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1 Introduction

A preliminary stage of the EXCHANGE-Risk project requires to gather and classify information about the broader natural gas pipeline network operating in the European continent. This is a necessary step in order to evaluate the density of the network crossing seismically active geographical areas and possibly to develop seismic risk maps for natural gas pipelines in subsequent phases of the project. The database can also be used to easily extract technical data about pipelines needed for benchmark numerical studies in the framework of the project.

For this reason, an electronic database was created to:

- (1) keep track of all major natural gas pipeline systems supplying the European continent and, at the same time,
- (2) provide taxonomy capabilities in terms of various pipeline characteristics.

Table 1: List of fields defined in the table to reflect basic pipeline characteristics.

Field name	Data type	Description
Pipeline name	Short text	
Operator	Short Text	Full pipeline operator name.
Operating since	Date	Starting date of operation.
Current operating status	Yes/No	Operational or out-of-service.
Capacity	Number	In billion cubic metres per year.
Geographic characterization	Short Text	Transnational, intranational or intercontinental
Transit/Served countries	Short Text	List of sovereign countries that are crossed or served by the pipeline (sourced from another table).
Functionality	Short Text	Gathering system, transmission system or distribution system.
Installation setting	Short Text	Specify type of bedding (onshore buried, onshore aboveground, onshore elevated, offshore subsea).
Total length	Number	In kilometres.
Material	Short Text	Steel, PVC, PE, etc. (sourced from another table).
Diameter	Number	In millimetres.
Operating pressure	Number	In Megapascal.
Pipe segment connectivity	Short Text	For example welded joints, mechanical joints etc.
Notes	Long Text	Other notes related to the pipeline.

2 The database

The database was built in the Microsoft Access environment and its structure is straightforward; it consists of two objects, a table where data are recorded and a linked form to facilitate input of new table entries. The table currently contains 15 fields that provide fundamental *technical*, *operational* and *geographical* information on each pipeline. These fields have been selected on the basis of general availability and after consulting professional GIS data providers; they are summarized in Table 1. With a view to eliminating the possibility of inconsistent data input, appropriate data types have been assigned to each input field and specially designed tables/lists have been linked to specific fields in order to restrict the range of admissible field values.

As of now, the table contains 48 entries in total, both onshore and offshore pipelines. The main sources used to populate the database are the dedicated operator websites for each pipeline, hence data may be deemed reliable. Moreover, pipeline data have been crosschecked against larger pools providing pipeline information collectively [1–3]. However, not all pipeline features included in the database are readily available on the web (e.g. operating pressure), and for this reason some pipeline entries are not complete. In addition, some entry fields (e.g. installation setting) were postulated based on other fields, due to lack of explicit information. It is also important to mention that, in this premature form of the database, all pipeline systems registered in it are transmission pipelines. The objective is to extend this database in order to incorporate gathering and distribution pipelines within Europe as well, and possibly pipeline systems located in North America. The database is continuously updated. Some views of the database are provided in the following figures.

The database itself is available as an individual Microsoft Access file that is uploaded in the portal.

The screenshot shows a Microsoft Access form titled "Pipeline Inventory". The form is displayed in a window with a red title bar. The form contains several input fields and dropdown menus for data entry. The fields are arranged in a grid-like structure. The following table represents the data visible in the form:

Field Name	Value	Field Name	Value
Pipeline name	JAGA	Installation setting	Onshore/Offshore
Operator	Gasunie (Gathering/Debit)	Total length	230
Operating price	0.00000	Material	Steel
Current operating status	On	Diameter	1200
Category	24	Operating pressure	0
Geographic classification	International	Per segment connectivity	
Geographical country	Germany	Notes	
Key benefits	Transmission		

Figure 1: View of the database form used to insert new pipeline entries into the table.

Pipeline name	Operator	Operating since	Current operating status	Capacity	Geographic character	Transferred countries	Functionality
National Transmission System (NTS)	National Grid plc	01-01-03	Y	0	International	United Kingdom	Transmission
OPAL	Interconnector GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH & Co	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission
OPAL	OPAL Gas Transport GmbH	01-01-11	Y	30	International	Germany	Transmission

Figure 2: Partial datasheet view of the database table.

Field Name	Data Type	Description (Optional)
Operator	Short Text	Full pipeline operator name
Operating since	Date/Time	Starting date of operation
Current operating status	Yes/No	Operational or out-of-service
Capacity	Number	In billion cubic meters per year
Geographic character	Short Text	For example: international, international etc.
Transferred countries	Short Text	List of average countries that are crossed or served by the pipeline
Functionality	Short Text	Submarine system, transmission system or distribution system
Installation starting	Short Text	Specify type of building (pipeline tunnel, offshore alongground, offshore elevated, offshore subsea); multiple values allowed
Total length	Number	In kilometers
Material	Short Text	In kilometers
Deployment	Number	In kilometers
Operating pressure	Number	In megapascals
Pipe segment connectivity	Short Text	For example: onshore, offshore, onshore/offshore etc.
Notes	Long Text	Other notes related to the pipeline

Figure 3: View of the database table in design mode; visible are the fields specified, along with the associated data types.

References

- [1] ENTSOG (the European Network of Transmission System Operators for Gas) n.d. <http://www.entsog.eu/> (accessed June 25, 2016).
- [2] GIE - Gas Infrastructure Europe n.d. <http://www.gie.eu/> (accessed June 25, 2016).
- [3] Wikipedia contributors. List of natural gas pipelines. Wikipedia, Free Encycl 2016. https://en.wikipedia.org/wiki/List_of_natural_gas_pipelines (accessed June 25, 2016).