is less challenging to process and structure, as it is semi-structured and therefore requires less human processing and linguistic knowledge. However, it might contain errors, e.g. due to encoding issues or characters that are easy to process by humans but are difficult for machines. Such content should be validated by linguistic experts.

Figure 1 presents the full workflow of processing different formats.

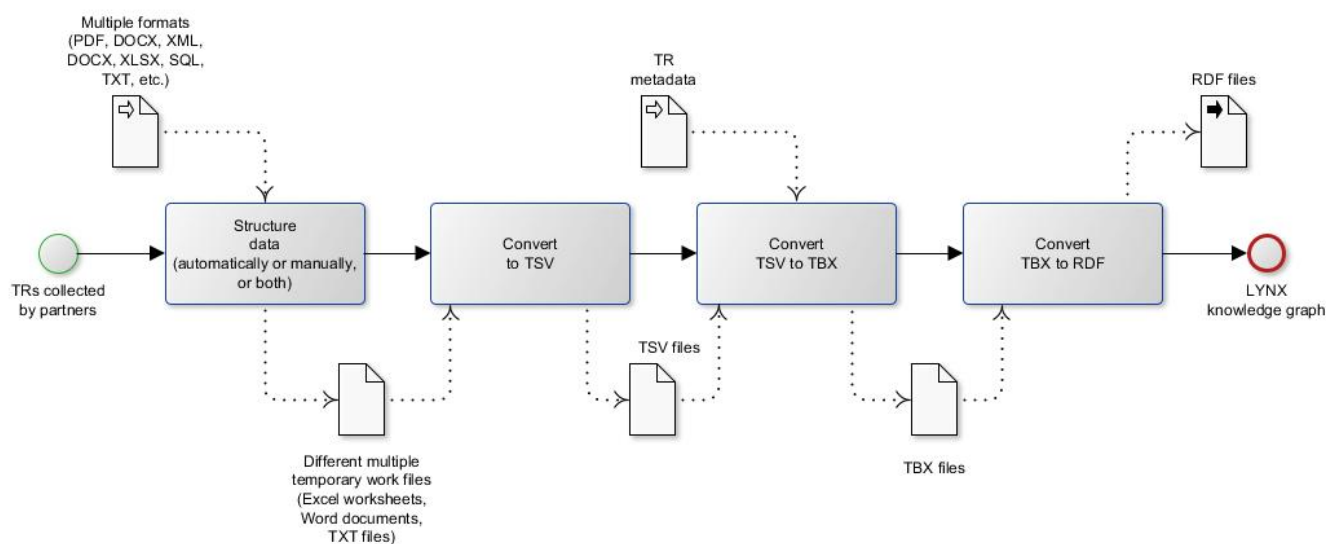


Figure 1. Workflow of processing different data formats

A separate part of the workflow is devoted to finding out IPRs and describing those where the status of intellectual property rights is not clear or where the art work is copyright protected (not under Creative Commons conditions).

Altogether, consortium partners have identified up to 600 sources as potential DDVs. Currently more than 200 resources have clear licencing status and data structure, and are thus undergoing a process of conversion into TBX. Around 60 of these have already been processed and registered to the public Lynx data portal, whereas others are still in the private working list awaiting clearance on IPR and processing issues. Appendix 1 gathers all the datasets collected during this harvesting stage.

During this process, other potentially useful resources have been identified, but they have not been archived since they are either published in formats that can't be handled, are no longer available, or are not supported by their publishers.

Following this resource harvesting stage, some conclusions about the status of the legal vocabularies can be drawn:

- Legal language resources are often generated for one single sub-domain of law (e.g. economic law) so they may not directly cover the domains we are interested in for Lynx.
- Usually, vocabularies represent terms in major languages, which make it more complex to find resources for other languages.
- Datasets are heterogeneous in terms of format, language and lexical information.
- Resources generated by small organisations or individuals are often in obsolete formats that are no longer available or useful, and thus must be converted to an up-to-date format.

These reasons have impeded us to generate more legal vocabularies to ease the annotation, classification and translation activities that are required in the Lynx project. The creation “from scratch” of DDV that cover the terminological needs of use cases has been reported in section 3.

2.2 DOMAIN INDEPENDENT VOCABULARIES (DIV)

General language resources that are not specifically oriented to the Lynx domain (and thus not part of DDV) form the domain independent vocabularies (DIV) and complement DDV in the aim of offering wholesome linguistic information. To begin with they derive from existing resources of KD, and they are due to expand through linking to open resources that will be harvested on the Web, primarily from the Linguistic Linked Open Data cloud.

2.2.1 Existing DIV

The KD data sets cover the five principle languages of Lynx – English (EN), German (DE), Italian (IT), Spanish (ES), and newly added Dutch (NL) – and extend to others too. They are based on deep lexicographic analysis of each language, its mapping and cross-lingualising, and include sense disambiguation, translation, morphological inflection, and other features and information. These resources are all available in XML, and to various extents in RDF, JSON and JSON-LD formats, so their linked data transformation is in process and should be completed. The final LD model will be lemon-Ontolex, with RDF serialisation in JSON-LD. This part is going to be elaborated in the Final Report (D2.5, M24).

(a) Global series

A monolingual lexical core of each of the languages involved, with translation equivalents in some of the other languages, and options to link to each other and to more languages. It includes semantic and syntactic details, representation of pronunciation and alternative scripts, inflected forms, grammatical categorization, sense division, attributes and definitions, phrases and examples, cross-references, frequency and other information, as well as translation equivalents of word meanings, multiword units and examples of usage. Every language core thus constitutes a multilayer crosslingual lexical network that can also link to others. The Global sets are originally in XML format and are nearly fully converted to RDF and JSON-LD in line with the lemon-Ontolex model. The main figures per language are listed in Table 1.

language	level	words & phrases	senses	examples of usage	translated to
Dutch (NL)	1	17,000	21,000	21,000	English, German, Spanish
	2	31,000	36,000	37,000	English, German
English (EN)	1	17,000	27,000	30,000	Spanish
German (DE)	1	19,000	30,000	32,000	English, Dutch
	2	35,000	50,000	57,000	English, Dutch
Italian (IT)	1	22,000	36,000	37,000	English

	2	36,000	55,000	57,000	English
Spanish (ES)	1	15,000	28,000	57,000	English, Dutch
	2	28,000	47,000	75,000	English, Dutch
	3	57,000	81,000	107,000	

Table 1. Basic statistics per language in the Global series

Figure 2 presents the existing Global dictionary monolingual cores (in green) and their bilingual pairs.

	DE	EN	ES	IT	NL
DE	•	•			•
EN		•	•		
ES		•	•		•
IT		•		•	
NL	•	•	•		•

Figure 2. Global language cores and pairs

(b) Password and MultiGloss

The Password multilingual set of semi-bilingual English learner's dictionaries includes nearly fifty language versions, consisting of an English-English core with brief translations for each sense, so the Dutch, German and Spanish equivalents can be juxtaposed against the English term.

Dutch, German and Spanish also each have their own lists of words and phrases with every sense linked to the corresponding meaning in Password. This forms human edited bilingual glossaries that are multilingualised automatically by associating the translations from the other languages to that sense of the Password entry.

The data are in XML format. Main figures per language are shown in Table 2.

language	source	words & phrases	senses	examples of usage	translated to
English	Password	29,000	39,000	37,000	Dutch, German, Italian, Spanish
Dutch	MultiGloss	21,000	35,000		English > German, Italian, Spanish
German	MultiGloss	25,000	39,000		English > Dutch, Italian, Spanish
Italian	MultiGloss	26,000	46,000		English > Dutch, German, Spanish
Spanish	MultiGloss	22,000	45,000		English > Dutch, German, Italian

Table 2. Basic statistics per language in Password & MultiGloss

Figure 3 shows the monolingual cores (in green), manually created pairs (blue for English>L2 and yellow for L2>English) and auto-generated pairs (orange).

	DE	EN	ES	IT	NL
DE					
EN					
ES					
IT					
NL					

Figure 3. Password & MultiGloss cores and pairs

(c) Random House Webster's College Dictionary

A comprehensive English monolingual dictionary that was originally conceived for American university students and English native general users, including over 130,000 entries and 190,000 senses. The data is in XML format.

(d) Wordforms

Morphology lists of inflected forms linked to their lemmas, the figures are shown in Table 3.

language	lemmas	inflected forms
Dutch	157,000	206,000
English	69,000	160,000
German	95,000	456,000
Italian	29,000	303,000
Spanish	125,000	499,000

Table 3. Numbers of lemmas & inflected forms

KD data samples for DIV are included in Appendix 2.

2.2.2 Harvesting DIV

External DIV resources are planned to be harvested mainly from the Linguistic Linked Open Data cloud (LLOD, <http://linguistic-lod.org/>). The major LLOD resources for this purpose might consist of BabelNet and DBpedia. The specific processes and methods will be determined following the completion of the conversion of the existing DIV listed above in section 2.2.1 to RDF and JSON-LD formats.



Figure 4. LLOD cloud (accessed 25/11/2018)

3 NEW VOCABULARY GENERATION

3.1 CREATING VOCABULARIES

Due to the shortage of DDV covering the specific domains of the Lynx use cases from those that have been identified, the creation of new terminologies has become a requirement. For this purpose, the partners decided to perform a term identification task from legal corpora provided by Lynx consortium.

The workflow followed here slightly differs from the methodology presented in Section 2.1, since this process does not involve intermediate TSV and TBX formats between the source document and the target RDF file. However, in some specific occasions, it may be necessary to transform PDF into TXT files, and then treat them as CSV to directly convert them to RDF.

Consequently, Figure 5 offers a general vision of this alternative workflow:

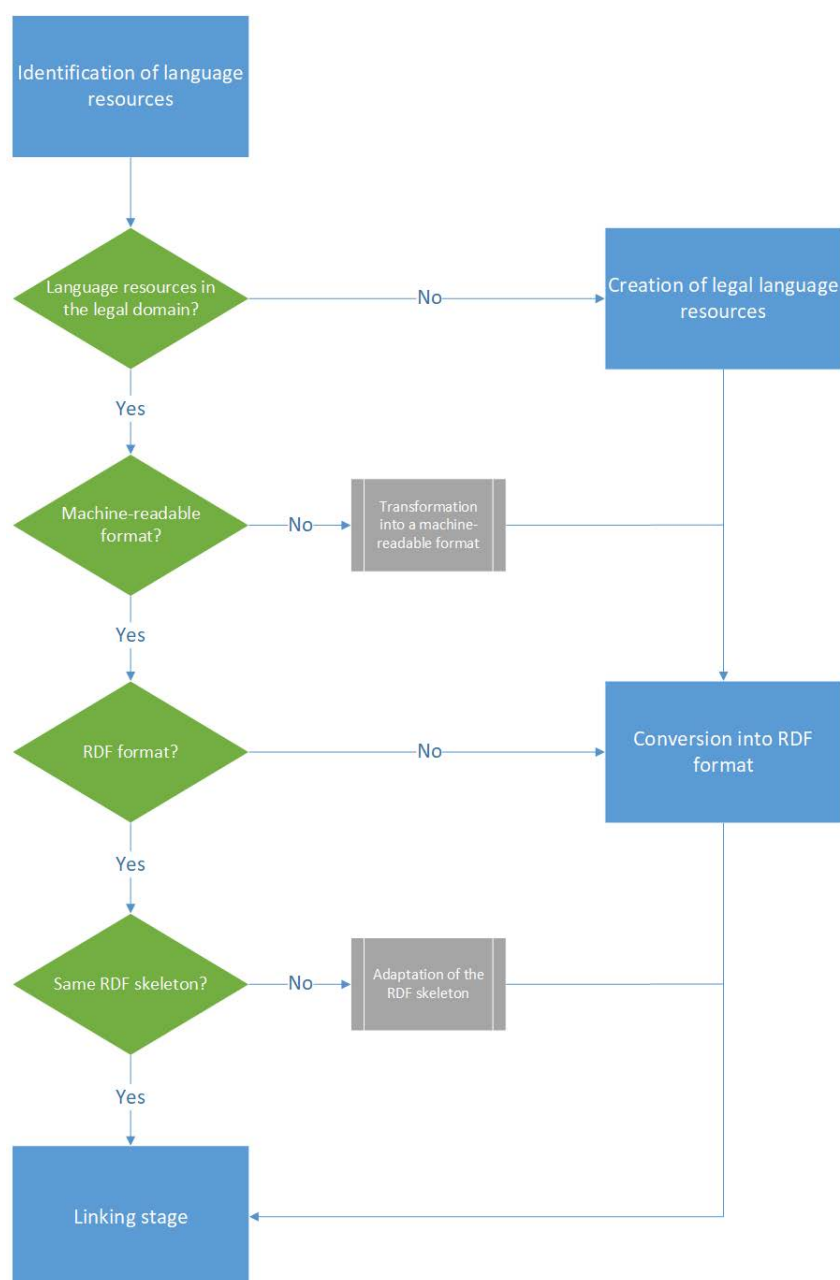


Figure 5. New vocabulary generation stage

The corpora mentioned above, from which the terms have been extracted, were provided by the three use case partners: CuatreCasas (labour law domain), Openlaws (data protection domain) and DNV (industrial standards).

The specific sub-domains and languages for which corpora were provided are as follows:

- **CuatreCasas** provided a set of documents in Spanish composed by collective agreements. Thus, this pilot is related to the Labour Law domain.
- **OpenLaws** provided a set of documents in English composed by regulations for data protection in the European Union. Thus, this pilot is related to the Data Protection domain.
- **DNV** provided a set of documents in English containing decisions and agreements in the maritime industry. Thus, this pilot is related to the Industrial Standards domain.

All these documents are published in non-machine-readable PDF format. To process them, there were two options: either convert them into plain text (TXT) or find a term extraction tool that could work with PDF files. For this initial work, the commercial term extraction tool Sketch Engine was used with a free license for academic purposes.

The term lists resulting from applying this tool on the legal corpora were composed by 200 terms, which were evaluated to determine which terms were correctly extracted, which are relevant for the domain, etc. After this evaluation, the “clean glossaries” include 100 terms: 50% single terms and 50% compound terms.

3.2 TRANSFORMING RESOURCES TO RDF

Prior to the transformation process, we needed to perform two main activities: 1) to decide the URI naming strategy and 2) to choose an RDF vocabulary that had better represent the terminological information that had been previously extracted.

To provide each term with a URI, it was necessary to carry out several cleaning tasks for consistency: removing duplicates, noise and empty cells. This has been done with OpenRefine (<http://openrefine.org/>) and the GREL (<https://github.com/OpenRefine/OpenRefine/wiki/GREL-Functions>) expressions. Since the URI is based on the term itself, it was also required to delete spaces in compound terms, accents and special characters. In some other occasions, the addition of other information was also necessary.

Regarding the second activity mentioned in the introduction of this section, several transformations and linking activities have been performed in order to choose the RDF vocabularies that best suit the nature of the resources and the objective of the project. To achieve this, a set of specific legal language resources has been selected. Three glossaries have been obtained from the term extraction process mentioned in the previous section, and two additional glossaries have been reused from the open terminology portal of the Termcat centre (<http://www.termcat.cat/en/TerminologiaOberta/>), identified during the harvesting stage:

- CuatreCasas terminological glossary from the Labour Law domain in Spanish (New)
- OpenLaws terminological glossary from the Data Protection domain in English (New)
- DNV terminological glossary from the Industrial Standards domain in English (New)
- TERMCAT glossary of Labour Law domain in English (Reused)
- TERMCAT glossary of Labour Law domain in Spanish (Reused)

▪ Vocabularies applied

Once the URI is created, the properties that will be used to model the RDF skeleton need to be chosen based on the information that will be represented. It is convenient to make these decisions prior to the

creation of the source file (CSV, XLSX, etc.) that is to be converted, in order to distribute the content accordingly.

Considering the current state of the glossaries (term lists), their objective (annotate legal documents) and their content (terms and some definitions), SKOS (Simple Knowledge Organization System) seems like the most appropriate model to be applied to this project due to its simplicity and intuitive representation. These initial glossaries will evolve, gathering more information and probably being transformed according to other models that allow more expressivity in the description of linguistic information, such as lemon-Ontolex.

So far, the SKOS properties that have been selected to model each terminological entry are the following:

SKOS	
skos:prefLabel	It assigns a preferred lexical label to a resource. Since RDF literals are defined as character strings with optional language tags, SKOS allows to assign multilingual labels.
skos:altLabel	It assigns an alternative lexical label to a concept. This property assigns a different label from the preferred one and it is normally used to represent synonyms.
skos:definition	It shows a complete description of the meaning of the term.
skos:note	It gives context to term: usage advices and additional information.
skos:broader	It is used to assign a more general concept to the main entry. Consequently, skos:narrower expresses that one concept is more specific than another.
skos:topConcept	It links a concept scheme with the most general concepts contained in it (i.e. "animal", "person", "vehicle").
skos:hasTopConcept	It is used to link a concept scheme to the top SKOS concepts.
skos:closeMatch*	It links two similar terms that can be interchanged. (*This property is applied in the linking step, not in the initial RDF skeleton.)

Table 4. SKOS properties selected to model terminological entries

On the other hand, DublinCore ontology has been used to represent metadata of each resource:

DublinCore	
dc:creator	This property is applied to show the creator of a resource.
dc:date	This property is applied to show the creation date of a resource.
dc:title	This property is applied to show the title of the resource.
dc:description	This property offers a brief description of the information contained in the resource.

Table 5. DublinCore ontology used to represent metadata

The tool used to perform the transformation activities is also OpenRefine. Figure 6 represents an example of the RDF skeleton modelled with SKOS vocabulary using this tool.

Base URI: <http://linguistic.linkeddata.es/terminoteca/lynx/> edit

RDF Skeleton

RDF Preview

Available Prefixes:

rdf owl xsd skos rdfs foaf dc

+add prefix

manage prefixes

conceptId URI

✖ skos:concept

add rdf.type

✖ skos:inScheme→

http://.../lynx

✖ skos:ConceptScheme

add rdf.type

✖ dc:creator→

OEG/UPM

✖ dc:date→

2018-04-19

✖ dc:title→

Data protection glossary

✖ dc:description→

Glossary with terms extra

✖ skos:prefLabel→

Data Protection Lynx

✖ skos:definition→

Glossary with terms rela

✖ skos:hasTopConcept→

conceptId URI

add rdf.type

add property

✖ skos:prefLabel→

prefLabel cell

✖ skos:definition→

definition cell

✖ skos:altLabel→

altLabel cell

✖ skos:altLabel→

altLabel2 cell

✖ skos:broader→

broader cell

✖ skos:note→

note cell

✖ skos:hasTopConcept→

topConcept cell

✖ skos:closeMatch→

closeMatchDBpedia URI

add rdf.type

Figure 6. Example of RDF skeleton modelled with SKOS in OpenRefine

Consequently, each term entry alongside its terminological information is modelled as per the SKOS properties selected. For instance, Figure 7 describes the approach followed to model a term entry of a given vocabulary.

```

<http://linguistic.linkeddata.es/terminoteca/lynx/consent-n-en> skos:inScheme <http://linguistic.linkeddata.es/terminoteca/lynx> ;
  skos:prefLabel "consent" ;
  skos:definition "permission to do something" ;
  skos:broader "permission" ;
  skos:closeMatch <http://www.wikidata.org/entity/Q231043> .

```

Figure 7. Modelling a term entry

The `skos:closeMatch` property is generated during the linking stage, that will be explained in the next section. Basically, it shows the path to the same or a related entry in a different resource. This resource can contain different information to be added to our term.

Figure 8 shows a graphical example of another terminological entry, in this case *statute*, modelled with SKOS.

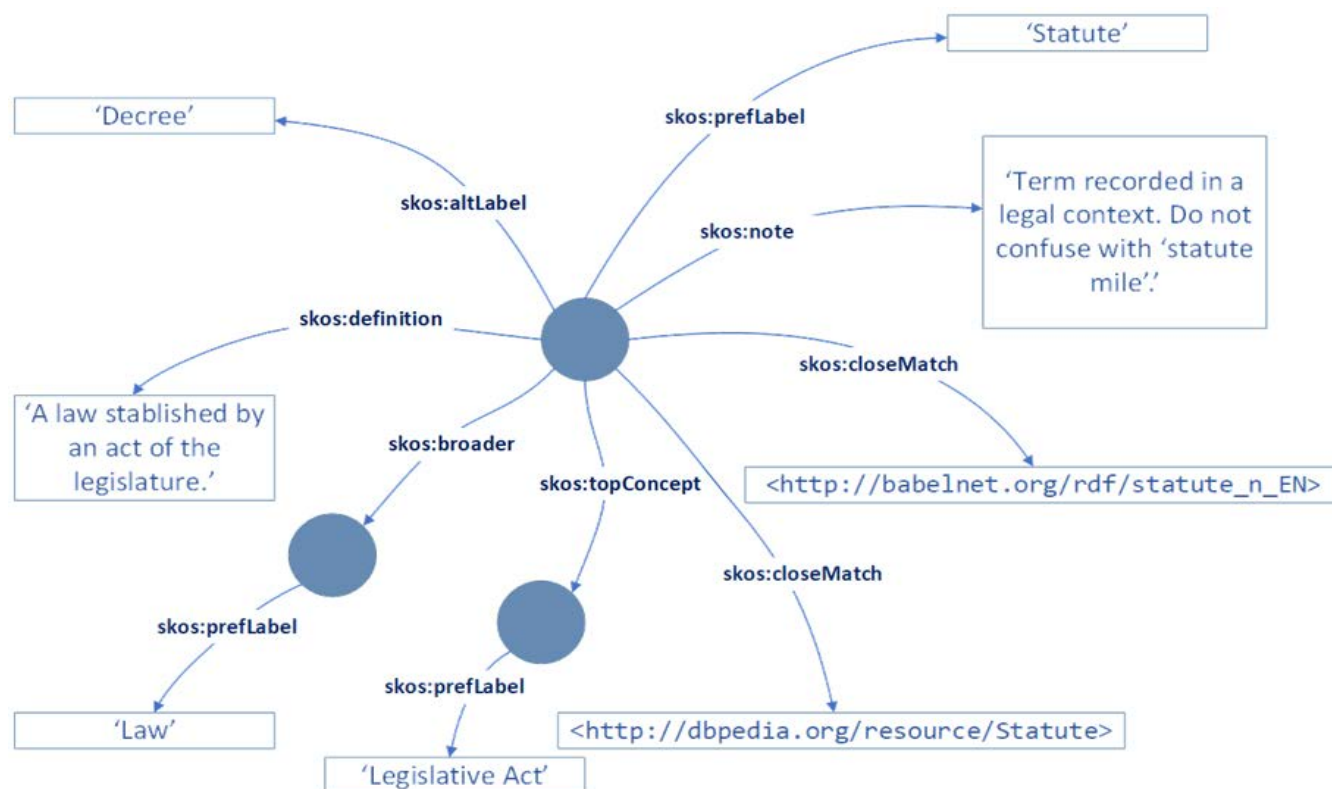


Figure 8. The terminological entry statute modelled with SKOS

3.3 DOCUMENTING VOCABULARIES

An issue spotted during the harvesting of terminological resources is the fact that the greatest part of existing resources is not properly documented. This means that they are difficult to find, handle and update. To solve this situation, a common repository has been created through a CKAN platform, where the metadata of the harvested and created resources are collected. The platform can be accessed through this URL: <http://data.lynx-project.eu/>.

The resources are described according to a set of metadata descriptors that have been collected in two main blocks: information about the dataset and information about the resource. This distinction is quite significant: within this context, *dataset* makes reference to the whole asset, while *resource* defines each of the different formats in which the dataset is published. (An example of a terminological record of this portal appears in Section 3.1.2 of D2.1.)

While at the time that D2.1 was generated 26 datasets were collected in CKAN, now there are 65 datasets documented in the portal. All the partners have contributed to their identification and documentation. Most of them are already in RDF format, but many others still need to be transformed in order to be used by semantic web technologies.

3.4 LINKING RESOURCES

The objective of this process is to generate hyperlinks that connect the legal resources collected with other knowledge bases and linguistic linked resources that are already part of the LLOD cloud. Other partners in the project have also used OpenRefine to perform the linking. Since that was the tool selected for the conversion, the interface and features were already known. These tests are also intended to check the performance of the tool, the relevancy of the terms in these repositories for the legal domain, the needs, and future work in this area.

The first approaches have focused on linking the glossaries containing the terms extracted from Lynx corpora and the identified existing glossaries from TERMCAT (<http://www.termcat.cat/neoloteca/>), since such a set of resources covers the three use cases of Lynx.

By linking the glossaries, we can easily discover more information about the terms provided by external resources to complement the content of our asset: the relations between terms, usage context, common top concepts, different senses of the same term, translations, etc. The linking service of OpenRefine can be executed in two ways: by means of an SPARQL endpoint or by using an RDF dump of the knowledge base. For this work, the linking has been done through the SPARQL endpoint service, since this access is supported by the three knowledge bases involved: DBpedia, BabelNet and EuroVoc.

The first two resources were already described in section 5.1.2 of D2.1, under the title “Linguistic Knowledge Graphs”. They are both domain independent vocabularies, but they have been considered useful for the project for the reasons mentioned below.

DBpedia (<https://wiki.dbpedia.org/>) is a huge general knowledge base that provides information about approximately 4 million entities in more than one hundred languages. Many of the entities represented are persons and places, but it seems relevant to test the linking with this knowledge base due to its size. The English glossaries have been linked with DBpedia and Spanish glossaries with the Spanish DBpedia.

BabelNet (<https://babelnet.org>) is regarded as both a multilingual encyclopaedic dictionary and a semantic network and knowledge base. It, too, uses data from Wikipedia, but also from WordNet, Wikidata and Wiktionary. Since BabelNet combines general data with lexical information that comes from WordNet, it also seems appropriate to analyse how the terms in the glossaries are related to the terms in this net.

Lastly, EuroVoc (<http://eurovoc.europa.eu>), the multilingual thesaurus of the EU, contains terminological information in twenty-three languages. The SPARQL endpoint developed by the Lynx member Semantic Web Company to access the SKOS version of this thesaurus is very convenient to perform the linking process. This resource is pertinent since it covers several areas of the legal domain (including labour law and data protection).

▪ Linking results

The results of the linking process are average: the number of links generated is not too high nor too low. By analysing the results, it can be stated that the number of links is highly dependent on the glossary domain and on the type of knowledge base. For instance, BabelNet performance in linking terms from the Data Protection domain is quite positive, while in the Industrial Standards field it is considerably lower.

On the other hand, DBpedia results are revealing as well: the lowest percentages belong to Labour Law glossaries, and there is a huge difference between these results and the number of links generated for more technical domains, meaning that contributions in DBpedia are specialised in technical domains.

On the whole, in terms of automation, the linking process has ended up being virtually manual. OpenRefine means a great help, but disambiguation still represents a serious drawback for which the tool has not found a solution yet.

For instance, when linking the term *erasure*, a common concept in the Data Protection domain, all the links suggested by the tool made reference to a British music band. None of the proposed terms had the sense of “data deletion”, that is the one represented in the glossary (see Figure 9).



[Main page](#)
[Community portal](#)
[Project chat](#)
[Create a new item](#)
[Recent changes](#)
[Random item](#)
[Query Service](#)
[Nearby](#)
[Help](#)
[Donate](#)

Item [Discussion](#)
[Read](#) [View history](#)

Erasure (Q484885)

British synthpop band

[edit](#)
[In more languages](#) [Configure](#)

Language	Label	Description	Also known as
English	Erasure	British synthpop band	
Spanish	Erasure	dúo británico de synthpop	
Catalan	Erasure	No description defined	
Galician	No label defined	No description defined	

Figure 9. Disambiguation issue during the linking stage

4 SUMMARY AND OUTLOOK

The main vocabulary achievements in the first year of the Lynx project can be summarized in the processes of identifying the relevant resources, preparing to collect those already available from the consortium partners and for their smooth delivery to suit the LKG, and planning the further linked data resource enrichment that is due mainly during the project's second year.

In the aim of reinforcing, enhancing and improving the legal knowledge services to be provided by Lynx, and in accordance with the main languages practices by the three use case partners, it has been proposed to add a fifth language to the four already committed to originally (namely Dutch, in addition to English, French, German and Italian). The Lynx partners would thus be able to assure a more solid and efficient linguistic infrastructure for the LKG regarding both general language and legal terminology.

Terminology resources gathered and selected for the Lynx project will be available via the EuroTermBank portal and the Lynx data portal. The primary location for those resources harvested in synergy with the eTTB project will be EuroTermBank portal, which enables the management of terms, facilitates licencing, provides search and export functionalities, and ensures all terminology in a single format. While the Lynx data portal CKAN acts as an electronic catalogue for related resources, it can also lead to external platforms and contain any data and in any format. The Lynx data portal CKAN will function as a guide for new use cases and where to get Lynx domain dependent terminologies, as well as to document terminologies that are used by Lynx services.

At the end of this task, the consortium will document all Lynx related terminology resources in the CKAN official data portal, but as long as resources are not completed or lack final versions of licences and data, partners will keep them in a private mode. Lynx data portal CKAN will be public and available for everyone. Thus, the documentation of all Lynx-related resources will consist part of the future work as well continuing to gather new existing resources, and will be reported in Deliverable D2.5 in M24, when this task is completed.

With regard to data linking tools, in future stages other tools will be considered for application, such as VocBench, maintained by the Publications Office of the European Union, or PoolParty, developed by Lynx partner SWC.

Appendix 1. Relevant language resources documented in Lynx Data Portal

name	title	domain	publisher	jurisdiction	language	notes
abc-of-oil	ABC of oil	industry	Norwegian Petroleum Directorate	Norway	en, no	ABC of oil contains terminology and abbreviations used in oil industry.
agrovoc	Agrovoc				29 languages	Controlled general vocabulary
babelnet	BabelNet	General			270 languages	BabelNet is regarded as a multilingual encyclopaedic dictionary but also as a semantic network and a knowledge base that combines general data with lexical information that comes from WordNet.
biocides	Biocides	agriculture	Health and Safety Executive	European Union	en	This glossary contains terminology related to biocides and their regulation.
bpr	BPR - Bibliography of the Italian Parliament	Legal	Italian Parliament		it	The BPR - Bibliografia del Parlamento italiano e degli studi elettorali (Bibliography of the Italian Parliament and Electoral Studies) is a database of bibliographic references of books and articles in periodical journals addressing the history of the Italian Parliament and the history of elections.
calathe	Cadastral Vocabulary (CaLaThe)	Environmental Law	University of Denmark and University of Turkey		en	Monolingual thesaurus for the domain of cadastre and land administration that provides a controlled vocabulary. It contains 142 terms related to previous vocabularies, such as AGROVOC, GEMET and STW thesaurus for economics. Terms are arranged in graphical, tabular and alphabetical order.
cdisc-glossary	CDISC Glossary	Clinical Data	CDISC		en	CDISC develops data standards to streamline clinical research and enable connections to healthcare. This glossary contains definitions of terms and abbreviations. It is published as PDF and XLS formats, and it has also been converted into RDF.
conneticut-legal-glossary	Conneticut Legal Glossary	Legal	State of Conneticut Judicial Branch		en, es	Bilingual glossary from English into Spanish organised in alphabetical order that can be downloaded in PDF. It is published by the Conneticut Judicial Branch. Terms contained in this glossary cover general law area, including labour law and economic terminology.
copyrighttermbank	Copyright Termbank	Copyright	OEG	European Union	en, es, fr, pt	A multilingual termbank that contains copyright-related terms from WIPO definitions, IATE and Creative Commons licenses. This termbank is also connected to external resources such as DBpedia and Lexvo. Terms

						have been hierarchically organised, and they are useful to annotate licenses.
court-thesaurus	Court Thesaurus	legal	Wolters Kluwer		de	A monolingual thesaurus in German containing names of German and international courts.
dataprotectionglossary	Data Protection Lynx Glossary	Legal	OEG		en	Monolingual termlist from the Data Protection domain in RDF linked with BabelNet, DBpedia and EuroVoc.
dbpedia	DBpedia				>100 languages	Extensive general knowledge base providing information about approx. 4 million entities in more than one hundred languages.
ecb	European Central Bank Corpus	financial, legal	OPUS, the open parallel corpus	European Union	cs, da, de, el, en, es, et, fi, fr, hu, it, lt, lv, mt, nl, pl, pt, sk, sl	ECB Corpus is a multilingual corpus that contains financial vocabulary. It has been extracted from the website and documentation of the European Central Bank, and it is aligned among 19 European languages.
edp	European Data Portal	Several topics including: government, justice and legal fields	European Commission	European Union	bg, cs, da, de, el, en, es, et, fi, fr, ga, hr, hu, it, lt, lv, mt, nl, pl, pt, ro, sk, sl, sv	The European Data Portal harvests the metadata of Public Sector Information available on public data portals across European countries. Not only linguistic information is presented here, but any kind of data related to diverse domains: environment, government, law, etc. Information regarding the provision of data and the benefits of re-using data is also included. Also, datasets can be filtered by country, language, format, domain, etc.
eige	EIGE Glossary	Gender Equality	EIGE		en	Glossary of gender-related terms in English published by the European Institute of Gender Equality. It contains over 400 terms in English that have been extracted from 92 resources. Each entry includes a link to its related source.
eucases	EUCases			eu, uk, bg	en, bg, de	This is the result of the EUCases Research Project which developed a European case law Linking Platform, transforming multilingual legal open data into linked open data. The EUCases Linking Platform links EU law with legislative acts and court decisions of six EU member states: Austria, Bulgaria, France, Germany, Italy and United Kingdom.
eugdpr-glossary	EUGDPR Glossary	Legal	EUGDPR	European Union	en	A Glossary of Terms and Definitions as used in relation to the GDPR in the EU.
eugo	EUGO Glossary	Business	EUGO	Spain	es	The glossary of EUGO is addressed to companies and entrepreneurs that need to comply with administrative

						or professional requirements to perform a remunerated economic activity in Spain.
eurlax	EUR-Lex	Law	Publications Office	European Union	bg, cs, da, de, el, en, es, et, fi, fr, ga, hr, hu, it, lt, lv, mt, nl, pl, pt, ro, sk, sl, sv	EUR-Lex gives access to EU Law, the jurisprudence of the EU Court of Justice, other EU public documents and the electronic edition of the Official Journal of the EU, in 24 languages.
eurovoc	EuroVoc Thesaurus	Politics, international relations, european communities, law	European Union	n.a.	bg, cs, da, de, el, en, es, et, fi, fr, hr, hu, it, lt, lv, mt, nl, pl, pt, ro, sk, sl, sv	EuroVoc is a multilingual, multidisciplinary thesaurus that covers the activities of the EU. It is available in 23 languages of the European Union. It is intended to be used as a disambiguation tool by contextualising each term, offering univocal meanings. Also, the tool provides related terms and preferred and non preferred designations to guide the user.
eurovoc-agrovoc-semantic-alignment	EuroVoc-AgroVoc Semantic Alignment	Agricultural, General	Publications Office		en	Semantic Alignment of AgroVoc Thesaurus with EuroVoc Thesaurus.
eurovoc-eige	EuroVoc-EIGE Semantic Alignment	Gender Equality, Legal	Publications Office	European Union	en	Semantic Alignment of Gender Equality glossary with EuroVoc Thesaurus.
eurovoc-gemet-semantic-alignment	EuroVoc-GEMET Semantic Alignment	Environmental	Publications Office		Several languages including: en, de, es, it	Semantic Alignment of GEMET Thesaurus with EuroVoc Thesaurus.
eurovoc-inspire-alignment	EuroVoc-Inspire Alignment	General	Publications Office	European Union	en	Semantic Alignment of Inspire glossary with EuroVoc Thesaurus.
eurovoc-lcsh-semantic-alignment	EuroVoc-LCSH Semantic Alignment	General	Publications Office		en	Semantic Alignment of the Library of Congress Subject Headings with EuroVoc Thesaurus.
eurovoc-stw	EuroVoc-STW Semantic Alignment	Economics	Publications Office		en	Semantic Alignment of STW Thesaurus for economics with EuroVoc Thesaurus.
eurovoc-umthes-semantic-alignment	EuroVoc-Umthes Semantic Alignment	Environmental	Publications Office		de, en	Semantic Alignment of the Umthes (German Environmental Thesaurus) with EuroVoc Thesaurus.
eurovoc-unbis	EuroVoc-UNBIS Semantic Alignment	General	Publications Office		ar, cn, en, es, fr, ru	Semantic Alignment of UNBIS Thesaurus with EuroVoc Thesaurus.
eurovoc-unesco-semantic-alignment	EuroVoc-UNESCO Semantic Alignment	General	Publications Office	European Union	en, es, fr, ru	Semantic Alignment of the UNESCO Thesaurus with EuroVoc Thesaurus.
evroterm	Evroterm	legislation	General Secretariat of the Government of the Republic of Slovenia	European Union	en, sl	The Evroterm terminology collection contains terms from EU legal regulations and other documents related to the EU.

finnish-legislation	Finnish legislation			Finland		Finnish legislation as linked data. This dataset covers the following legal subdomains: legislation, case law (supreme court), case law (supreme administrative) and court. http://data.finlex.fi
gemet	GEMET (General Multilingual Environmental Thesaurus)	General	EIONET (European Environment Information and Observation Network)		Several languages including: en, de, es, it	GEMET is a compilation of the following resources. - "Umwelt Thesaurus" that has more than 2.000 descriptors out of 8.500 in German and English. - "Thesaurus Italiano per l'Ambiente (TIA)" with more than 4.000 descriptors in Italian, English, Dutch and German. - "Multilingual Environment Thesaurus (MET)" with more than 2.300 descriptors in Dutch, Danish, English, French, German, Italian, Norwegian and Spanish. - "EnVoc Thesaurus", of UNEP Infoterra, 1997 edition, with about 2.000 descriptors in English, French and Spanish, with possibility of access to Arabic, Chinese and Russian. - "Thesaurus de Medio Ambiente" with more than 2.600 descriptors in Spanish, English, French, German. - "Lexique environnement - Planète" with more than 5.000 descriptors in French and English. - Descriptors of relevant documents of the EEA, namely "Europe's Environment, The Dobris Assessment", the "DPSIR Data Flow Scheme", as well as terminology of ETCs and Eionet, in English. - Descriptors of the "Thesaurus Eurovoc" in French, English, Dutch, German, Italian, and Spanish, with possibility of access to Danish, Greek, and Portuguese. The result are 6562 terms arranged in 3 super-groups, 30 groups plus 5 accessory, instrumental groups, hierarchically organised.
gllir	Glossary of labour law and industrial relations	employment	International Labour Organization	European Union	en	
gllt	German labour law thesaurus	Labor Law	Wolters Kluwer Deutschland GmbH	Germany	de	Labour law thesaurus covers all main areas of labor law, including the roles of employee and employer; legal aspects around labour contracts and dismissal; also co-determination and industrial action.
gowers-review-of-intellectual-property	Gowers Review of Intellectual Property	laws	Crown		en	Glossary about Intellectual Property can be found on pages 121 to 127.
iate	IATE	Law, information technology, agriculture, etc.	European Union	n.a.	bg, cs, da, de, el, en, es, et, fi, fr, ga, hr, hu, it, la,	IATE is a terminological database developed by the European Union that contains around 8,5 million terms in the 24 official languages of the EU. It can also be

					lt, lv, mt, nl, pl, pt, ro, sk, sl, sv	downloaded both in RDF and TBX format. IATE uses EuroVoc Thesaurus to classify its entries by domain.
ilo-taxonomy	ILO Taxonomy	employment	International Labour Organization		en, fr, es	ILO Taxonomy contains terms related to the world of work in English, French, and Spanish.
imf	International Monetary Fund Terminology		IMF		de, en, es	This terminology list contains over 150,000 terms useful to translators working with IMF material. It provides English terms with their equivalents in a number of languages. This list includes words, phrases, and institutional titles commonly encountered in IMF documents in areas such as money and banking, public finance, balance of payments, and economic growth.
industrialstandardsglossary	Industrial Standards Lynx Glossary	Legal	OEG		en	Monolingual termlist from the Industrial Standards domain in RDF linked with BabelNet and DBpedia.
informea	InforMEA Glossary (UNESCO)	Environmental Law	UNESCO		en	The glossary contains terms, definitions and related information on Multilateral Environmental Agreements. Such terms are classified in 6 different domains: Water, Chemicals and Wastes, Biodiversity, Air and Climate, Land and Environmental Law and Governance. Terms are also organised hierarchically, grouped in small sets of terms that are all dependent on a top term. This glossary also establishes broader and narrower relations between terms. Moreover, it provides sources where the terms have been applied to check their right usage context.
inspire	INSPIRE Glossary (EU)	Spatial information	European Union		en, es	Glossary developed by the INSPIRE Knowledge Base of the European Union. The INSPIRE Glossary contains 195 general terms and definitions that specify the common terminology used in the INSPIRE Directive and in the INSPIRE Implementing Rules documents. This glossary contains definitions both in English and Spanish. It also provides information about the previous versions of each entry and it marks if terms are valid or not.
jrcacquis	JRC-Acquis	Legal	Ralf Steinberger - European Commission - Joint Research Centre (JRC)		bg, cs, da, de, el, en, es, et, fi, fr, hu, it, lt, lv, mt, nl, pl, pt, ro, sk, sl, sv	JRC-Acquis is a collection of legislative texts from the European Union generated between the years 1958 and 2006. They are available in xml format and in 22 languages of the EU.
jurivoc	Jurivoc	Law	Bundesgericht (Switzerland)	Switzerland	de, it, fr (and some terms in EU languages)	JURIVOC, is the juridical thesaurus of the Federal Supreme Court and the former Federal Insurance of Switzerland. It contains information in German, French

						and Italian. Terms are arranged as per the following relations: - LT: lead term - SN: scope note - UF: used for - UFA: used for... and... - NT: narrower term - SA: see also - BT: broader term
labour-law-corpus	Labour Law Corpus	Labour Law	Lynx Project	National and European	en, es, de, it	Corpus of legal documents from different countries: Austria, Germany, Ireland, Italy, Spain and UK. And also from the European Union.
labourlawglossary	Labour Law Lynx Glossary	Legal	OEG		es	Monolingual glossary containing terms in Spanish from the labour law domain. Terms have been automatically extracted from legal corpora and manually reviewed by language and law professionals. The glossary was first generated in TBX and eventually converted into RDF to be linked with BabelNet, Eurovoc and DBpedia.
legislative-glossary	Legislative Glossary (Glossário Legislativo)	legislation	Câmara Municipal de Bento Gonçalves		pt	Monolingual glossary about legislation in Portuguese
libraryofcongress	Library of Congress	General: books, agreements, documents	Library of Congress	Global	en	The Library of Congress Linked Data Service enables both humans and machines to programmatically access authority data of the Library of Congress.
llcorpus	Spanish Labour Law Corpus	Legal		Spanish	es	Labour law corpus composed by 20 agreements in Spanish provided by Cuatrecasas Lynx partners.
myndigheternas-foreskrifter	Government Regulations (Myndigheternas föreskrifter)	legislation	Sveriges regering	Sweden	sv	
nacerev2	NACE, Rev. 2	statistics	Eurostat	European Union	en	Statistical Classification of Economic Activities in the European Community, Rev. 2
nomothesia	NOMOTHESIA			Greece	el	Greek legislation modelled as per Metalex OWL ontology. It can be accessed through a SPARQL endpoint or downloaded as RDF file. The content of this resource can also be requested through a websearch application.
osh-thesaurus	OSH Thesaurus	employment	International Labour Organization	United Nations	en, fr, es	OSH Thesaurus contains over 15,000 multilingual terms and synonyms on occupational safety and health.
psi-glossary	PSI Glossary	information	European Commission		en	Contains terminology related to Public Sector Information
quality-glossary	Quality Glossary (Терминологичен речник на качеството)	statistics	Национален статистически институт.	European Union	bg, en	Bilingual glossary about quality in English and Bulgarian with definitions.

saij	SAIJ Legal Thesaurus (Argentine Juridical Information System)	Law	Government of Argentine		es	SAIJ Thesaurus organises legal knowledge through a list, modelled with SKOS, of controlled terms which represent concepts. It is used to ease users' access information related to the Argentinian legal system that can be found in a file or in a documentation centre. Terms are also hierarchically organised with broader and narrower relations.
stw	STW Thesaurus for Economics	Economics	ZBW		en	The thesaurus provides vocabulary on any economic subject: almost 6,000 standardized subject headings and about 20,000 additional entry terms to support individual keywords. Terms used in law, sociology, or politics can also be found. This thesaurus is provided by the Leibniz Information Centre and it has been published in RDFa format to boost the reuse of such resources in the Semantic Web. It is one of the first resources in the Linked Open Data Cloud since it is mapped with a great number of related resources.
tcnen	TERMCAT Collective Negotiation Glossary EN	Legal	TERMCAT	dbpedia	en	Monolingual termlist from the Collective Negotiation (Labour Law) domain in RDF linked with DBpedia and EuroVoc. (English)
tcnes	TERMCAT Collective Negotiation Glossary ES	Legal	TERMCAT		es	Monolingual termlist from the Collective Negotiation (Labour Law) domain in RDF linked with DBpedia and EuroVoc. (Spanish)
temcoord	Temcoord Glossaries	Several topics	DG TRAD	European Union	bg, cs, da, de, el, en, es, et, fi, fr, ga, hr, hu, it, lt, lv, mt, nl, pl, pt, ro, sk, sl, sv	Repository that contains around 300 hundred glossaries developed by European institutions and bodies in the 23 languages of the European Union. Most of them are available as PDF files, while others have been published in HTML format. The content of this repository is heterogeneous in terms of domain and information exposed in each glossary: some glossaries provide with definitions of the terms while others establish equivalences in different languages, etc.
termcat	Termcat Terminological Database	General	Termcat		ca, en, es, de, fr, it	TERMCAT's mission is to ensure the development and integration of Catalan terminology into both specialist sectors and society in general.
thesoz	TheSoz - Thesaurus for Social Sciences	Social Sciences	Leibniz Institut für Sozialwissenschaften		en, de, fr, ru	Thesaurus about social sciences organised according SKOS vocabulary containing terms in English, German, French and Russian.
uk-legislation	UK legislation					UK legislation as linked data

umwelt-thesaurus	Umwelt-Thesaurus	Environmental	Federal Environment Agency, Germany		de, en	German Thesaurus containing terms on environmental protection. It includes 13500 descriptors and 40000 linked German-language synonyms with 35000 English translations and around 11000 definitions.
unbis	UNBIS Thesaurus	General	UN Library		ar, cn, en, es, fr, ru	The UNBIS Thesaurus is a multilingual database of the controlled vocabulary used to describe UN documents, and terms are extracted from these documents.
unesco	UNESCO Thesaurus	Education, Science, Culture, Politics, Countries, Information	UNESCO		en, es, fr, ru	The UNESCO Thesaurus is a controlled and structured list of terms used in subject analysis and retrieval of documents and publications in several fields. The thesaurus is divided into seven greater domains and other smaller thesauri, where terms are hierarchically organised as per the following properties: SN - Scope Note MT - Microthesaurus UF - Used For BT - Broader Term NT - Narrower Term RT - Related Term The UNESCO Thesaurus can be downloaded as RDF file, accessed through a SPARQL endpoint and in the website: search by domain, by alphabetical order and by hierarchical order.

Appendix 2. Existing Domain Independent vocabularies from KD

name	title	domain	publisher	description	language	format
api	Lexicala API	DIV	K Dictionaries	data transfer facility	40+ languages	JSON, JSON-LD
mdls-de	Global German	DIV	K Dictionaries	German monolingual dictionary core, with translation to English, Dutch (+ other languages)	de, en, nl + 7	XML, RDF
mdls-en	Global English	DIV	K Dictionaries	English monolingual dictionary core, with translation to Spanish (+ other languages)	en, es + 6	XML, RDF
mdls-es	Global Spanish	DIV	K Dictionaries	Spanish monolingual dictionary core, with translation to English, Dutch (+ other languages)	es, en, nl + 6	XML, RDF
mdls-it	Global Italian	DIV	K Dictionaries	Italian monolingual dictionary core, with translation to English (+ other languages)	it, en + 2	XML
mdls-nl	Global Dutch	DIV	K Dictionaries	Dutch monolingual dictionary core, with translation to German, English, Spanish	nl, de, en, es	XML
pw	Password Multilingual Dictionary	DIV	K Dictionaries	English multilingual dictionary (translation 40+ languages)	en, de, es, it, nl +40	XML
kmt-de	MultiGloss German	DIV	K Dictionaries	German-English semi-automated multilingual glossary	de, en, es, it, nl + 40	XML
kmt-es	MultiGloss Spanish	DIV	K Dictionaries	Spanish-English semi-automated multilingual glossary	es, en, de, it, nl + 40	XML
kmt-it	MultiGloss Italian	DIV	K Dictionaries	Italian-English semi-automated multilingual glossary	it, en, de, es, nl + 40	XML
kmt-nl	MultiGloss Dutch	DIV	K Dictionaries	Dutch-English semi-automated multilingual glossary	nl, en, de, es, nl + 40	XML
rhwcd	Random House Webster's College Dictionary	DIV	K Dictionaries	English monolingual glossary	en	XML
wfl	Word Form Lists	DIV	K Dictionaries	morphological lists of inflected forms and keywords	de, en, es, it, nl	XLSX

Appendix 3. Sample data of Domain Independent Vocabularies from KD

1. GLOBAL – Dutch, German, English, Spanish
 - i. HTML
 - ii. XML
 - iii. JSON
 - iv. JSON-LD
2. PASSWORD – English, German, English, Spanish
 - i. HTML
 - ii. XML
3. KMT – Spanish, German, English, Dutch
 - i. HTML
 - ii. XML
4. RANDOM HOUSE
 - i. HTML
 - ii. XML

GLOBAL - NL-DE,EN,ES

HTML

grond [xɾɔnt] *nm* (*pl -en* []) 1 =bodem; oppervlakte van de aarde of vloer van een ruimte

{de} - Boden *m*, Erdboden *m*

{en} - ground, land

{es} - tierra *f*, suelo *m*

◊ *De gevangenen moesten op de grond gaan liggen.*

{de} - *Die Gefangenen mussten sich auf den Boden legen.*

{en} - *The prisoners had to get down on the ground.*

{es} - *Los presos tuvieron que acostarse en el suelo.*

♦ **te gronde gaan** verloren gaan

{de} - zugrunde gehen -

{en} - to be ruined; to go to the dogs

{es} - venirse abajo

♦ **met de grond gelijkmaken** (iets) helemaal afbreken

{de} - dem Erdboden gleichmachen -

{en} - to wipe (something) off the map

{es} - derribar

♦ **met de grond gelijkmaken** scherpe kritiek leveren op (iemand)

{de} - jemanden zugrunde richten -

{en} - to run (someone) down

{es} - poner (a alguien) por los suelos

♦ **de grond in boren** ernstige kritiek leveren op (iets of iemand)

{de} - jemanden zugrunde richten -, jemanden am Boden zerstören -

{en} - to grind (someone) down

{es} - no dejar títere con cabeza

♦ **van de grond komen** ontstaan, vorm krijgen

{de} - vom Fleck kommen -

{en} - to get off the ground

{es} - arrancar

◊ *Dat onderzoek komt maar niet van de grond.*

{de} - *Diese Untersuchung kommt nicht vom Fleck.*

{en} - *That research just won't get off the ground.*

{es} - *Esa investigación no acaba de arrancar.*

♦ **uit de grond stampen** in korte tijd maken of doen ontstaan

{de} - aus dem Boden stampfen -

{en} - to whip up (something)

{es} - construir en menos de nada, sacar de la nada

◊ *projecten uit de grond stampen*

{de} - *Projekte aus dem Boden stampfen*

{en} - *to whip up some projects*

{es} - *realizar proyectos de la nada*

♦ **begane grond** verdieping van een gebouw op het niveau van de straat

{de} - Erdgeschoss *nt*

{en} - ground floor

{es} - planta baja

2 =aarde; bovenste laag van het aardoppervlak

{de} - Erde *f*, Erdboden *m*, Boden *nt*

{en} - ground, land

{es} - tierra *f*
 ◇ Door de vruchtbare grond kun je hier goed groenten kweken.
 {de} - *Durch den fruchtbaren Boden kann man hier gut Gemüse anbauen.*
 {en} - *You can easily grow vegetables here, because the soil is quite fertile.*
 {es} - *Por la tierra fértil es fácil cultivar verduras aquí.*
 3 =argument; reden
 {de} - Grund *m*
 {en} - ground, foundation, reason
 {es} - motivo *m*, razón *f*
 ◇ op goede gronden iets kiezen
 {de} - *etwas aus guten Gründen wählen*
 {en} - *to choose something with good reason*
 {es} - *elegir algo por motivos fundados*
 ◆ op grond van=vanwege; wegens
 {de} - aufgrund -, wegen -
 {en} - on the strength of, due to
 {es} - por causa de
 ◇ Het bedrijf nam hem in dienst op grond van zijn specialisme.
 {de} - *Das Unternehmen stellte ihn aufgrund seiner Spezialisierung ein.*
 {en} - *The company took him on payroll due to his expertise.*
 {es} - *La empresa lo contrató por causa de su especialidad.*

XML

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    <Synonym>vanwege</Synonym>
    <DefinitionCtn>
      <Definition>wegens</Definition>
    </DefinitionCtn>
    <TranslationCluster identifier="TC00024576" text="wegens" type="phrasedef">
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```

<Locale lang="de">
  <TranslationBlock>
    <TranslationCtn>
      <Translation>aufgrund</Translation>
      <GrammaticalGender value="-" />
    </TranslationCtn>
    <TranslationCtn>
      <Translation>wegen</Translation>
      <GrammaticalGender value="-" />
    </TranslationCtn>
  </TranslationBlock>
</Locale>
<Locale lang="en">
  <TranslationBlock>
    <TranslationCtn>
      <Translation>on the strength of, due to</Translation>
    </TranslationCtn>
  </TranslationBlock>
</Locale>
<Locale lang="es">
  <TranslationBlock>
    <TranslationCtn>
      <Translation>por causa de</Translation>
    </TranslationCtn>
  </TranslationBlock>
</Locale>
</TranslationCluster>
<ExampleCtn type="sid" version="1" id="EX00012754">
  <Example>Het bedrijf nam hem in dienst op grond van zijn specialisme.</Example>
  <TranslationCluster identifier="TC00024577" text="Het bedrijf nam hem in dienst op grond van zijn
specialisme." type="phraseexmp">
    <Locale lang="de">
      <TranslationBlock>
        <TranslationCtn>
          <Translation>Das Unternehmen stellte ihn aufgrund seiner Spezialisierung ein.</Translation>
        </TranslationCtn>
      </TranslationBlock>
    </Locale>
    <Locale lang="en">
      <TranslationBlock>
        <TranslationCtn>
          <Translation>The company took him on payroll due to his
expertise.</Translation>
        </TranslationCtn>
      </TranslationBlock>
    </Locale>
    <Locale lang="es">
      <TranslationBlock>
        <TranslationCtn>
          <Translation>La empresa lo contrató por causa de su especialidad.</Translation>
        </TranslationCtn>
      </TranslationBlock>
    </Locale>
  </TranslationCluster>
</ExampleCtn>
</CompositionalPhraseCtn>
</SenseGrp>
</SenseBlock>
</DictionaryEntry>
</Entry>

```

JSON

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  "source": "global",
  "language": "nl",
  "version": 1,
  "headword": {
    "text": "grond",
    "display": "grond",
    "pronunciation": {
      "value": "xɾɔnt"
    }
  },
  "pos": "noun",
  "gender": "masculine",
  "inflections": [
    {

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    "text": "grond|en",
    "display": "-en",
    "number": "plural"
  }
]
},
"senses": [
  {
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    "definition": "oppervlakte van de aarde of vloer van een ruimte",
    "synonyms": [
      "bodem"
    ],
    "translations": {
      "de": [
        {
          "text": "Boden",
          "gender": "masculine"
        },
        {
          "text": "Erdboden",
          "gender": "masculine"
        }
      ],
      "en": [
        {
          "text": "ground"
        },
        {
          "text": "floor"
        }
      ],
      "es": [
        {
          "text": "tierra",
          "gender": "feminine"
        },
        {
          "text": "suelo",
          "gender": "masculine"
        }
      ]
    },
    "examples": [
      {
        "text": "De gevangenen moesten op de grond gaan liggen.",
        "translations": {
          "de": {
            "text": "Die Gefangenen mussten sich auf den Boden legen."
          },
          "en": {
            "text": "The prisoners had to get down on the ground."
          },
          "es": {
            "text": "Los presos tuvieron que acostarse en el suelo."
          }
        }
      }
    ]
  },
  {
    "text": "te gronde gaan",
    "definition": "verloren gaan",
    "translations": {
      "de": {
        "text": "zugrunde gehen",
        "gender": "-"
      },
      "en": [
        {
          "text": "to be ruined"
        },
        {
          "text": "to go to the dogs"
        }
      ],
      "es": {
```

```
      "text": "venirse abajo"
    },
  ],
  {
    "text": "met de grond gelijkmaken",
    "definition": "(iets) helemaal afbreken",
    "translations": {
      "de": {
        "text": "dem Erdboden gleichmachen",
        "gender": "- "
      },
      "en": {
        "text": "to wipe (something) off the map"
      },
      "es": {
        "text": "derribar"
      }
    }
  },
  {
    "text": "met de grond gelijkmaken",
    "definition": "scherpe kritiek leveren op (iemand)",
    "translations": {
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        "text": "jemanden zugrunde richten",
        "gender": "- "
      },
      "en": {
        "text": "to run (someone) down"
      },
      "es": {
        "text": "poner (a alguien) por los suelos"
      }
    }
  },
  {
    "text": "de grond in boren",
    "definition": "ernstige kritiek leveren op (iets of iemand)",
    "translations": {
      "de": [
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          "text": "jemanden zugrunde richten",
          "gender": "- "
        },
        {
          "text": "jemanden am Boden zerstören",
          "gender": "- "
        }
      ],
      "en": {
        "text": "to grind (someone) down"
      },
      "es": {
        "text": "no dejar títere con cabeza"
      }
    }
  },
  {
    "text": "van de grond komen",
    "definition": "ontstaan, vorm krijgen",
    "translations": {
      "de": {
        "text": "vom Fleck kommen",
        "gender": "- "
      },
      "en": {
        "text": "to get off the ground"
      },
      "es": {
        "text": "arrancar"
      }
    }
  },
  "examples": [
    {
      "text": "Dat onderzoek komt maar niet van de grond.",
      "translations": {
        "de": {
```

```

      "text": "Diese Untersuchung kommt nicht vom Fleck."
    },
    "en": {
      "text": "That research just won't get off the ground."
    },
    "es": {
      "text": "Esa investigación no acaba de arrancar."
    }
  }
}
],
},
{
  "text": "uit de grond stampen",
  "definition": "in korte tijd maken of doen ontstaan",
  "translations": {
    "de": {
      "text": "aus dem Boden stampfen",
      "gender": "- "
    },
    "en": {
      "text": "to whip up (something)"
    },
    "es": [
      {
        "text": "construir en menos de nada"
      },
      {
        "text": "sacar de la nada"
      }
    ]
  }
},
"examples": [
  {
    "text": "projecten uit de grond stampen",
    "translations": {
      "de": {
        "text": "Projekte aus dem Boden stampfen"
      },
      "en": {
        "text": "to whip up some projects"
      },
      "es": {
        "text": "realizar proyectos de la nada"
      }
    }
  }
]
},
{
  "text": "begane grond",
  "definition": "verdieping van een gebouw op het niveau van de straat",
  "translations": {
    "de": {
      "text": "Erdgeschoss",
      "gender": "neuter"
    },
    "en": {
      "text": "ground floor"
    },
    "es": {
      "text": "planta baja"
    }
  }
}
]
},
{
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  "definition": "bovenste laag van het aardoppervlak",
  "synonyms": [
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  ],
  "translations": {
    "de": [
      {
        "text": "Erde",

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```
    "gender": "feminine"
  },
  {
    "text": "Erdboden",
    "gender": "masculine"
  },
  {
    "text": "Boden",
    "gender": "neuter"
  }
],
"en": [
  {
    "text": "ground"
  },
  {
    "text": "land"
  }
],
"es": {
  "text": "tierra",
  "gender": "feminine"
}
},
"examples": [
  {
    "text": "Door de vruchtbare grond kun je hier goed groenten kweken.",
    "translations": {
      "de": {
        "text": "Durch den fruchtbaren Boden kann man hier gut Gemüse anbauen."
      },
      "en": {
        "text": "You can easily grow vegetables here, because the soil is quite fertile."
      },
      "es": {
        "text": "Por la tierra fértil es fácil cultivar verduras aquí."
      }
    }
  }
]
},
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  "synonyms": [
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  ],
  "translations": {
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      "gender": "masculine"
    },
    "en": [
      {
        "text": "ground"
      },
      {
        "text": "reason"
      }
    ],
    "es": [
      {
        "text": "motivo",
        "gender": "masculine"
      },
      {
        "text": "razón",
        "gender": "feminine"
      }
    ]
  },
  "examples": [
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      "text": "op goede gronden iets kiezen",
      "translations": {
        "de": {
          "text": "etwas aus guten Gründen wählen"
        }
      }
    }
  ]
}
```

```
    },
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      "text": "to choose something with good reason"
    },
    "es": {
      "text": "elegir algo por motivos fundados"
    }
  }
},
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    "text": "op grond van",
    "definition": "wegens",
    "synonyms": [
      "vanwege"
    ],
    "translations": {
      "de": [
        {
          "text": "aufgrund",
          "gender": "-"
        },
        {
          "text": "wegen",
          "gender": "-"
        }
      ],
      "en": {
        "text": "according to"
      },
      "es": {
        "text": "por causa de"
      }
    },
    "examples": [
      {
        "text": "Het bedrijf nam hem in dienst op grond van zijn specialisme.",
        "translations": {
          "de": {
            "text": "Das Unternehmen stellte ihn aufgrund seiner Spezialisierung ein."
          },
          "en": {
            "text": "The company took him on payroll due to his expertise."
          },
          "es": {
            "text": "La empresa lo contrató por causa de su especialidad."
          }
        }
      }
    ]
  }
]
}
}
```

JSON-LD

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  "@type": "ontolex:LexicalEntry",
  "entryId": "EN00008029",
  "dictionaryEntryId": "NL_DE00008062",
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    "@type": "lime:Lexicon",
    "language": "nl"
  },
  "dictionary": {
    "@id": "kd-dictionary:NL",
    "@type": "kd:Dictionary"
  },
  "version": 1,
  "pos": "lexinfo:noun",
  "forms": [
    {

```



```
"@id": "kd-lex:NL/grond-n-m-form",
"@type": "Ontolex:Form",
"text": {
  "nl": "grond"
},
"pronunciation": {
  "nl-fonipa": "xront"
},
"gender": "lexinfo:masculine",
"display": {
  "@id": "kd-lex:NL/grond-n-m-form-display",
  "@type": "kd:Display",
  "text": {
    "nl": "grond"
  }
}
},
],
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  "reference": {
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    "@type": "skos:Concept",
    "definition": {
      "nl": "oppervlakte van de aarde of vloer van een ruimte"
    }
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  "relation": {
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    "category": "lexinfo:synonym",
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      "@type": "ontolex:LexicalSense",
      "reference": {
        "@id": "kd-base:NL_SE00009937-concept",
        "@type": "skos:Concept"
      },
    },
    "sense_entry": {
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      "@type": "ontolex:LexicalEntry",
      "form": {
        "@id": "kd-lex:NL/bodem-form",
        "@type": "Ontolex:Form",
        "text": {
          "nl": "bodem"
        }
      }
    }
  },
}
],
"example": [
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  "value": {
    "nl": "De gevangenen moesten op de grond gaan liggen."
  },
  "relation": {
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    "@type": "kd:TranslationExampleCluster",
    "relates": [
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        "@type": "kd:UsageExample",
        "value": {
          "de": "Die Gefangenen mussten sich auf den Boden legen."
        }
      },
      {
        "@type": "kd:UsageExample",
        "value": {
          "en": "The prisoners had to get down on the ground."
        }
      }
    ]
  },
}
]
```

```
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      "value": {
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      }
    }
  ]
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      "@type": "ontolex:LexicalSense",
      "reference": {
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        "@type": "skos:Concept"
      },
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        "@type": "ontolex:LexicalEntry",
        "form": {
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          "@type": "ontolex:Form"
        }
      }
    }
  },
  {
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      "reference": {
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        "@type": "skos:Concept"
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        "@type": "ontolex:LexicalEntry",
        "form": {
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          "@type": "ontolex:Form",
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            "de": "Boden"
          }
        }
      }
    }
  },
  {
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      "@type": "ontolex:LexicalSense",
      "reference": {
        "@id": "kd-base:NL_SE00009937-concept",
        "@type": "skos:Concept"
      },
      "sense_entry": {
        "@id": "kd-lex:DE/Erdboden",
        "@type": "ontolex:LexicalEntry",
        "form": {
          "@id": "kd-lex:DE/Erdboden-form",
          "@type": "ontolex:Form",
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            "de": "Erdboden"
          }
        }
      }
    }
  }
],
{
  }
```

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    "@type": "skos:Concept"
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    "form": {
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      "@type": "ontolex:Form",
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        "en": "ground"
      }
    }
  }
},
},
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    "reference": {
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      "@type": "skos:Concept"
    },
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      "form": {
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        "@type": "ontolex:Form",
        "text": {
          "en": "floor"
        }
      }
    }
  },
},
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  "target": {
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    "reference": {
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      "@type": "skos:Concept"
    },
    "sense_entry": {
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      "@type": "ontolex:LexicalEntry",
      "form": {
        "@id": "kd-lex:ES/tierra-form",
        "@type": "ontolex:Form",
        "text": {
          "es": "tierra"
        }
      }
    }
  },
},
{
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  "target": {
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    "@type": "ontolex:LexicalSense",
    "reference": {
      "@id": "kd-base:NL_SE00009937-concept",
      "@type": "skos:Concept"
    }
  }
},
}
```

```
    },
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      "@type": "ontolex:LexicalEntry",
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        "@type": "ontolex:Form",
        "text": {
          "es": "suelo"
        }
      }
    }
  }
}
]
},
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  "@type": "ontolex:LexicalSense",
  "reference": {
    "@id": "kd-base:NL_SE00009938-concept",
    "@type": "skos:Concept",
    "definition": {
      "nl": "bovenste laag van het aardoppervlak"
    }
  },
  "relation": {
    "@id": "kd-lex:NL/grond-n-NL_SE00009938-sense-aarde-grond-n-NL_SE00009938-sense-sr",
    "@type": "ontolex:SenseRelation",
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    "relates": {
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      "@type": "ontolex:LexicalSense",
      "reference": {
        "@id": "kd-base:NL_SE00009938-concept",
        "@type": "skos:Concept"
      }
    },
    "sense_entry": {
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      "@type": "ontolex:LexicalEntry",
      "form": {
        "@id": "kd-lex:NL/aarde-form",
        "@type": "ontolex:Form",
        "text": {
          "nl": "aarde"
        }
      }
    }
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}
},
"example": [
  {
    "@id": "kd-lex:NL/grond-n-NL_SE00009938-sense-TC00024573-ex",
    "@type": "kd:UsageExample",
    "value": {
      "nl": "Door de vruchtbare grond kun je hier goed groenten kweken."
    },
    "relation": {
      "@id": "TC00024573-trans-ex-cl",
      "@type": "kd:TranslationExampleCluster",
      "relates": [
        {
          "@type": "kd:UsageExample",
          "value": {
            "de": "Durch den fruchtbaren Boden kann man hier gut Gemüse anbauen."
          }
        },
        {
          "@type": "kd:UsageExample",
          "value": {
            "en": "You can easily grow vegetables here, because the soil is quite fertile."
          }
        },
        {
          "@type": "kd:UsageExample",
          "value": {
            "es": "Por la tierra fértil es fácil cultivar verduras aquí."
          }
        }
      ]
    }
  }
]
```

```
    }
  }
]
},
"translation": [
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        "@type": "skos:Concept"
      },
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        "@id": "kd-lex:ID/-form",
        "@type": "ontolex:Form"
      }
    }
  },
  {
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PASSWORD: EN-DE,ES,NL

HTML

kick [kik] *verb*

1 to hit or strike out with the foot: *The child kicked his brother; He kicked the ball into the next garden; He kicked at the locked door; She kicked open the gate.*

de treten

es dar un puntapié, golpear con el pie, dar una patada a

nl schoppen

2 (of a gun) to jerk or spring back violently when fired.

de zurückstoßen

es dar un culatazo

nl terugslag hebben

♦ *noun*

1 a blow with the foot: *The boy gave him a kick on the ankle; He was injured by a kick from a horse.*

de der Tritt

es puntapié, patada

nl schop

2 the springing back of a gun after it has been fired.

de der Rückstoß

es culatazo

nl terugslag

3 a pleasant thrill: *She gets a kick out of entertaining people.*

de mächtiger Spaß

es diversión, emoción

nl stimulans, kick

kick about/around *phrasal verb*

to treat badly or bully: *The bigger boys are always kicking him around.*

de schikanieren

es maltratar

nl ruw behandelen

kick off *phrasal verb*

to start a football game by kicking the ball: *We kick off at 2.30; (noun 'kick-off': The kick-off is at 2.30)*

de anstoßen; der Anstoß

es sacar, hacer el saque inicial

nl aftrappen

kick up *phrasal verb*

to cause or start off (a fuss etc): *Don't start kicking up a fuss.*

de verursachen

es armar follón, armar bronca

nl veroorzaken

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KMT : ES-EN - DE, NL

HTML

juntar *verb*

1. gather *verb*

to (cause to) come together in one place
◊ *A crowd of people gathered near the accident.*

{de} - versammeln

{nl} - (doen) bijeenkomen

2. gather together *phrasal verb*

to come or bring together, in a group
◊ *He gathered his books and papers together.*

{de} - zusammensammeln

{nl} - bijeenkomen, bijeenzoeken

3. join *verb*

(often with up, onetc) to put together or connect
◊ *The electrician joined the wires (up) wrongly* ◻ *You must join this piece (on) to that piece* ◻ *He joined the two stories together to make a play* ◻ *The island is joined to the mainland by a sandbank at low tide.*

{de} - verbinden

{nl} - verbinden

4. rally *verb*

to come or bring together for a joint action or effort
◊ *The supporters rallied to save the club from collapse* ◻ *The politician asked his supporters to rally to the cause.*

{de} - sich zusammentun

{nl} - zich verzamelen

5. lump *verb*

(usually with together) to treat or think of as (all) alike
◊ *She lumped all men together, and didn't trust any of them.*

{de} - in einen Topf werfen

{nl} - op een hoop gooien

6. pool *verb*

to put together for general use
◊ *We pooled our money and bought a caravan that we could all use.*

{de} - zusammenlegen

{nl} - bij elkaar leggen

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RANDOM HOUSE Webster's College Dictionary

HTML

ma•chine /mə'jɪn/ , -chined, -chin•ing.

1. an apparatus consisting of interrelated parts with separate functions, used in the performance of some kind of work: *a sewing machine*.
2. **a.** a device that transmits or modifies force or motion. **b.** Also called **simple machine**. any of several elementary mechanisms, as the lever, wheel and axle, pulley, wedge, or inclined plane. **c.** a combination of simple machines.
3. an automobile or airplane.
4. any of various apparatus, devices, etc., that dispense things, esp. a vending machine.
5. any complex agency or operating system: *the machine of government*.
6. a group of persons that conducts or controls a political party or organization.
7. a person or thing that acts in a mechanical or automatic manner.
8. a mechanical contrivance formerly used for producing stage effects.
9. a literary contrivance introduced for special effect.

10. to make, prepare, or finish with a machine or machine tool.

[1540–50; < F < L *māchina* < Attic Gk *mēchanē*; see MECHANICmagh-1]

XML

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