INFRARISK GIS Knowledge Base

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WHAT

An integrated knowledge base about major infrastructure failures with natural hazard events

WHY

To gather and present valuable information on the outcomes of natural hazard events on critical transport infrastructure

WHO (for)

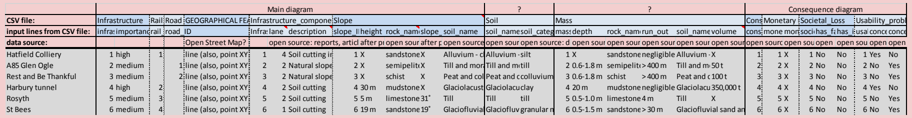
Infrastructure managers & Researchers

(risk management, transportation, civil engineering, natural sciences, etc.)

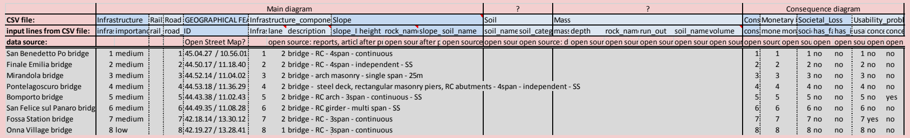
HOW

A Linked Data approach

From tabular data to insightful information



	Main diagram													?		?						Consequence diagram								
CSV file:	Infrastructure		Rail	Road	GEOGRAPHICAL FE	Infrastructure_compone			Slope					Soil		Mass						Cons	Monetary		Societal_Loss			Usability_probl		
input lines from CSV file:	infra	importanc	rail_	road_ID		Infra	lane	description	slope_l	height	rock_nam	slope_	soil_name	soil_name	soil_categ	mass	depth	rock_nam	run_out	soil_name	volume	cons	mone	mon	soci	has_f	has_	usa	conce	conce
data source:					Open Street Map?		open source: reports, articl			after p	open sour	after p	open source	open sour	open source: d		open sour	open sour	open sour	open sour	open sour	open sourc	open sou		open	open sou		open	open	
Hatfield Colliery	1	high	1		line (also, point XY	1	4	Soil cutting ir	1	X	sandstone	X	Alluvium - c	Alluvium -	silt	1	X	sandstone	negligible	Alluvium -	X	1	1	X	1	No	No	1	Yes	No
A85 Glen Ogle	2	medium		1	line (also, point XY	2	2	Natural slope	2	X	semipelit	X	Till and mor	Till and m	till	2	0.6-1.8 m	semipelit	> 400 m	Till and m	50 t	2	2	X	2	No	No	2	No	Yes
Rest and Be Thankful	3	medium		2	line (also, point XY	3	2	Natural slope	3	X	schist	X	Peat and col	Peat and c	colluvium	3	0.6-1.8 m	schist	> 400 m	Peat and c	100 t	3	3	X	3	No	No	3	No	Yes
Harbury tunnel	4	high	2		line (also, point XY	4	2	Soil cutting	4	30 m	mudstone	X	Glaciolacust	Glaciolacu	clay	4	20 m	mudstone	negligible	Glaciolacu	350,000 t	4	4	X	4	No	No	4	Yes	No
Rosyth	5	medium	3		line (also, point XY	5	2	Soil cutting	5	5 m	limestone	31˚	Till	Till	till	5	0.5-1.0 m	limestone	4 m	Till	X	5	5	X	5	No	No	5	No	Yes
St Bees	6	medium	4		line (also, point XY	6	1	Soil cutting	6	19 m	sandstone	19˚	Glaciofluvial	Glaciofluv	granular n	6	0.5-1.5 m	sandstone	> 30 m	Glaciofluvial sand an		6	6	X	6	No	No	6	No	Yes



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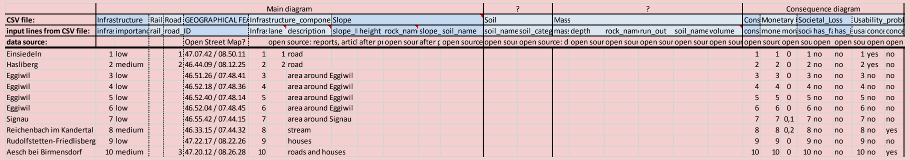
San Benedetto Po bridge	1	medium		1	45.04.27 / 10.56.01	1	2	bridge - RC - 4span - continuous														1	1		1	no	no	1	no	no
Finale Emilia bridge	2	medium		2	44.50.17 / 11.18.40	2	2	bridge - RC - 4span - independent - SS														2	2		2	no	no	2	no	no
Mirandola bridge	3	medium		3	44.52.14 / 11.04.02	3	2	bridge - arch masonry - single span - 25m														3	3		3	no	no	3	no	no
Pontelagoscuro bridge	4	medium		4	44.53.18 / 11.36.29	4	2	bridge - steel deck, rectangular masonry piers, RC abutments - 4span - independent - SS														4	4		4	no	no	4	no	no
Bomporto bridge	5	medium		5	44.43.38 / 11.02.43	5	2	bridge - RC arch - 3span - continuous - SS														5	5		5	no	no	5	no	yes
San Felice sul Panaro bridg	6	medium		6	44.49.35 / 11.08.28	6	2	bridge - RC girder - multi span - SS														6	6		6	no	no	6	no	no
Fossa Station bridge	7	medium		7	42.18.14 / 13.30.12	7	2	bridge - RC - 3span - continuous														7	7		7	no	no	7	yes	no
Onna Village bridge	8	low		8	42.19.27 / 13.28.41	8	1	bridge - RC - 3span - continuous														8	8		8	no	no	8	no	no



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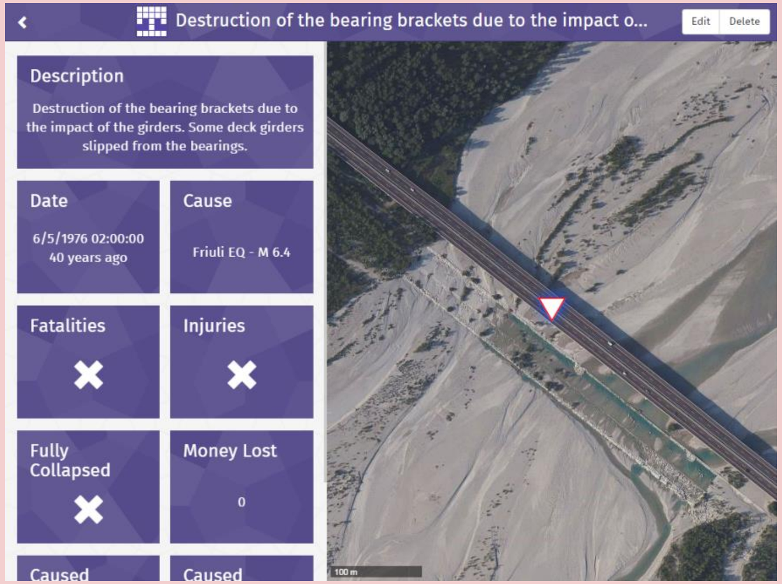
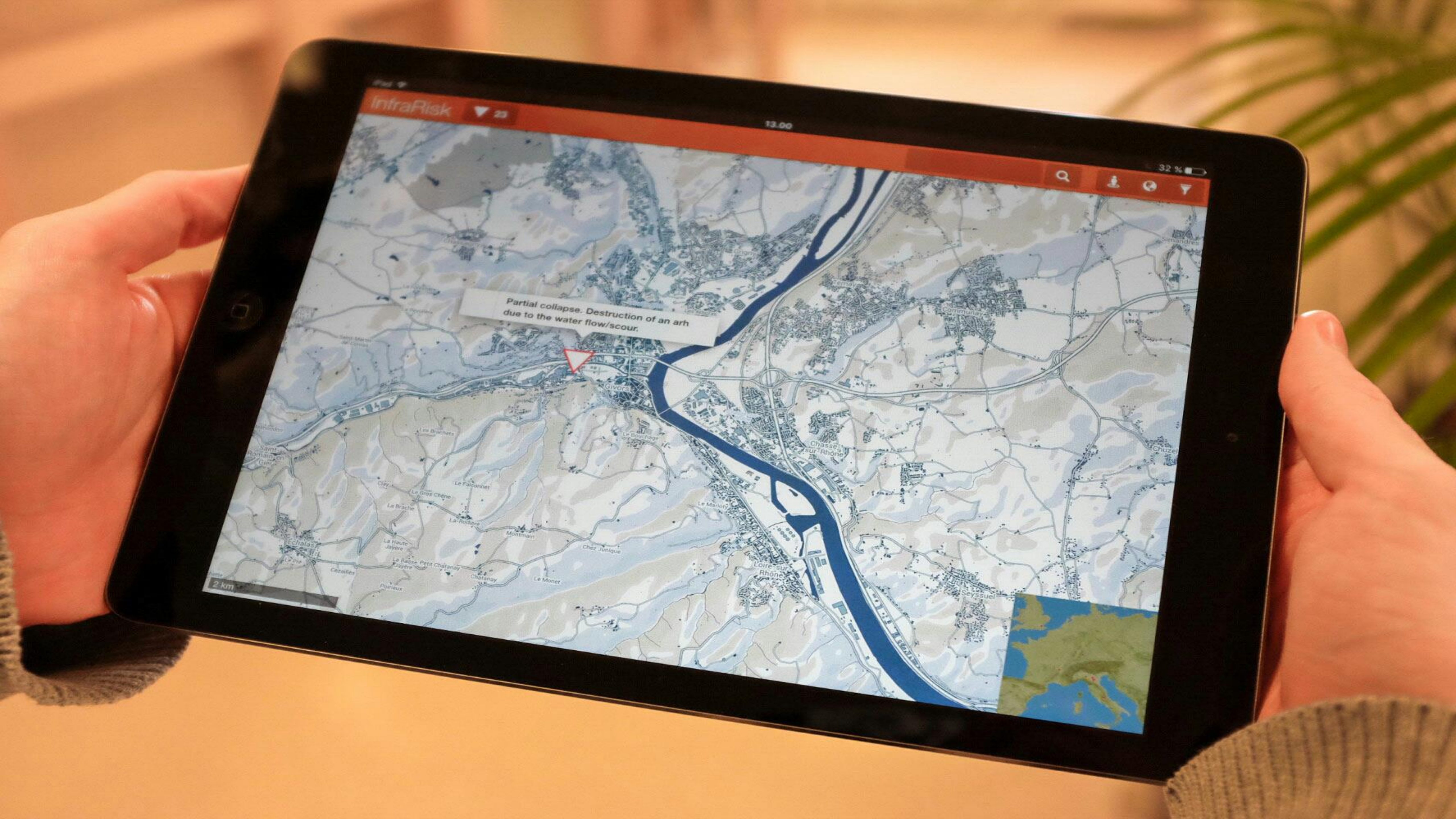
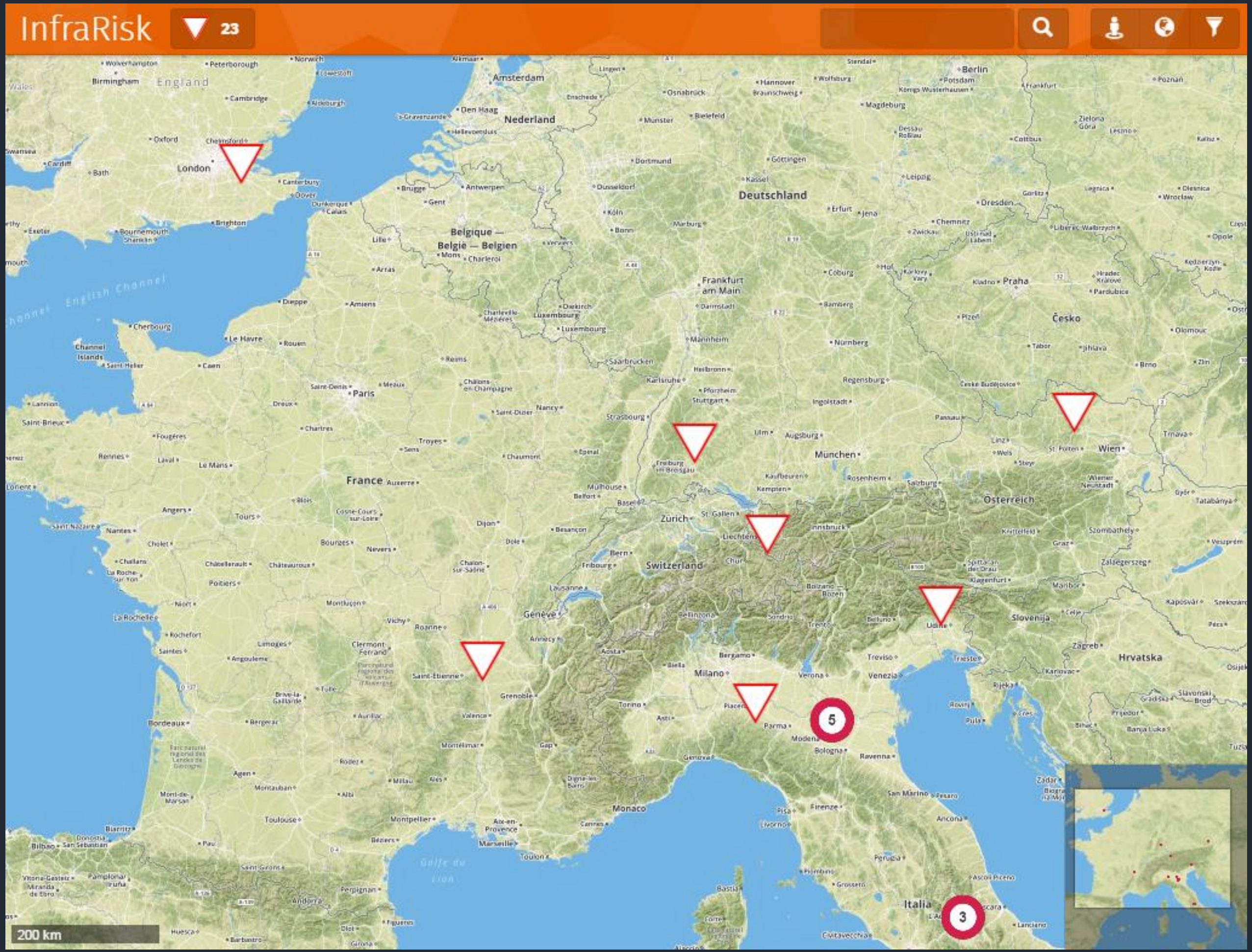
Einsiedeln	1	low		1	47.07.42 / 08.50.11	1	1	road														1	1	0	1	no	no	1	yes	no
Hasliberg	2	medium		2	46.44.09 / 08.12.25	2	2	road														2	2	0	2	no	no	2	yes	no
Eggiwil	3	low			46.51.26 / 07.48.41	3		area around Eggiwil														3	3	0	3	no	no	3	no	no
Eggiwil	4	low			46.52.18 / 07.48.36	4		area around Eggiwil														4	4	0	4	no	no	4	no	no
Eggiwil	5	low			46.52.40 / 07.48.14	5		area around Eggiwil														5	5	0	5	no	no	5	no	no
Eggiwil	6	low			46.52.04 / 07.48.45	6		area around Eggiwil														6	6	0	6	no	no	6	no	no
Signau	7	low			46.55.42 / 07.44.15	7		area around Signau														7	7	0,1	7	no	no	7	no	no
Reichenbach im Kandertal	8	medium			46.33.15 / 07.44.32	8		stream														8	8	0,2	8	no	no	8	no	yes
Rudolfstetten-Friedlisberg	9	low			47.22.17 / 08.22.26	9		houses														9	9	0	9	no	no	9	no	no
Aesch bei Birmensdorf	10	medium		3	47.20.12 / 08.26.28	10		roads and houses														10	10	0	10	no	no	10	no	yes




InfraRisk
23
13.00
32 %
Partial collapse. Destruction of an arh
due to the water flow/scour.
Givors
Chasse-sur-Rhône
Loire-sur-Rhône
Seyssuel
Communay
Le Bouchage
Les Brachets
Le Falconnet
Le Gros Chêne
La Rodière
Montmain
Chez Junique
Le Monet
Chatanay
Echalas
2 km


InfraRisk
23
England
London
Nederland
Amsterdam
Deutschland
Belgique
België — Belgien
Paris
France
München
Wien
Česko
Praha
Zürich
Switzerland
Österreich
Slovenija
Hrvatska
Milano
Bologna
Italia
5
3
200 km


SP1
SP1
Google
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Report a problem

Description

Previous damage. Cracking of some structural and non-structural elements (as the abutment and a opened hole in the sidewalk)

Date

20/5/2012 03:00:00
4 years ago

Cause

Emilia EQ - M 6.0

Fatalities

✕

Injuries

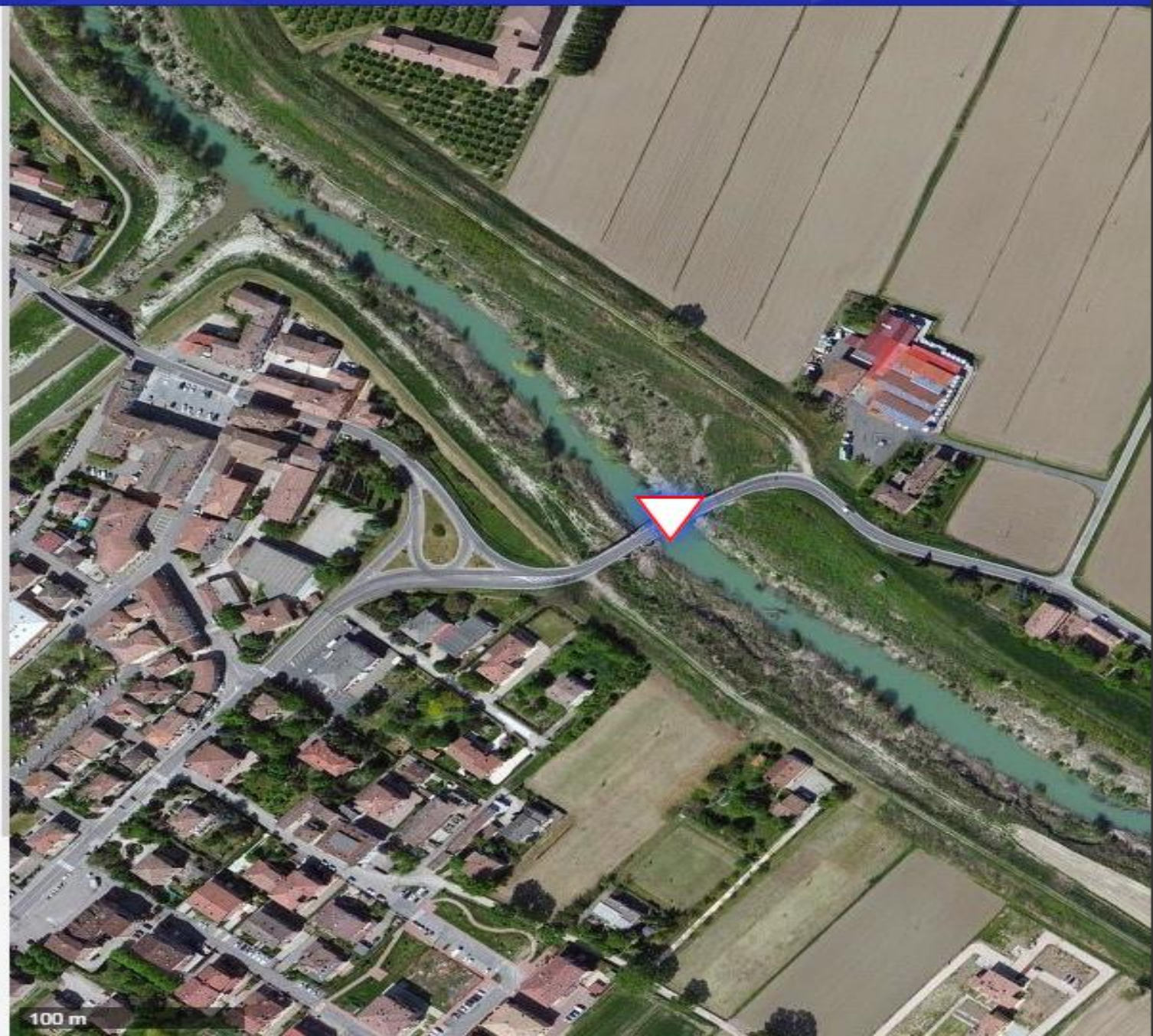
✕

Fully Collapsed

✕

Money Lost

0



Features of the approach

- End-user friendly Web application
- Grounded on a comprehensive data model for infrastructure components an natural hazards
- Easy to onboard data (e.g. upload spreadsheets)
- Data hosting/access
- Data provisioned as Linked Data
- Structured querying (SPARQL)

Easy to use

You can contribute and enhance the KB

Relevant data

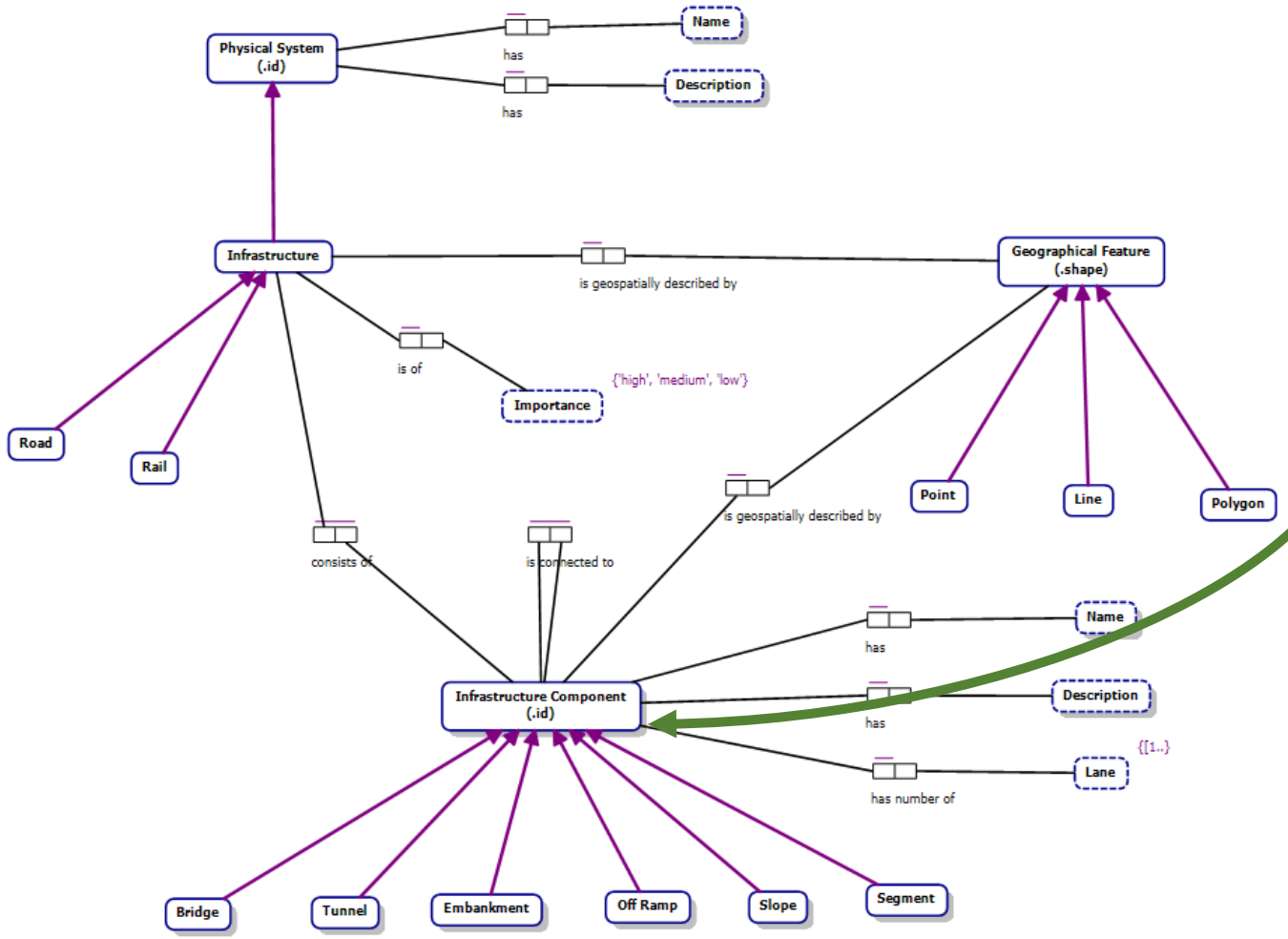
You don't need to worry about technicalities

Simple to link "our" data with other data sources

Powerful querying capabilities


Fault
Soil
Bridge
Monetary
Slope
Societal
Infrastructure
Usability
Rail
Natural
Line
Road
Slope
Flood
Extent
Lane
Point
Infrastructure
Rock
Off
Flow
Tunnel
Volume
Event
Landslide
Run-out
Date
Soil
Infrastructure
Soil
Hazard
Magnitude
Soil
Consequence
Typology
Segment
Earthquake
Geographical
Water
Shake
Duration
Seismic
Location
Construction

Schema



Vocabulary – example

"Infrastructure Component" Object Type ↑

Summary

Infrastructure Component **is an entity type**.
Reference Scheme: Infrastructure Component has Infrastructure Component_id.
Reference Mode: .id.

Fact Types

- **Each** Bridge is an instance of Infrastructure Component.
- **Each** Embankment is an instance of Infrastructure Component.
- Infrastructure Component Failure concerns full collapse of Infrastructure Component.
- Infrastructure Component Failure concerns partial collapse of Infrastructure Component.
- Infrastructure Component has Description.
- Infrastructure Component has Infrastructure Component_id.
- Infrastructure Component has Name.
- Infrastructure Component has number of Lane.
- Infrastructure Component is connected to Infrastructure Component.
- Infrastructure Component is geospatially described by Geographical Feature.
- Infrastructure consists of Infrastructure Component.
- **Each** Off Ramp is an instance of Infrastructure Component.
- **Each** Segment is an instance of Infrastructure Component.
- **Each** Slope is an instance of Infrastructure Component.
- **Each** Tunnel is an instance of Infrastructure Component.
- Usability Problem concerns closure of Infrastructure Component.
- Usability Problem concerns reduced traffic on Infrastructure Component.

Related Types

- Description
- Geographical Feature
- Infrastructure
- Infrastructure Component Failure
- Infrastructure Component_id
- Lane
- Name
- Usability Problem

Super Types

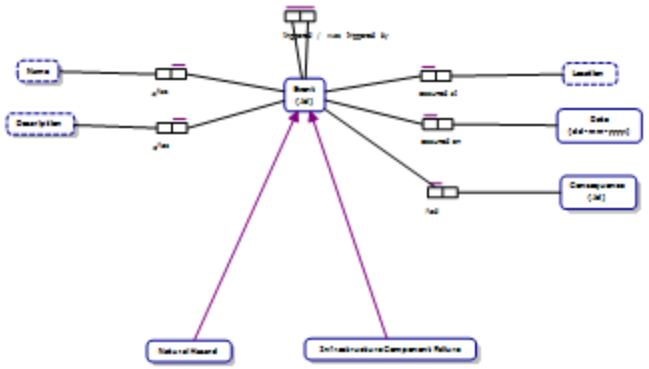
- There are no items for this section.

Sub Types

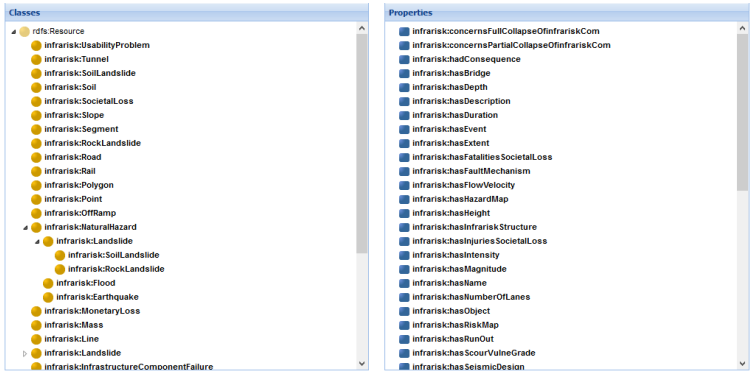
- Bridge
- Tunnel
- Embankment
- Off Ramp
- Slope
- Segment

- Defined data representation format in graph format

Conceptual model

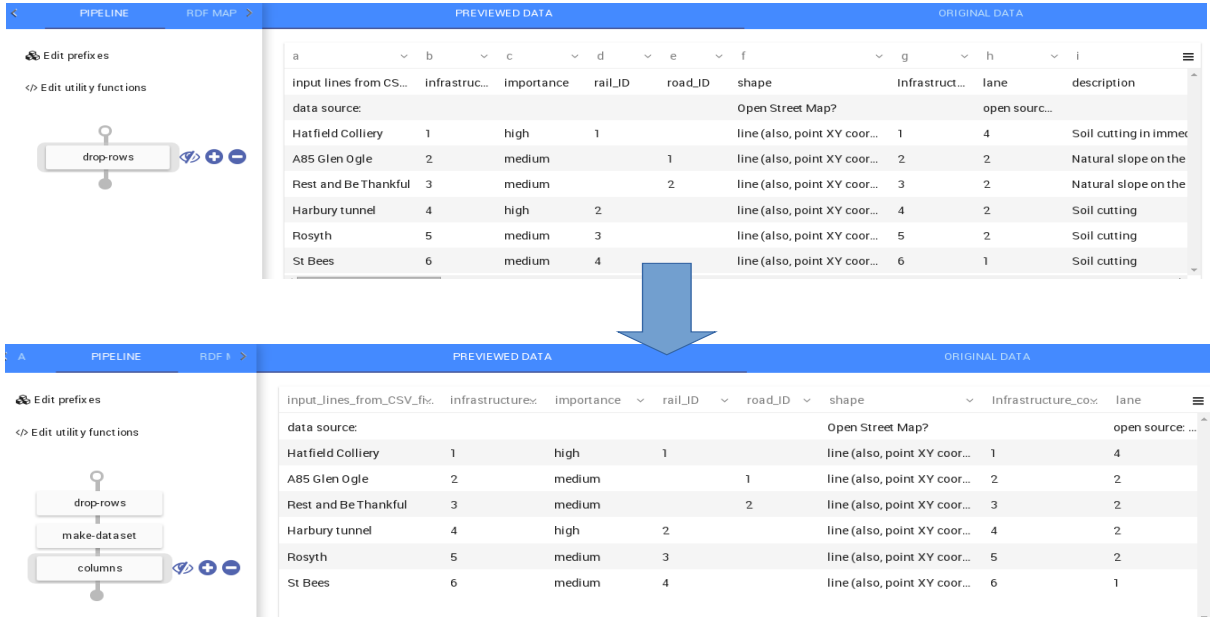


Vocabulary



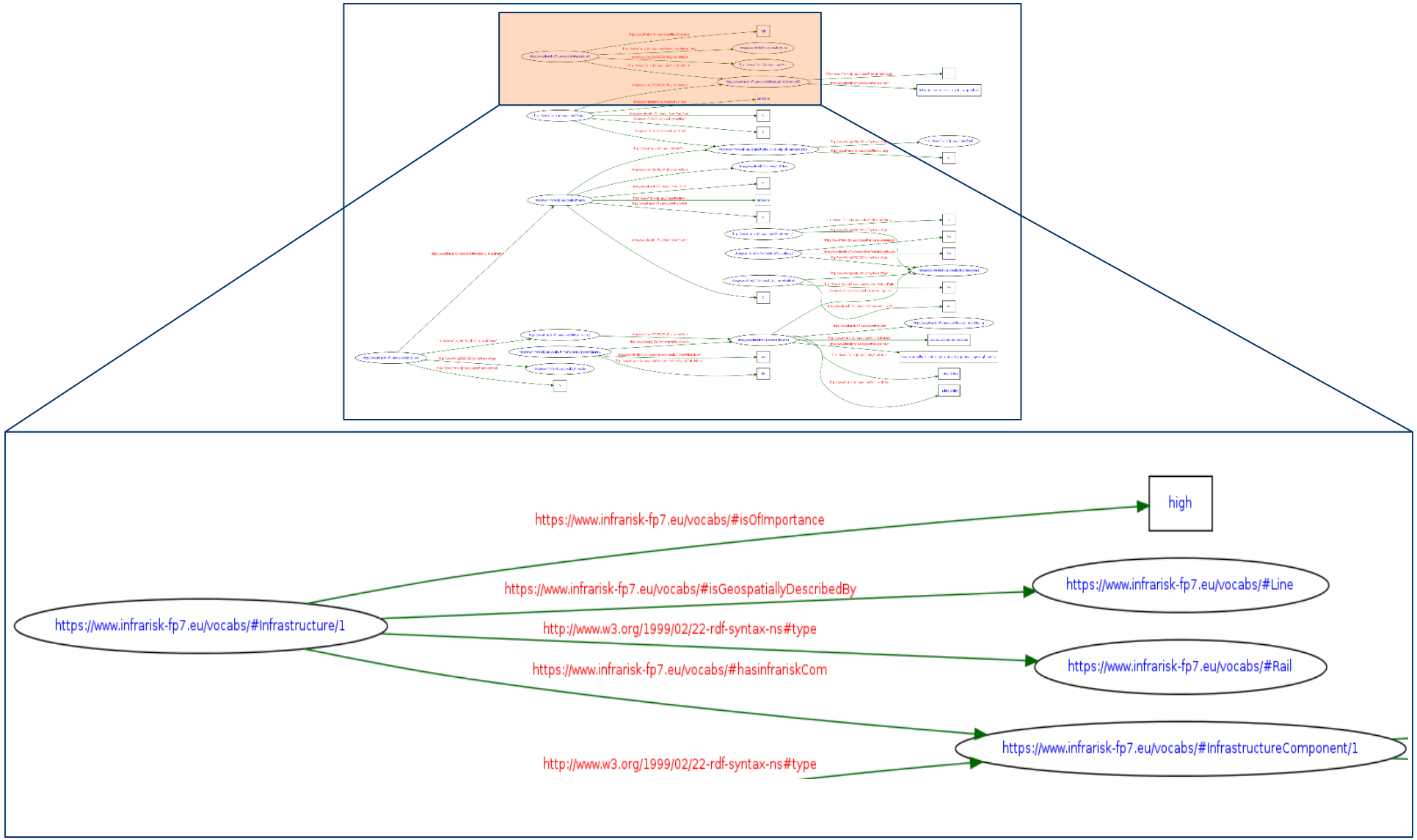
- Collected dataset samples (CSV format)

Dataset	Description	Filename
Events #1	Sample data about landslides, bridge failures and road failures in Europe.	ETHZ-Contribution-to-D2.2.xlsx
Floods #1	Sample data about floods in Europe.	database floods yuliya.xls
Floods #2	Sample data about floods in Spain.	EVENTS_DRA.xlxs
Bridge failures #1	Sample data about bridge failures in Europe.	events.xlsx
Bridge failures #2	Sample data about motorway bridge failures in Europe.	events_failures_CSIC_T2.2.xlsx



DataGraft

https://datagraft.net

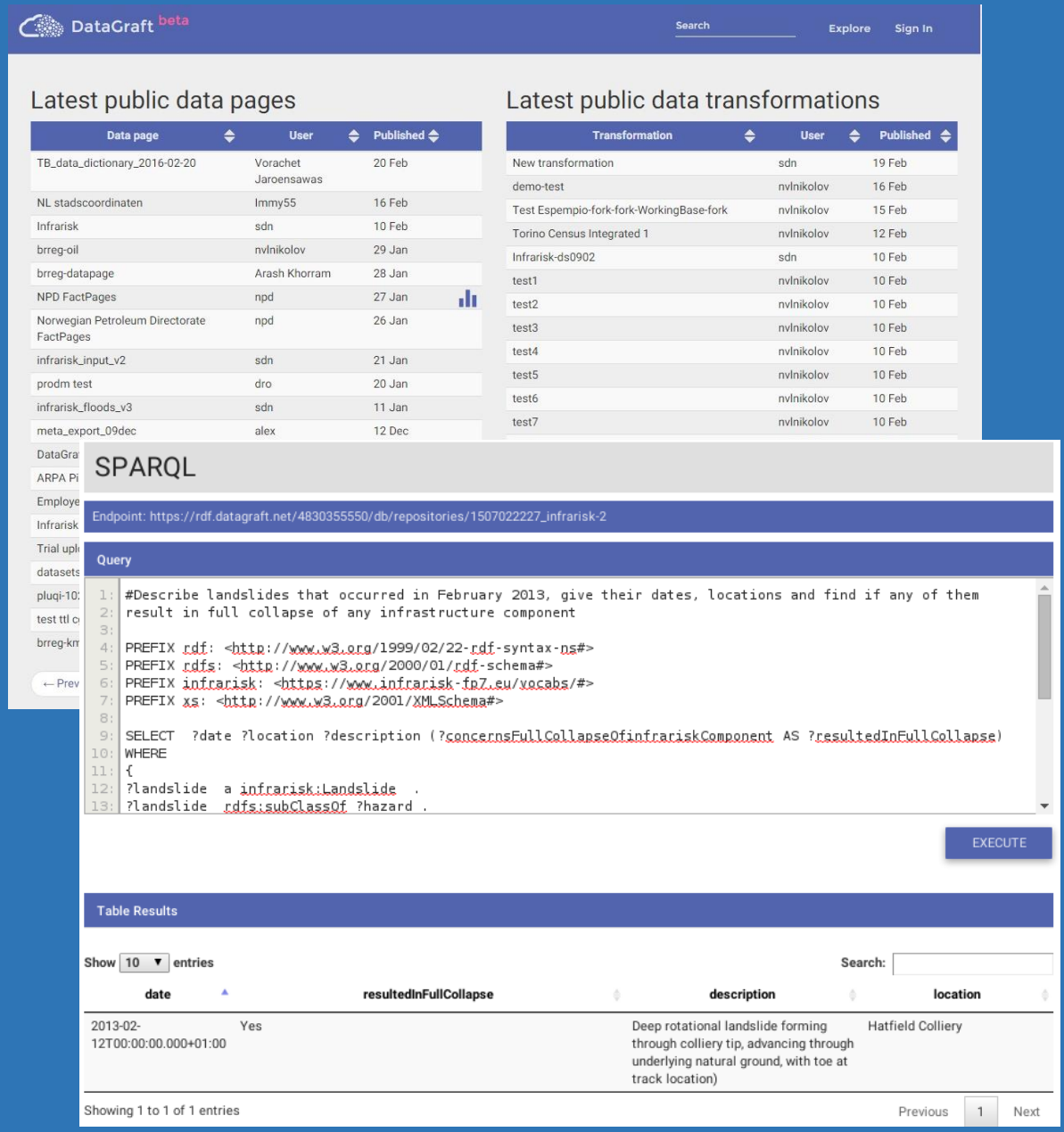

https://www.infrarisk-fp7.eu/vocabs/#isOfImportance
high
https://www.infrarisk-fp7.eu/vocabs/#isGeospatiallyDescribedBy
https://www.infrarisk-fp7.eu/vocabs/#Line
https://www.infrarisk-fp7.eu/vocabs/#Infrastructure/1
http://www.w3.org/1999/02/22-rdf-syntax-ns#type
https://www.infrarisk-fp7.eu/vocabs/#hasinfrariskCom
https://www.infrarisk-fp7.eu/vocabs/#Rail
https://www.infrarisk-fp7.eu/vocabs/#InfrastructureComponent/1
http://www.w3.org/1999/02/22-rdf-syntax-ns#type

Sample queries

- Describe landslides that occurred in February 2013, give their dates, locations and find if any of them result in full collapse of any infrastructure component

- Describe landslides that resulted in displacement of mass containing clay

- GIS Knowledge Base
  - Based on DataGraft
- Onboarding of INFRARISK data
  - Data cleaning & mapping (tabular to graph)
  - Executable data transformations
  - Data queries (in SPARQL)
- Development of GUI application prototype



Thank you!

Q&A

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