

INFRARISK: Consortium Meeting WP7

“The Integrated Decision-Support Tool”



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University of Southampton IT Innovation Centre

Southampton

INFRARISK Progress Meeting

29th September 2016, DRAGADOS, Madrid, Spain



IDST Design, Architecture

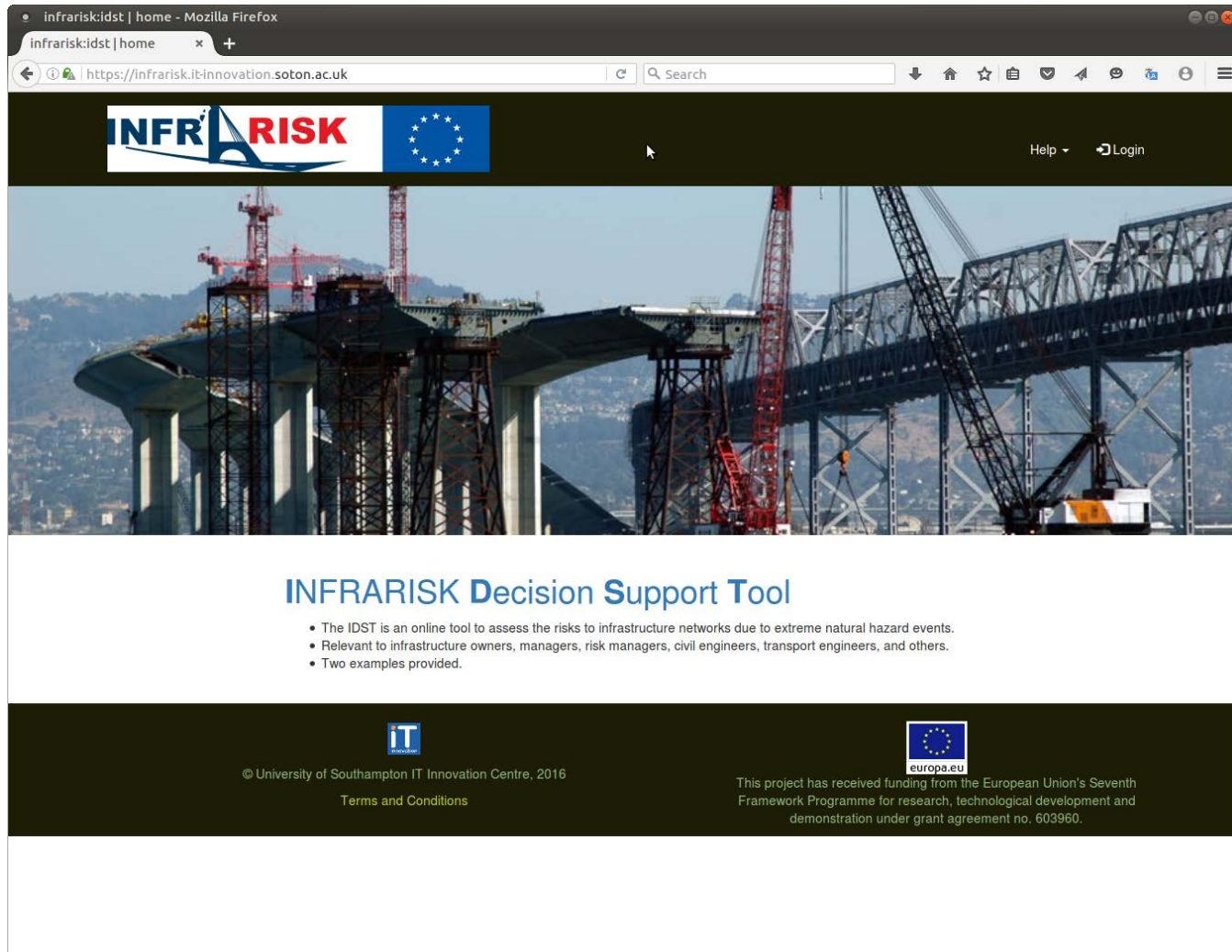
IDST Software Design

- Portal build using Django Framework
- Dynamic content using JavaScript (jQuery, Bootstrap)
- PostgreSQL (PostGIS modules)
- Mapping using OpenStreetMap data
-

IDST services

- Current releases:
<http://infrarisk.it-innovation.soton.ac.uk>

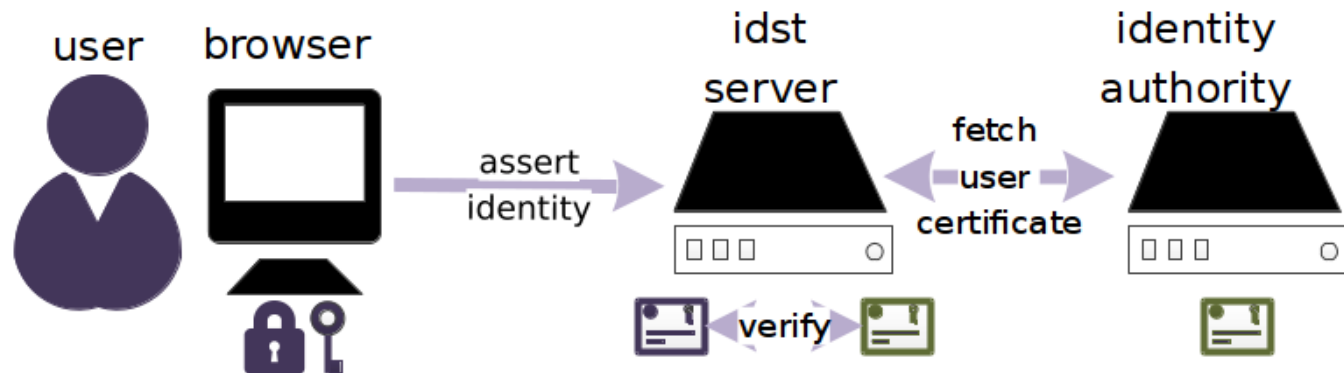
The IDST Portal Page



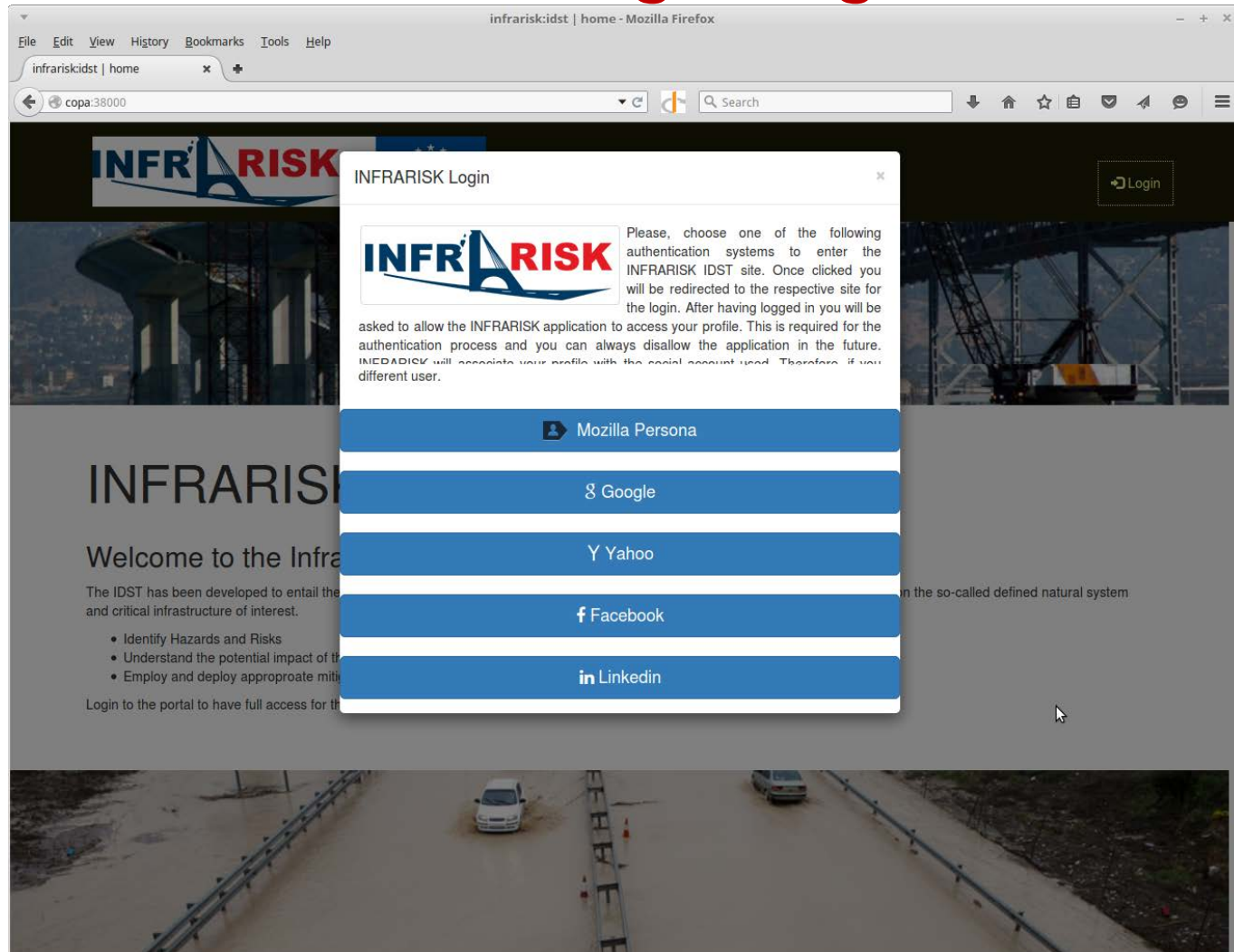
IDST Authentication System

Authentication in IDST is based on

- Local user account authentication (exclusive for admin users)
- Third party authentication services (for normal users), e.g.
 - Mozilla
 - Google
 - Yahoo
 - LinkedIn

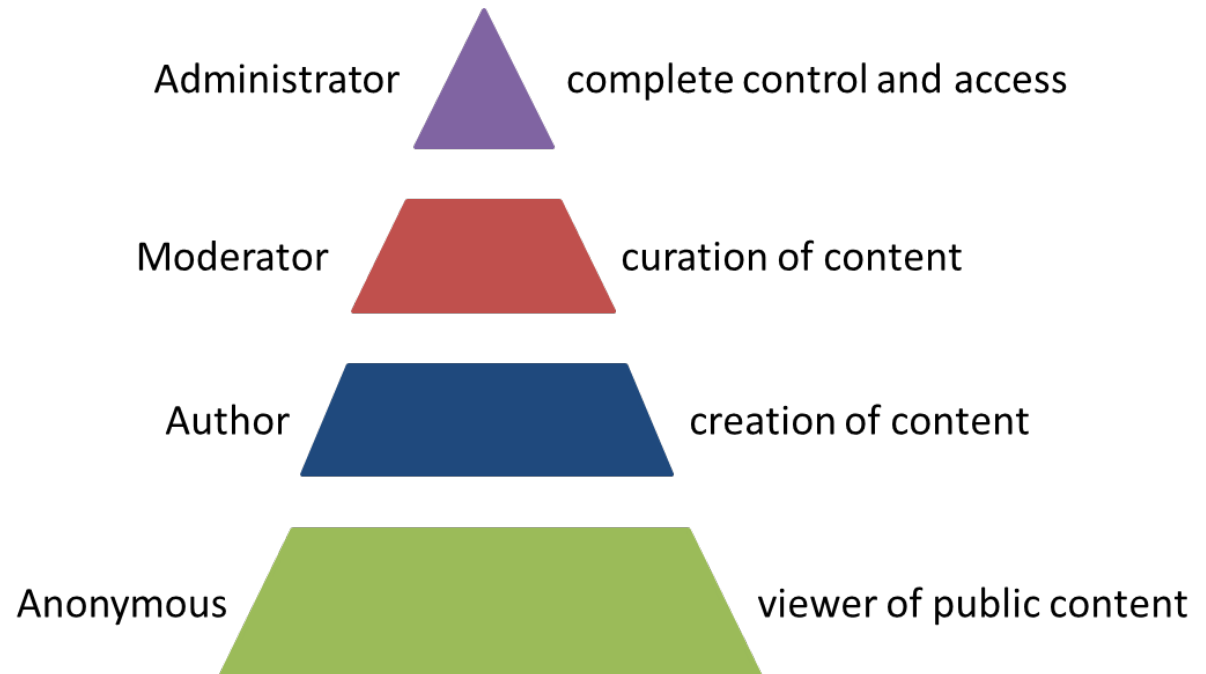


IDST Login Page

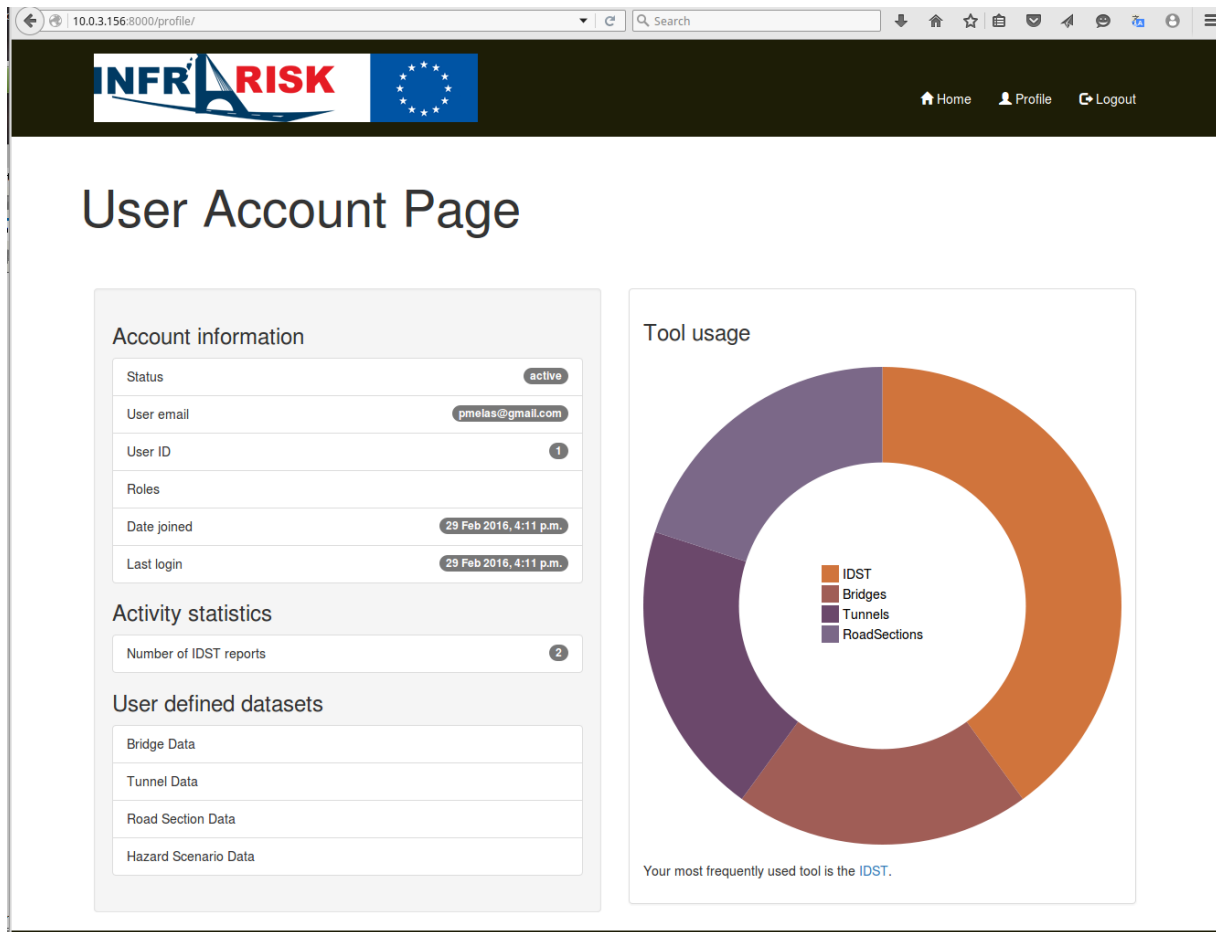


Authorisation and User Roles in IDSP

Authorisation in IDST is based on Roles
Role assigns what rights a user has
A user can have multiple roles



User profile, status in IDST



```

graph TD
    idstpwe_scenario[idstpwe_scenario  
id INTEGER] --> idstpwe_infrastructureobject[idstpwe_infrastructureobject  
id INTEGER]
    idstpwe_scenario --> idstpwe_infrastructureevent[idstpwe_infrastructureevent  
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    idstpwe_scenario --> idstpwe_social[idstpwe_social  
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    idstpwe_scenario --> idstpwe_networkevent[idstpwe_networkevent  
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id INTEGER]
  
```



IDST modelled data


- **OSM data sources**
 - Bridge
 - Road
 - Tunnel
- **Hazard data (supported by Ground Motion Models)**
 - PGA
- **Structural data**
 - Bridges
 - Tunnels
 - Road sections


OSM data models, DB schemas in IDST


osm_bridge	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
ref	CHARACTER VARYING(16)
type	CHARACTER VARYING(16)
oneway	INTEGER
bridge	INTEGER
tunnel	INTEGER
maxspeed	INTEGER
length	INTEGER
geom	USER-DEFINED


osm_road	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
ref	CHARACTER VARYING(16)
type	CHARACTER VARYING(16)
oneway	INTEGER
bridge	INTEGER
tunnel	INTEGER
maxspeed	INTEGER
geom	USER-DEFINED


osm_tunnel	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
ref	CHARACTER VARYING(16)
type	CHARACTER VARYING(16)
oneway	INTEGER
bridge	INTEGER
tunnel	INTEGER
maxspeed	INTEGER
geom	USER-DEFINED

osm_tentroad	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
ref	CHARACTER VARYING(16)
type	CHARACTER VARYING(16)
oneway	INTEGER
bridge	INTEGER
tunnel	INTEGER
maxspeed	INTEGER
geom	USER-DEFINED

osm_natural	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
type	CHARACTER VARYING(16)
geom	USER-DEFINED

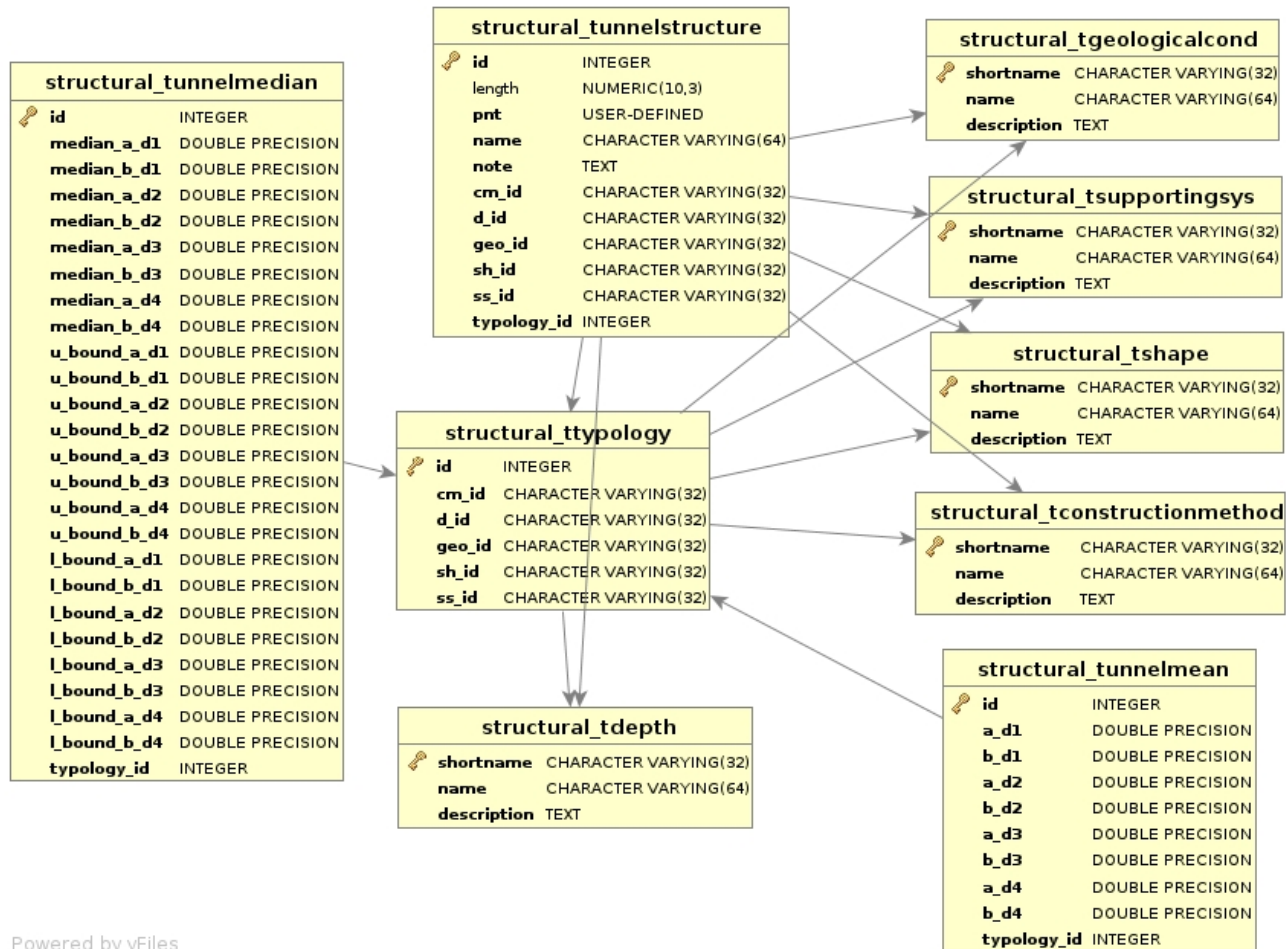
osm_railway	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
type	CHARACTER VARYING(16)
geom	USER-DEFINED

osm_landuse	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
type	CHARACTER VARYING(16)
geom	USER-DEFINED

osm_building	
 id	INTEGER
osm_id	CHARACTER VARYING(11)
name	CHARACTER VARYING(48)
type	CHARACTER VARYING(16)
geom	USER-DEFINED

Powered by yFiles

The IDST Tunnel structural model



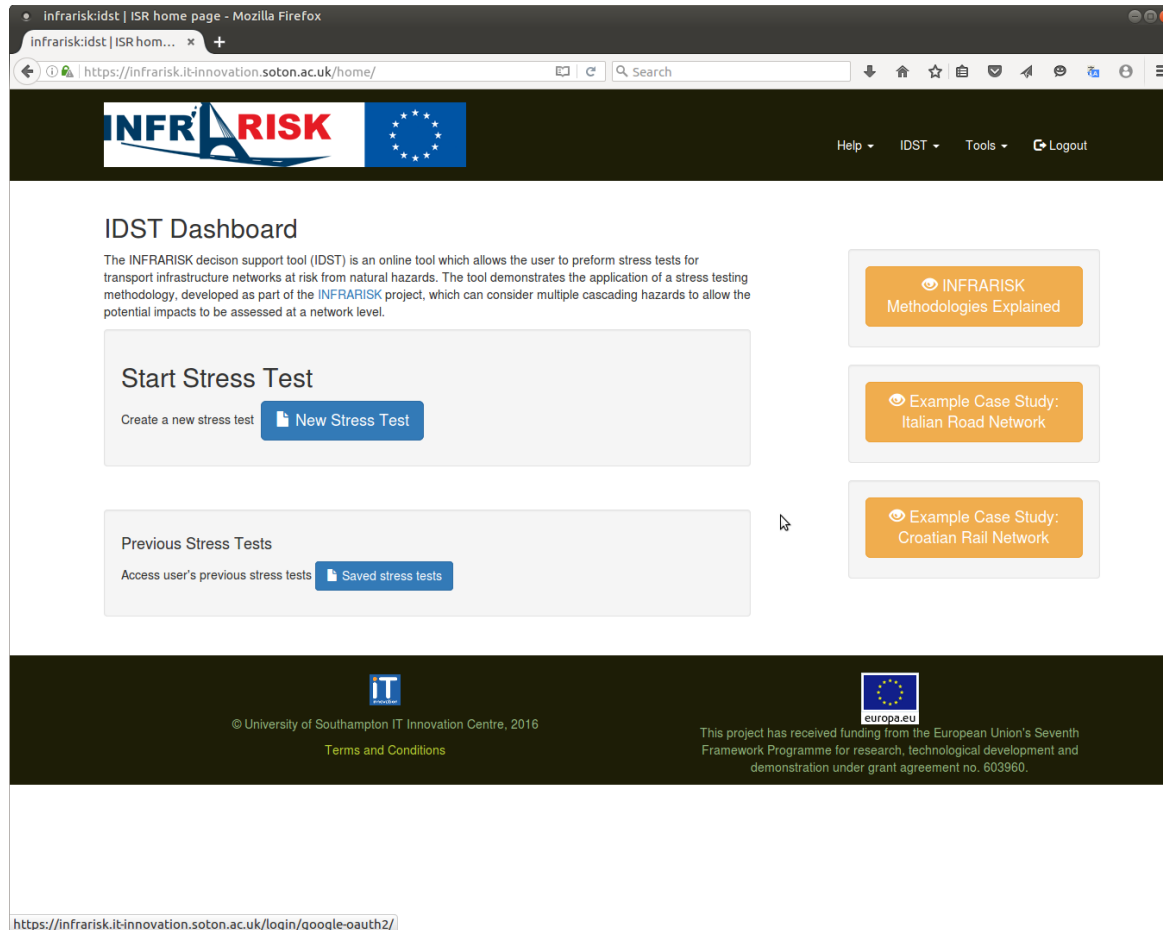
Powered by yFiles

The IDST Case Study

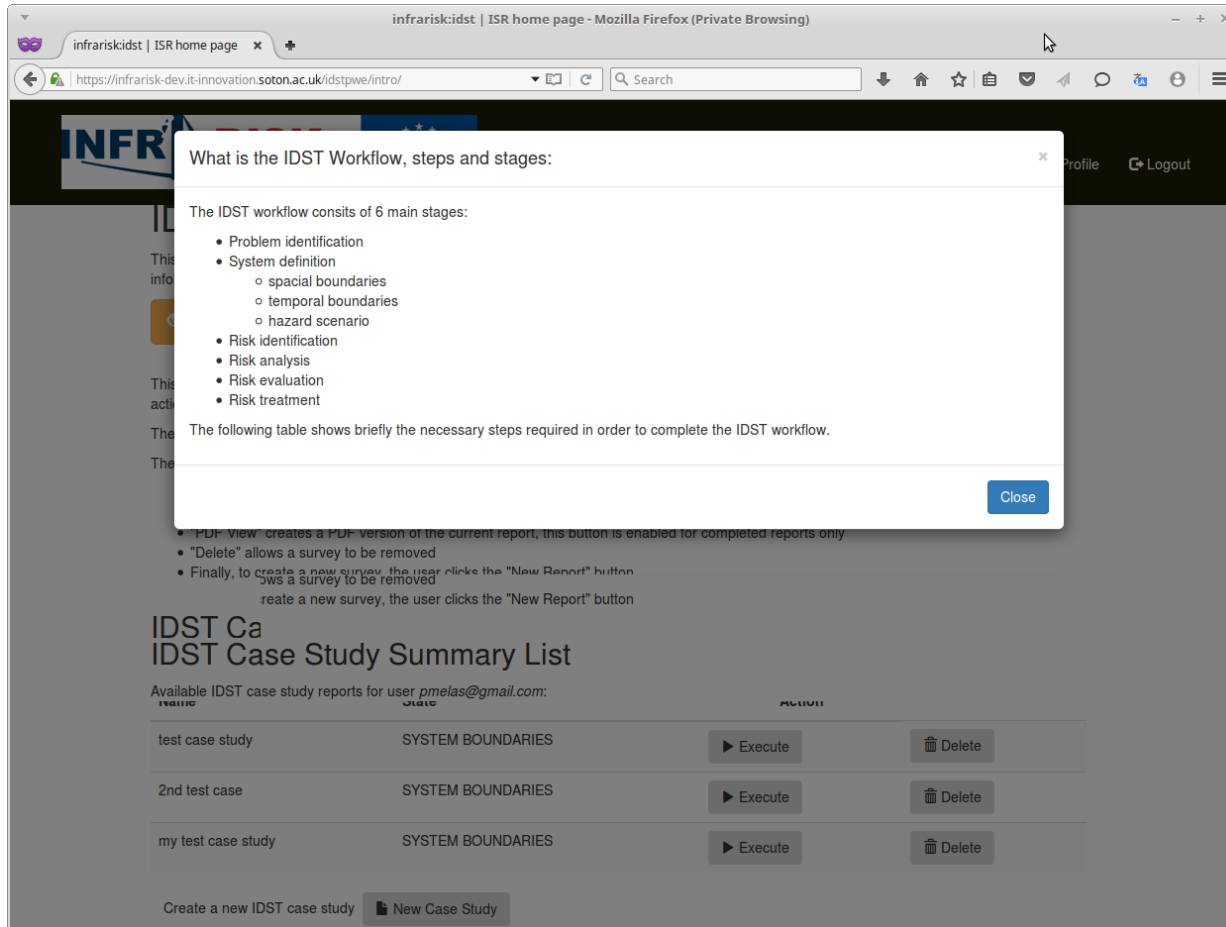
IDST Terminology:

- An IDST Process Workflow Engine run is a Case Study or scenario
- An IDST case study stores all necessary information to run a workflow.
- Users can create and manage multiple Case Studies, i.e.
 - Create
 - Run
 - Edit
 - Delete

IDST case study dashboard

A screenshot of a web browser displaying the INFRARISK IDST Dashboard. The browser's address bar shows the URL "https://infrarisk.it-innovation.soton.ac.uk/home/". The dashboard has a dark header with the INFRARISK logo, the European Union flag, and navigation links for "Help", "IDST", "Tools", and "Logout". The main content area is titled "IDST Dashboard" and includes a descriptive paragraph about the tool. It features three main sections: "Start Stress Test" with a "New Stress Test" button, "Previous Stress Tests" with a "Saved stress tests" button, and a sidebar with three orange buttons: "INFRARISK Methodologies Explained", "Example Case Study: Italian Road Network", and "Example Case Study: Croatian Rail Network". The footer contains the University of Southampton IT Innovation Centre logo and copyright information, the European Union flag and funding information, and a Google OAuth2 login link.

IDST on-line help page



infrariskidst | ISR home page - Mozilla Firefox (Private Browsing)

https://infrarisk-dev.it-innovation.soton.ac.uk/idstpwe/intro/

What is the IDST Workflow, steps and stages:

The IDST workflow consists of 6 main stages:

- Problem identification
- System definition
 - spacial boundaries
 - temporal boundaries
 - hazard scenario
- Risk identification
- Risk analysis
- Risk evaluation
- Risk treatment

The following table shows briefly the necessary steps required in order to complete the IDST workflow.

Close

PDF View: creates a PDF version of the current report, this button is enabled for completed reports only

"Delete" allows a survey to be removed

Finally, to create a new survey, the user clicks the "New Report" button

create a new survey, the user clicks the "New Report" button

IDST Case Study Summary List

Available IDST case study reports for user pmelas@gmail.com:

name	state	actions
test case study	SYSTEM BOUNDARIES	▶ Execute Delete
2nd test case	SYSTEM BOUNDARIES	▶ Execute Delete
my test case study	SYSTEM BOUNDARIES	▶ Execute Delete

Create a new IDST case study [New Case Study](#)

Process Workflow Engine Implementation

- Governed by Overarching Risk Management Framework (ORMF), implemented as a Case Study in IDST
 - Define a new Case Study, i.e. name, description
 - Define system boundaries
 - Define the hazard scenario, i.e. hazard source, assign hazard events
 - Configure hazard event assigned models
 - Define the network scenario, i.e. network type, assign network elements and their fragility curves models
 - Define network characteristics, (datasets)
 - Derive damage states for each element using their fragility curves and hazard intensity (e.g. PGA values)
 - Provide results for further processing outside the IDST

Case Study Northern Italy Scenario


- Target area: Region of Bologna, Northern Italy
- Network: Road network, (European TEN-T network)
- Hazards source: Earthquake
 - Hazard event: Ground motion (primary)
 - Hazard event: Earthquake-triggered landslides (secondary)
- Network element types:
 - Bridges
 - Tunnels
 - Road sections
- Determine element characteristics, i.e. network elements in IDST database datasets for bridges, tunnels, road section, or upload user defined.
- Stress tests: determine risk associated with an earthquake hazard event on the road network
- Calculate direct costs

Create a new Case Study, Problem Identification

infrariskidst | IDST Problem Identification - Mozilla Firefox

infrariskidst | IDST Pro... x +

https://infrarisk.it-innovation.soton.ac.uk/idstpwe/new/

INFRARISK 

Help ▾ IDST ▾ Tools ▾ Logout

◀ IDST Home System Definition ▶

Define Stress Test

This page allows general information on the stress test to be included. This information is not directly used to inform the analysis but is included within an automatically generated summary report upon completion of the stress test.

Enter stress test details:

Name:
Provide a name for the stress test

Summary (Optional):
Provide a brief summary of the stress test


Note that hazard-specific input parameters, e.g. return period, are considered at the "Define Hazard Scenario" stage.


Press the following button to save your stress test, and start the IDST workflow.

Save and proceed

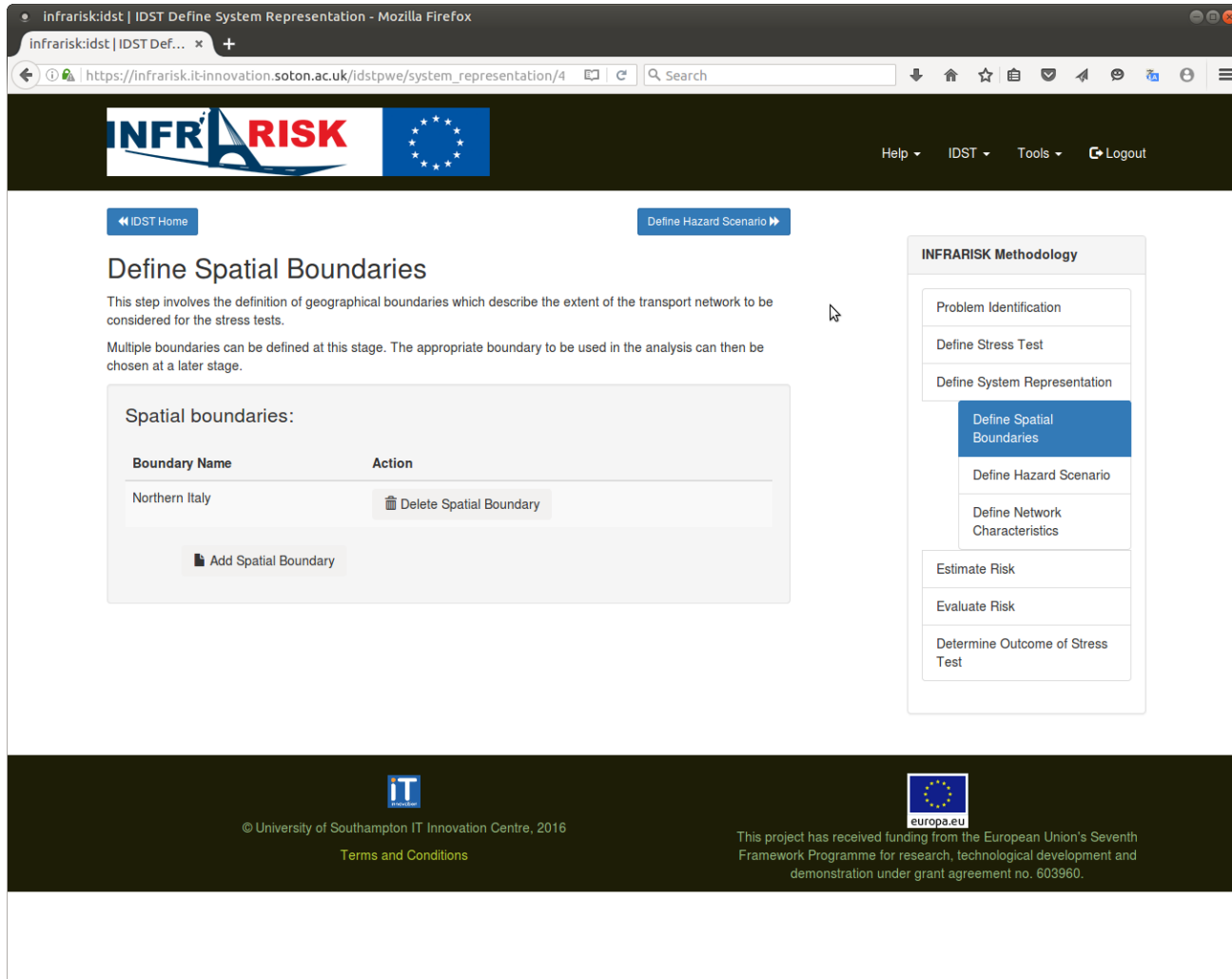
INFRARISK Methodology

- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario
 - Define Network Characteristics
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test

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 europa.eu
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IDST: Define spatial boundaries



The screenshot shows the 'INFRARISK | IDST Define System Representation' web application in a Mozilla Firefox browser. The URL is https://infrarisk.it-innovation.soton.ac.uk/idstpwe/system_representation/4. The application header includes the INFRARISK logo, the European Union flag, and navigation links for Help, IDST, Tools, and Logout.

The main content area is titled 'Define Spatial Boundaries' and includes the following text:

This step involves the definition of geographical boundaries which describe the extent of the transport network to be considered for the stress tests.

Multiple boundaries can be defined at this stage. The appropriate boundary to be used in the analysis can then be chosen at a later stage.

The 'Spatial boundaries:' section contains a table with the following data:

Boundary Name	Action
Northern Italy	Delete Spatial Boundary

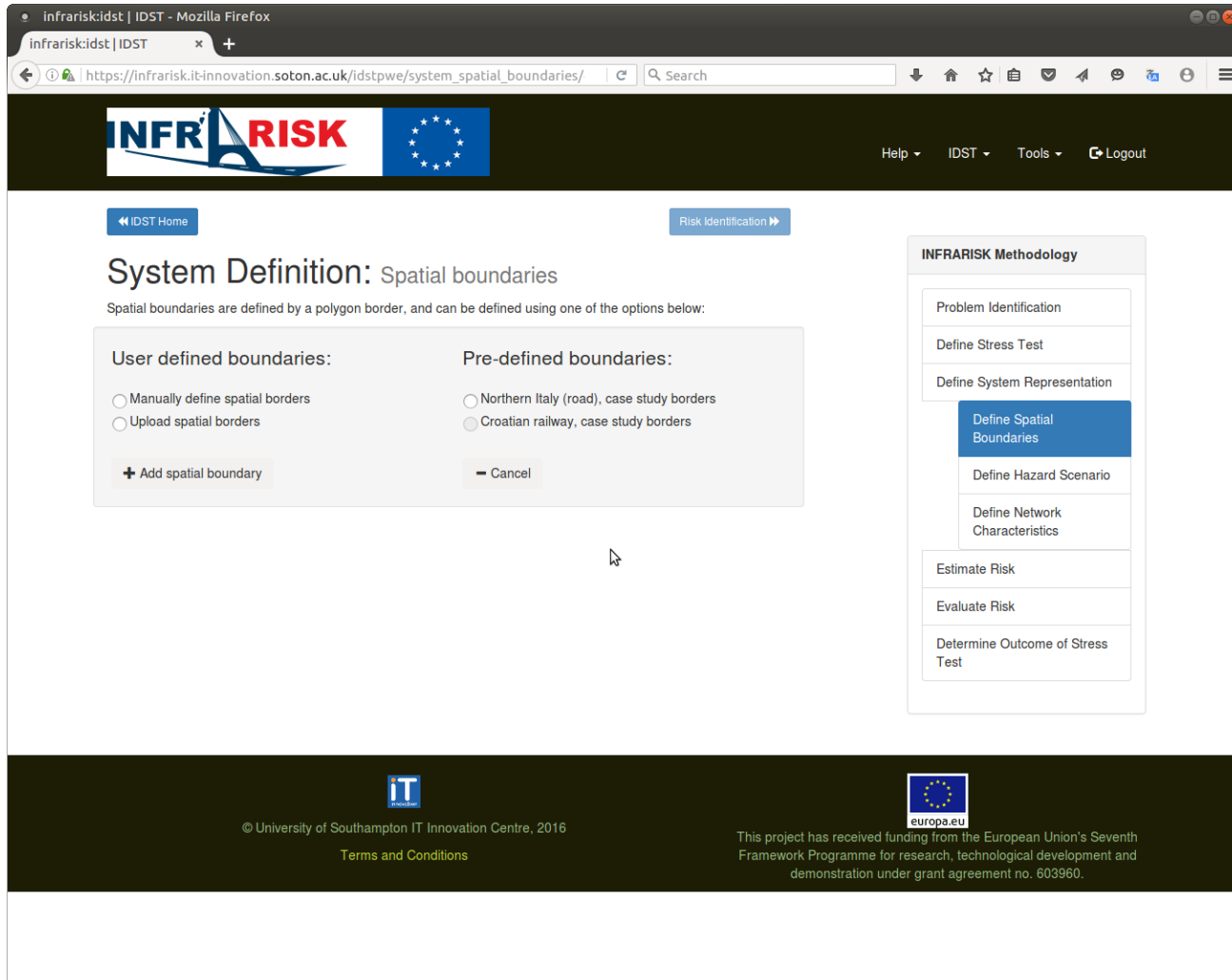
Below the table is an [Add Spatial Boundary](#) button.

On the right side, the 'INFRARISK Methodology' sidebar lists the following steps:

- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries** (selected)
 - Define Hazard Scenario
 - Define Network Characteristics
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test

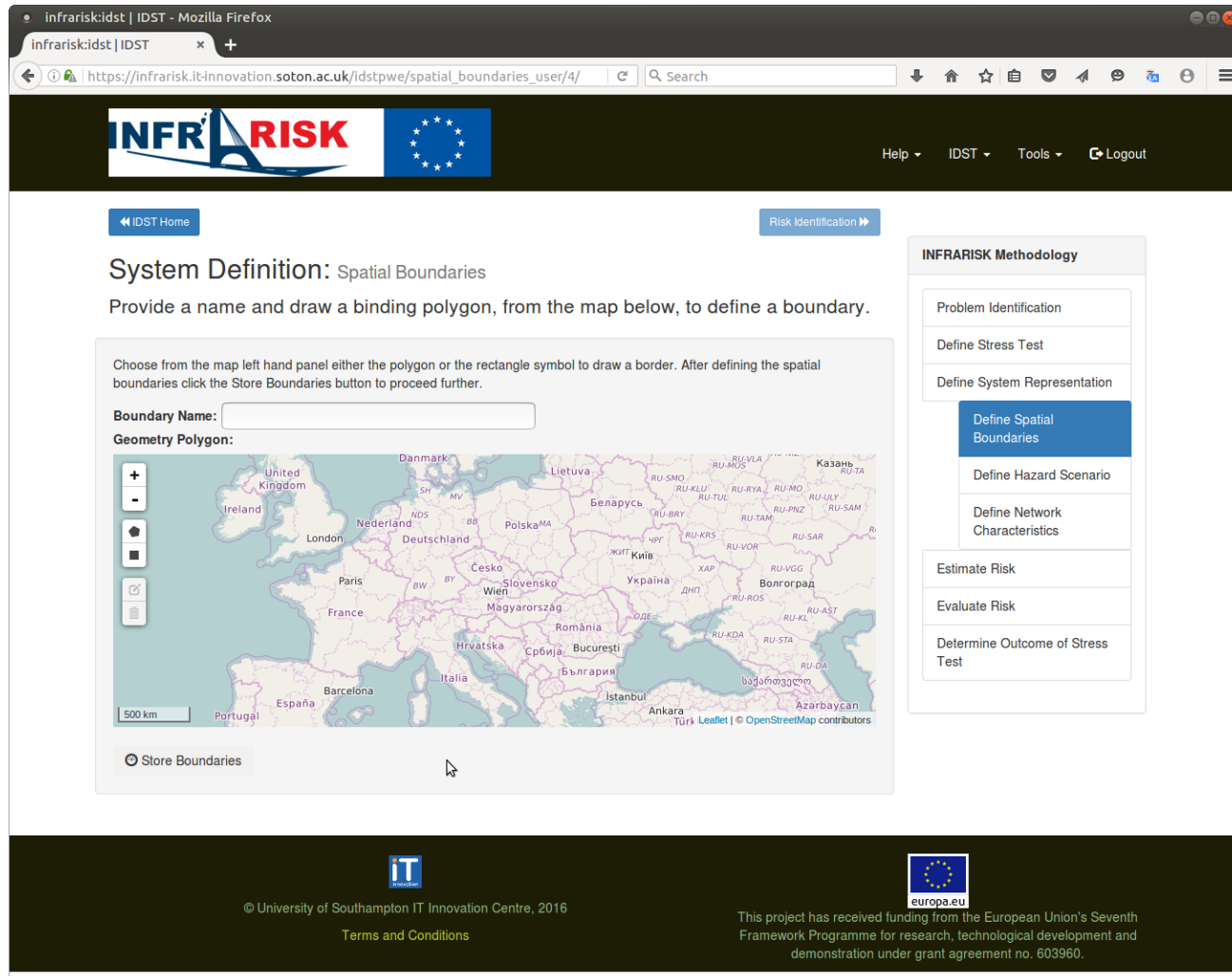
The footer includes the University of Southampton IT Innovation Centre logo and copyright information (© 2016), a link to Terms and Conditions, and a statement of funding from the European Union's Seventh Framework Programme (grant agreement no. 603960).

IDST: Define spatial boundaries



The screenshot shows the INFRARISK IDST web application interface. The browser address bar displays the URL: https://infrarisk.it-innovation.soton.ac.uk/idstpwe/system_spatial_boundaries/. The page title is "infrarisk:dst | IDST". The main content area is titled "System Definition: Spatial boundaries" and includes a sub-header "Spatial boundaries are defined by a polygon border, and can be defined using one of the options below:". There are two main sections: "User defined boundaries:" and "Pre-defined boundaries:". The "User defined boundaries:" section has two radio buttons: "Manually define spatial borders" and "Upload spatial borders", with an "Add spatial boundary" button below. The "Pre-defined boundaries:" section has two radio buttons: "Northern Italy (road), case study borders" and "Croatian railway, case study borders", with a "Cancel" button below. On the right side, there is a sidebar titled "INFRARISK Methodology" with a list of steps: "Problem Identification", "Define Stress Test", "Define System Representation", "Define Spatial Boundaries" (highlighted in blue), "Define Hazard Scenario", "Define Network Characteristics", "Estimate Risk", "Evaluate Risk", and "Determine Outcome of Stress Test". The footer contains the "iIT" logo, the text "© University of Southampton IT Innovation Centre, 2016", a link to "Terms and Conditions", the "europa.eu" logo, and a statement about funding from the European Union's Seventh Framework Programme.

IDST: Define spatial boundaries manually



The screenshot shows the INFRARISK IDST web application interface. The browser address bar displays the URL: https://infrarisk.it-innovation.soton.ac.uk/idstpwe/spatial_boundaries_user/4/. The page header includes the INFRARISK logo and the European Union flag, along with navigation links: Help, IDST, Tools, and Logout.

The main content area is titled "System Definition: Spatial Boundaries" and includes a sub-header "Risk Identification". The instructions state: "Provide a name and draw a binding polygon, from the map below, to define a boundary." Below this, a text box prompts the user to "Choose from the map left hand panel either the polygon or the rectangle symbol to draw a border. After defining the spatial boundaries click the Store Boundaries button to proceed further."

The interface includes a "Boundary Name:" text input field and a "Geometry Polygon:" section. The map shows a geographical area with various countries and cities labeled, including the United Kingdom, Ireland, France, Germany, Poland, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, and Turkey. A scale bar indicates 500 km. A "Store Boundaries" button is located at the bottom left of the map area.

On the right side, the "INFRARISK Methodology" sidebar lists the following steps: Problem Identification, Define Stress Test, Define System Representation, Define Spatial Boundaries (highlighted in blue), Define Hazard Scenario, Define Network Characteristics, Estimate Risk, Evaluate Risk, and Determine Outcome of Stress Test.



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IDST: define hazard scenario

- Source event: e.g. earthquake
- Hazard events:
 - A ground motion hazard
 - and the cascading effects, i.e. earthquake-triggered landslides

IDST: define hazard scenario

infrarisk:dst | IDST Define Hazard Scenario - Mozilla Firefox
infrarisk:dst | IDST Def...
https://infrarisk.it-innovation.soton.ac.uk/idstpwe/define_hazard_scenario/22/
Search
Help IDST Tools Logout

Define Hazard Scenario

This step includes choosing the natural hazard(s) to be considered for the stress test.

This is carried out in three steps:

- choose hazard source to be considered
- choose the resulting hazard events(s) to be considered
- choose hazard model(s) to represent the hazard event(s)

Hazard Source

Choose the hazard source for this stress test.

Hazard source: Earthquake Store Hazard Source

The IDST does not currently support other hazard sources, please contact us for further information on how these should be considered.

Hazard Events

Add hazard events to your hazard scenario.

Associated hazard event list:

Hazard Type	Primary/Secondary	Model	Action
Ground Motion	primary	INFRARISK GM MODEL	Change model Delete
Landslide	secondary	N/A	Void Delete

Add Hazard Event

INFRARISK Methodology

- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario**
 - Define Network Characteristics
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test

IDST: configure hazard model

infrarisk:dst | IDST Ground Motion PGA Grid - Mozilla Firefox
infrarisk:dst | IDST Gro...
https://infrarisk.it-innovation.soton.ac.uk/hazards/hazard_scenario/4/7/
Search
Help ▾ IDST ▾ Tools ▾ Logout

IDST Home
Network Scenario

IDST INFRARISK Ground Motion Model Configuration

This ground motion hazard model is based on the INFRARISK GM model. Please select the PGA grid for the Ground Motion event.

Help

Seismic activity model: Low activity ▾

Ground-motion prediction model: Low attenuation ▾

Hazard level (Mean return period): 2500 years ▾


Fractile of extreme ground-motion: 0.50 ▾

Store stress test hazard configuration.

Store hazard configuration


INFRARISK Methodology

- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario
 - Define Network Characteristics
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test



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IDST: define network scenario

IDST Home
Add Network Elements

Define Network Characteristics

This involves defining the network type and extent along with the element types to consider as part of the stress test. This requires a number of steps as shown below:

- Choose network type
- Choose types of network elements to be considered
 - Choose hazard event deemed to impact each element type
 - Choose approach for assigning fragility functions to element types
- Assign spatial boundary to network

Network Infrastructure

Choose the network type.

Infrastructure:
Road Network
Store Network Infrastructure

Network Elements

Add the element types on the network to be considered in the stress test.

Help

Network element type	Hazard event	Fragility Functions	Action
Bridge	Ground Motion	BRIDGE	Change approach Delete
Tunnel	Ground Motion	TUNNEL	Change approach Delete

Add Element Types

Spatial Boundaries

Choose boundary to assign to network

Spatial boundaries bound to this hazard scenario is: NORTHERN ITALY

Change Spatial Border

INFRARISK Methodology

Problem Identification
Define Stress Test
Define System Representation

Define Spatial Boundaries
Define Hazard Scenario
Define Network Characteristics

Estimate Risk
Evaluate Risk
Determine Outcome of Stress Test

Assigning Bridge, Tunnel Fragility Curves

- Median fragility curves with confidence bounds is ported to IDST
- Bridge and tunnel structural data modelled and ingested in IDST, 340 bridges, 30 tunnels
- Mean and standard-deviation for all damage states is calculated for 4 damage states
- Damage state sampling algorithm is also ported in IDST for a given hazard intensity (IM)

a/a	Damage State	Description
0	DS0	No damage
1	DS1	Slight damage
2	DS2	Moderate damage
3	DS3	Extensive damage
4	DS4	Complete damage

Assigning Road Section Fragility Curves

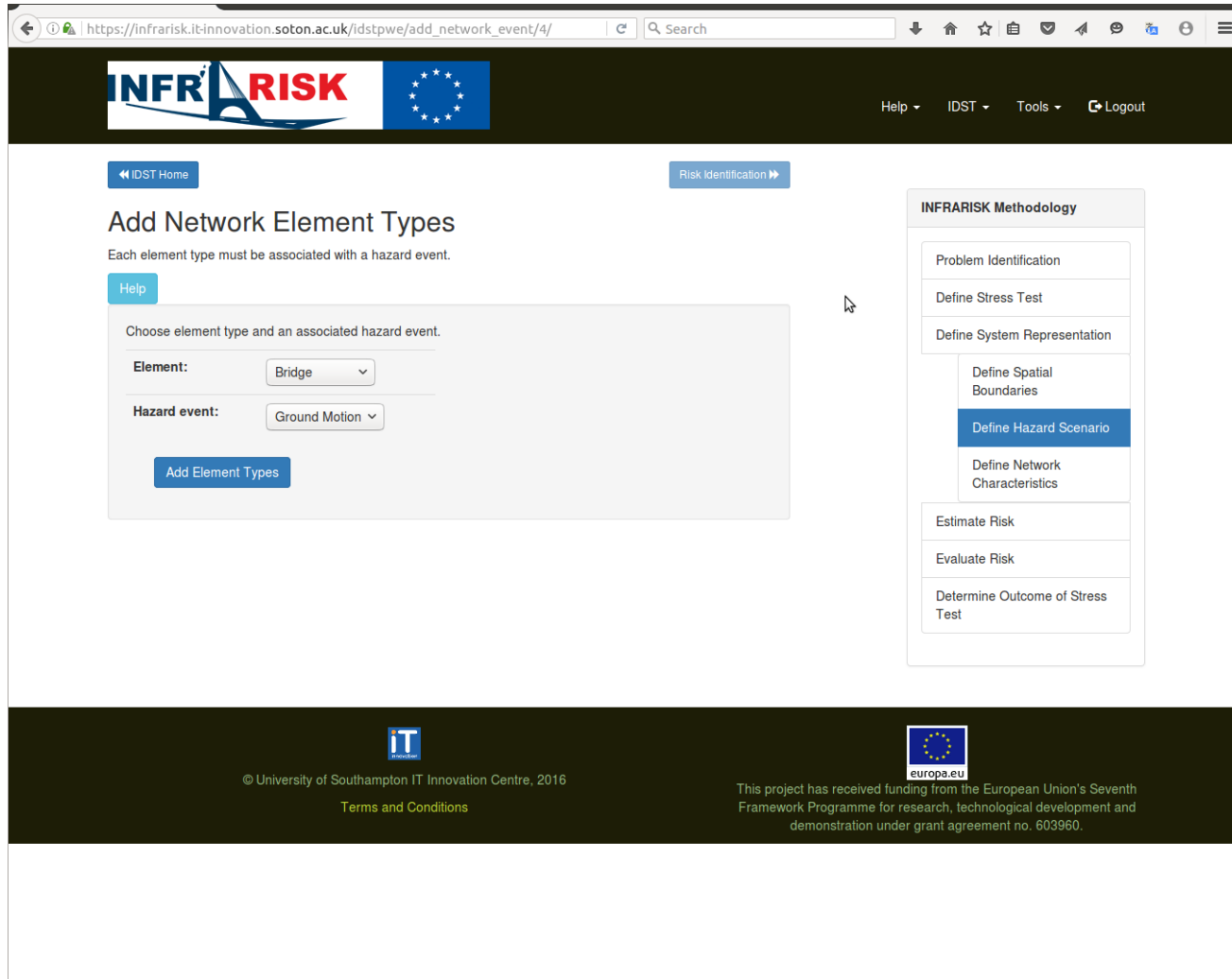

Structural Road sections data are modelled

Landslide data are modelled

Fragility Curves calculation porting to IDST is implemented

a/a	Damage State	Description
0	DS0	No damage
1	DS1	Slight damage
2	DS2	Moderate damage
3	DS3	Extensive damage

IDST: add network type elements

[Help](#)
[IDST](#)
[Tools](#)
[Logout](#)

[IDST Home](#)
[Risk Identification](#)

Add Network Element Types

Each element type must be associated with a hazard event.

[Help](#)

Choose element type and an associated hazard event.

Element:

Bridge

Hazard event:

Ground Motion

Add Element Types

INFRARISK Methodology

Problem Identification

Define Stress Test

Define System Representation

Define Spatial Boundaries


Define Hazard Scenario

Define Network Characteristics

Estimate Risk


Evaluate Risk

Determine Outcome of Stress Test



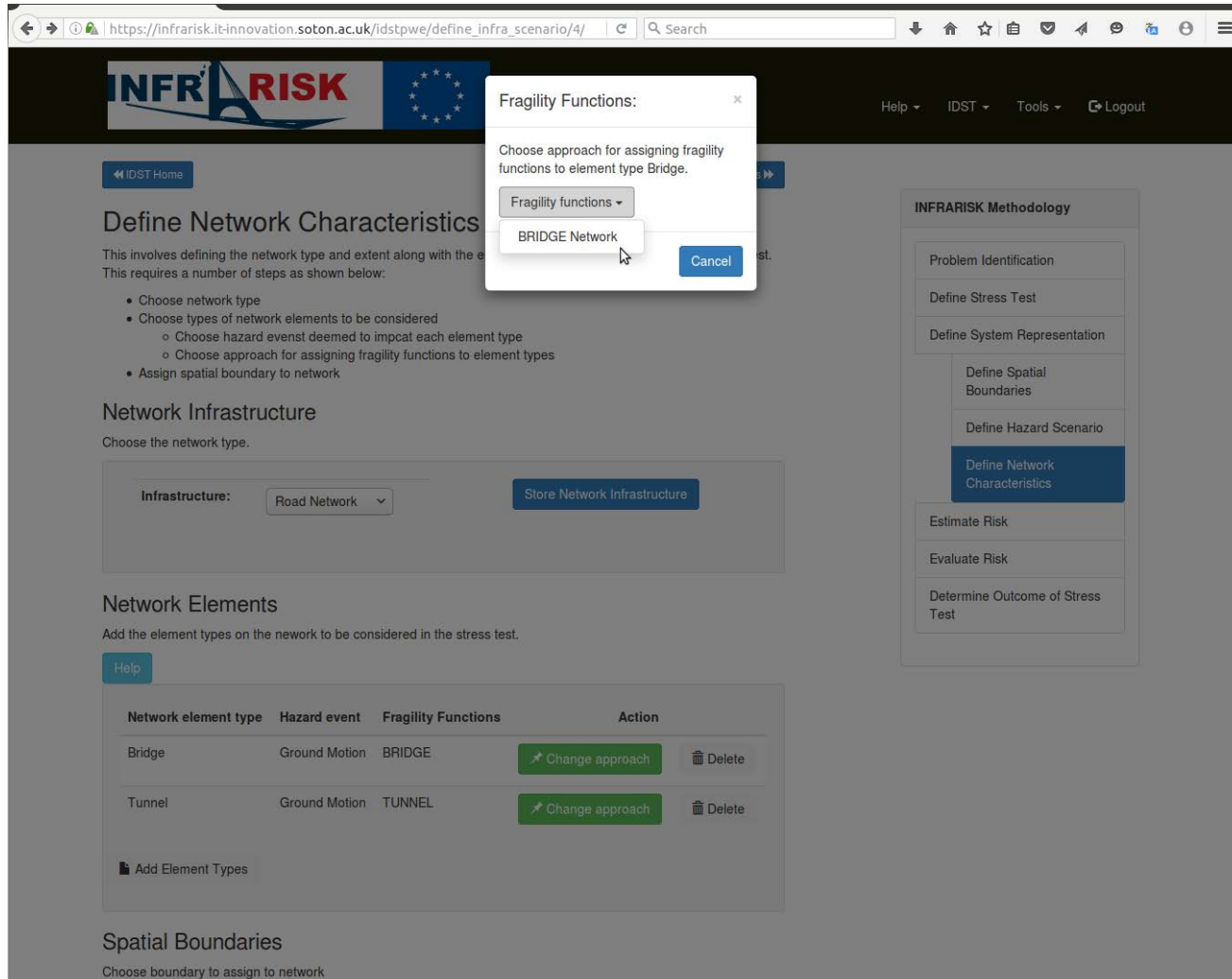
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IDST: assign fragility functions



The screenshot shows the INFRARISK web application interface. The main heading is "Define Network Characteristics". Below it, a list of steps is provided: "Choose network type", "Choose types of network elements to be considered" (with sub-steps "Choose hazard event deemed to impact each element type" and "Choose approach for assigning fragility functions to element types"), and "Assign spatial boundary to network".

The "Network Infrastructure" section shows a dropdown menu for "Infrastructure" set to "Road Network" and a "Store Network Infrastructure" button.

The "Network Elements" section shows a table with columns: "Network element type", "Hazard event", "Fragility Functions", and "Action".

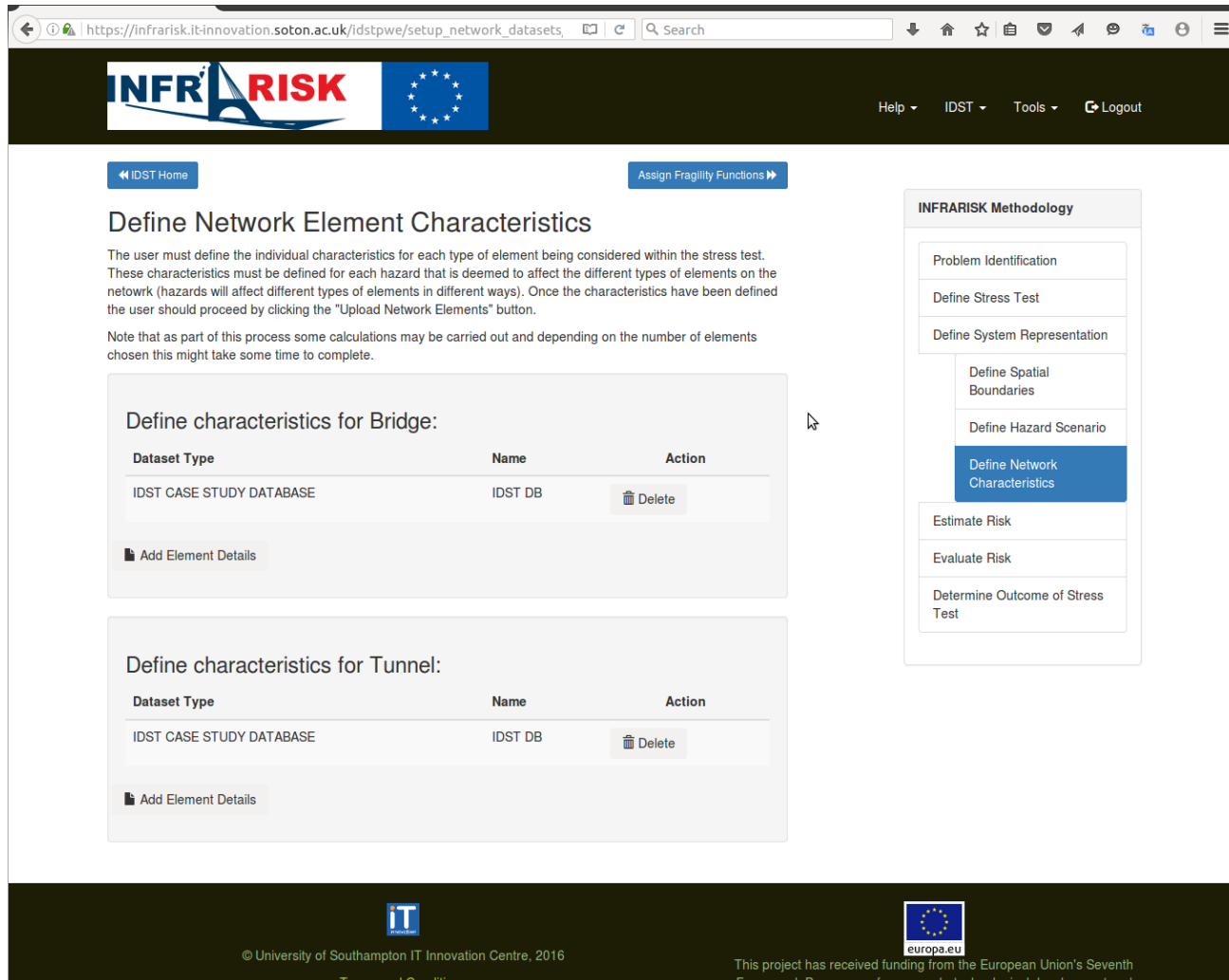
Network element type	Hazard event	Fragility Functions	Action
Bridge	Ground Motion	BRIDGE	Change approach, Delete
Tunnel	Ground Motion	TUNNEL	Change approach, Delete

A modal window titled "Fragility Functions:" is open, showing a dropdown menu for "Fragility functions" with "BRIDGE Network" selected. The modal also includes a "Cancel" button.

The "Spatial Boundaries" section is partially visible at the bottom, with the instruction "Choose boundary to assign to network".

On the right side, the "INFRARISK Methodology" sidebar lists the following steps: "Problem Identification", "Define Stress Test", "Define System Representation", "Define Spatial Boundaries", "Define Hazard Scenario", "Define Network Characteristics" (highlighted in blue), "Estimate Risk", "Evaluate Risk", and "Determine Outcome of Stress Test".

IDST: Define network element characteristics



The screenshot shows the INFRARISK web application interface. The browser address bar displays the URL: https://infrarisk.it-innovation.soton.ac.uk/idstpwe/setup_network_datasets. The page header includes the INFRARISK logo and the European Union flag. Navigation links for Help, IDST, Tools, and Logout are visible.

The main content area is titled "Define Network Element Characteristics". It includes a brief instruction: "The user must define the individual characteristics for each type of element being considered within the stress test. These characteristics must be defined for each hazard that is deemed to affect the different types of elements on the network (hazards will affect different types of elements in different ways). Once the characteristics have been defined the user should proceed by clicking the 'Upload Network Elements' button." A note mentions that calculations may be carried out depending on the number of elements chosen, which might take some time to complete.

There are two sections for defining characteristics: "Define characteristics for Bridge:" and "Define characteristics for Tunnel:". Each section contains a table with the following columns: Dataset Type, Name, and Action.



Dataset Type	Name	Action
IDST CASE STUDY DATABASE	IDST DB	Delete

Below each table is a button labeled "Add Element Details".

On the right side, there is a sidebar titled "INFRARISK Methodology" with a list of steps: Problem Identification, Define Stress Test, Define System Representation, Define Spatial Boundaries, Define Hazard Scenario, Define Network Characteristics (highlighted in blue), Estimate Risk, Evaluate Risk, and Determine Outcome of Stress Test.

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IDST: Dataset network element characteristics

[Help](#)
[IDST](#)
[Tools](#)
[Logout](#)

[IDST Home](#)
[Risk Identification](#)

System Definition: Define Network Element Characteristics

The current version of the IDST supports the following formats for defining element characteristics:

- Network element datasets already preloaded in IDST databases, e.g. Northern Italy case study.
- User defined network element datasets in a shapefile format.
- User defined network element datasets in a CSV format.

Please choose any of the following methods to define characteristics for individual network elements.


User defined network element characteristics:

☐ Use elements found in IDST databases.
 ☐ User upload elements in shapefile format.
 ☐ User upload elements in CSV format.

[+ Add network elements](#)
[x Cancel](#)


INFRARISK Methodology

- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario
 - Define Network Characteristics**
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test



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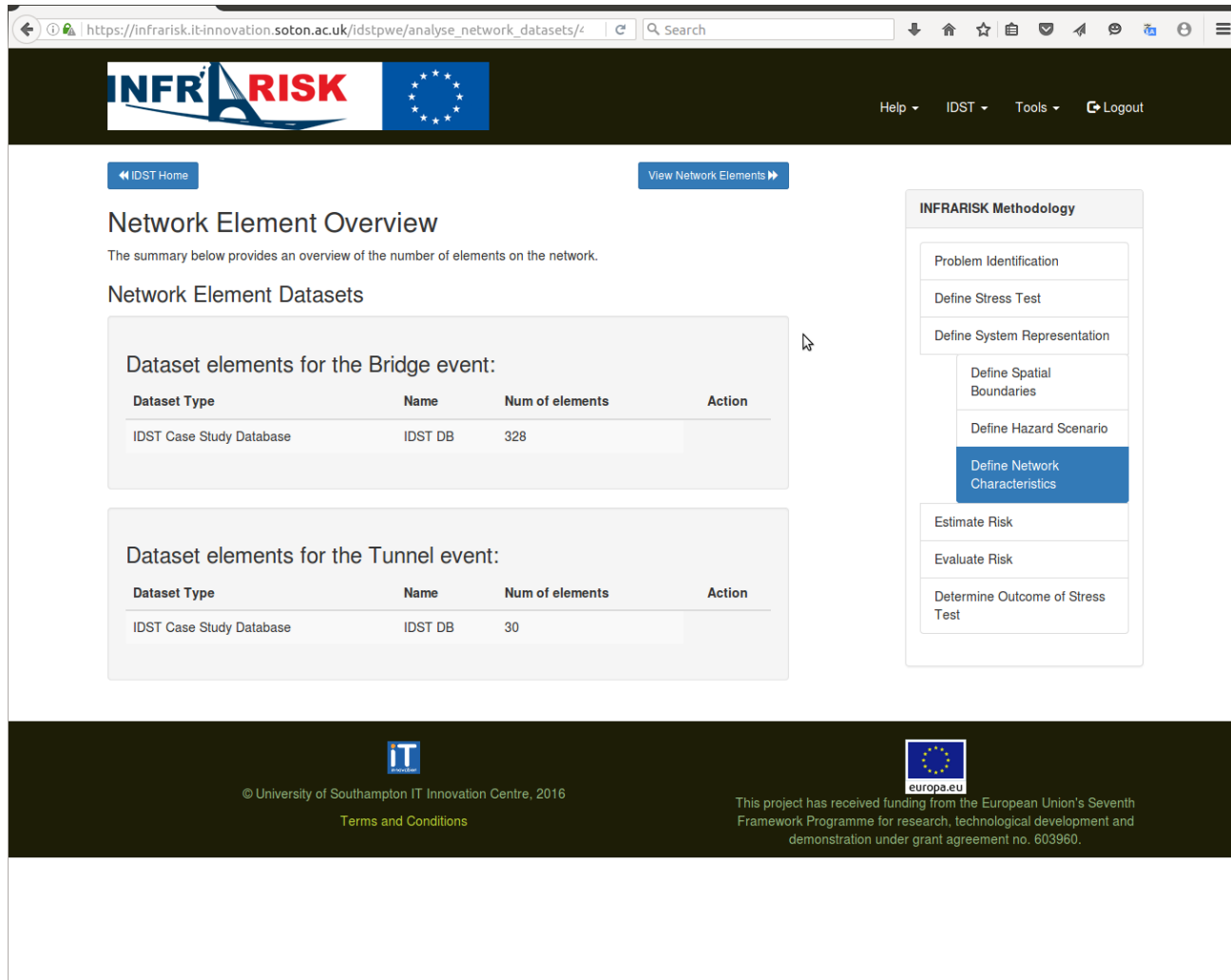
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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 603960.

IDST: Overview of network element datasets



The screenshot shows the INFRARISK web application interface. The browser address bar displays the URL: https://infrarisk.it-innovation.soton.ac.uk/idstpwe/analyse_network_datasets/. The page features the INFRARISK logo and the European Union flag in the header. Navigation links include Help, IDST, Tools, and Logout.

The main content area is titled "Network Element Overview" and includes a sub-header "Network Element Datasets". It provides a summary of the number of elements on the network. Two tables are displayed, one for the Bridge event and one for the Tunnel event.

Dataset elements for the Bridge event:

Dataset Type	Name	Num of elements	Action
IDST Case Study Database	IDST DB	328	

Dataset elements for the Tunnel event:



Dataset Type	Name	Num of elements	Action
IDST Case Study Database	IDST DB	30	

The right sidebar contains the "INFRARISK Methodology" section, which lists the following steps:

- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario
 - Define Network Characteristics** (highlighted)
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test

The footer includes the University of Southampton IT Innovation Centre logo and contact information, as well as the European Union flag and a statement of funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 603960.

IDST: Network element overview

[Help](#)
[IDST](#)
[Tools](#)
[Logout](#)

[IDST Home](#)
[Select Centre Point](#)

Network Element Overview: Northern Italy 2016-09-15

09:59:20.484043

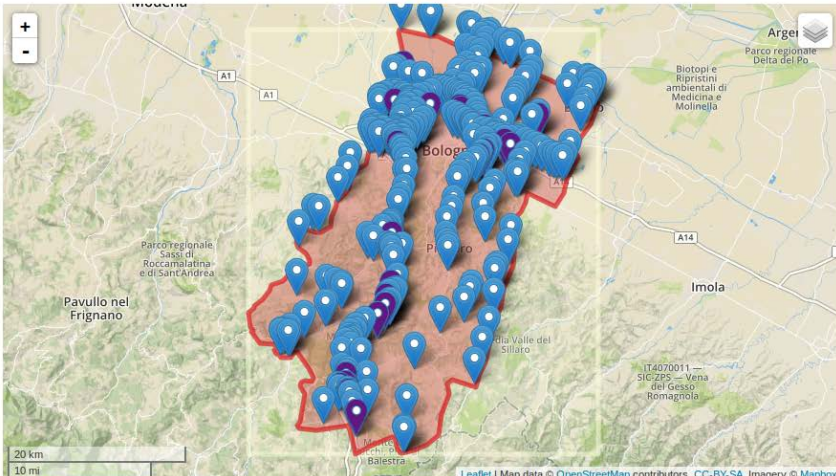
Infrastructure elements included in this stress test:

- Number of bridges: 328
- Number of tunnels: 30

Next: select the centre point of the PGA grid for this case study.



N.B. Hover over the layers icon, on the right hand side of the map below, to control the display of network element markers on the map.

Click on any element for further details.



INFRARISK Methodology

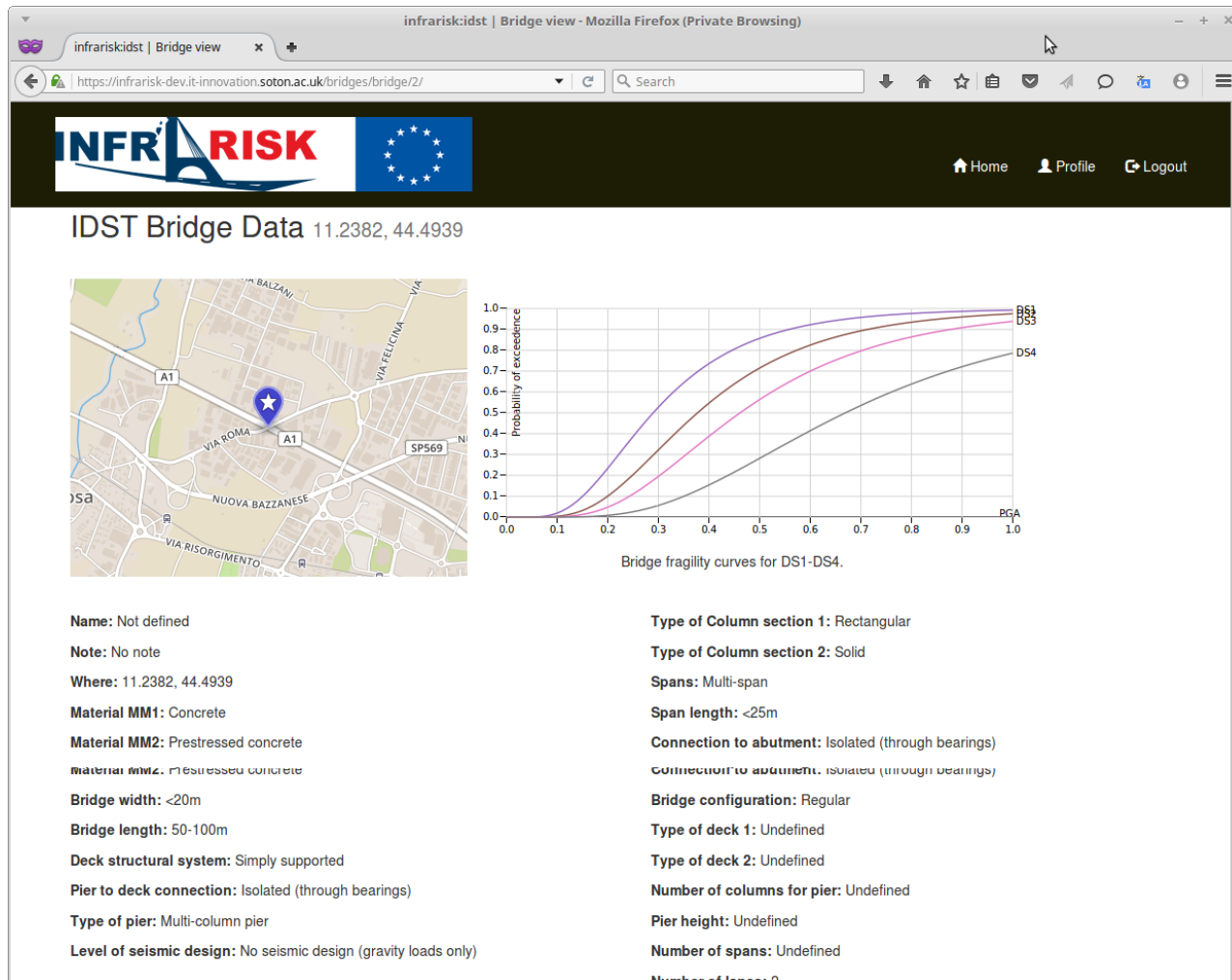
- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario
 - Define Network Characteristics**
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test

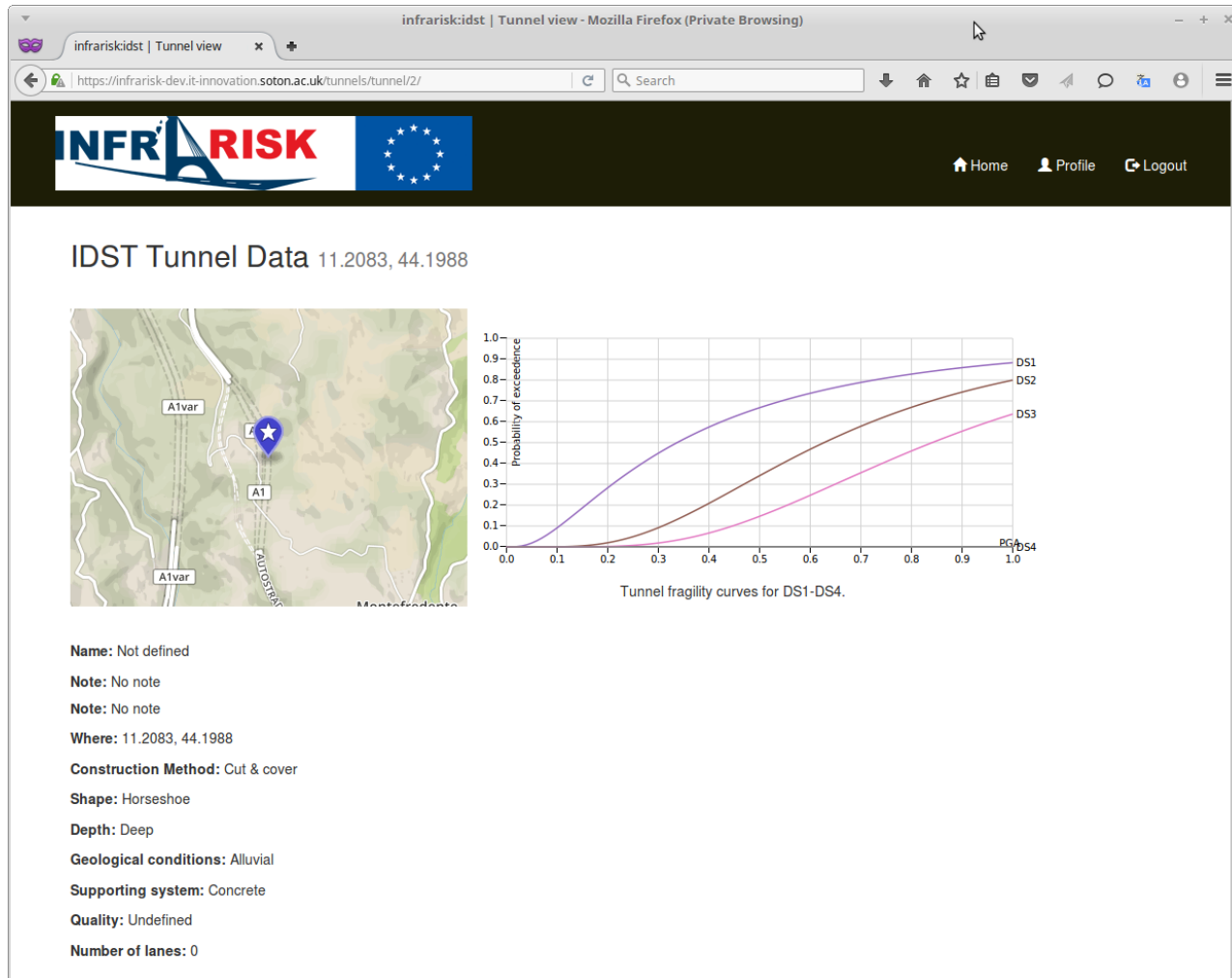
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This project has received funding from the European Union's Seventh

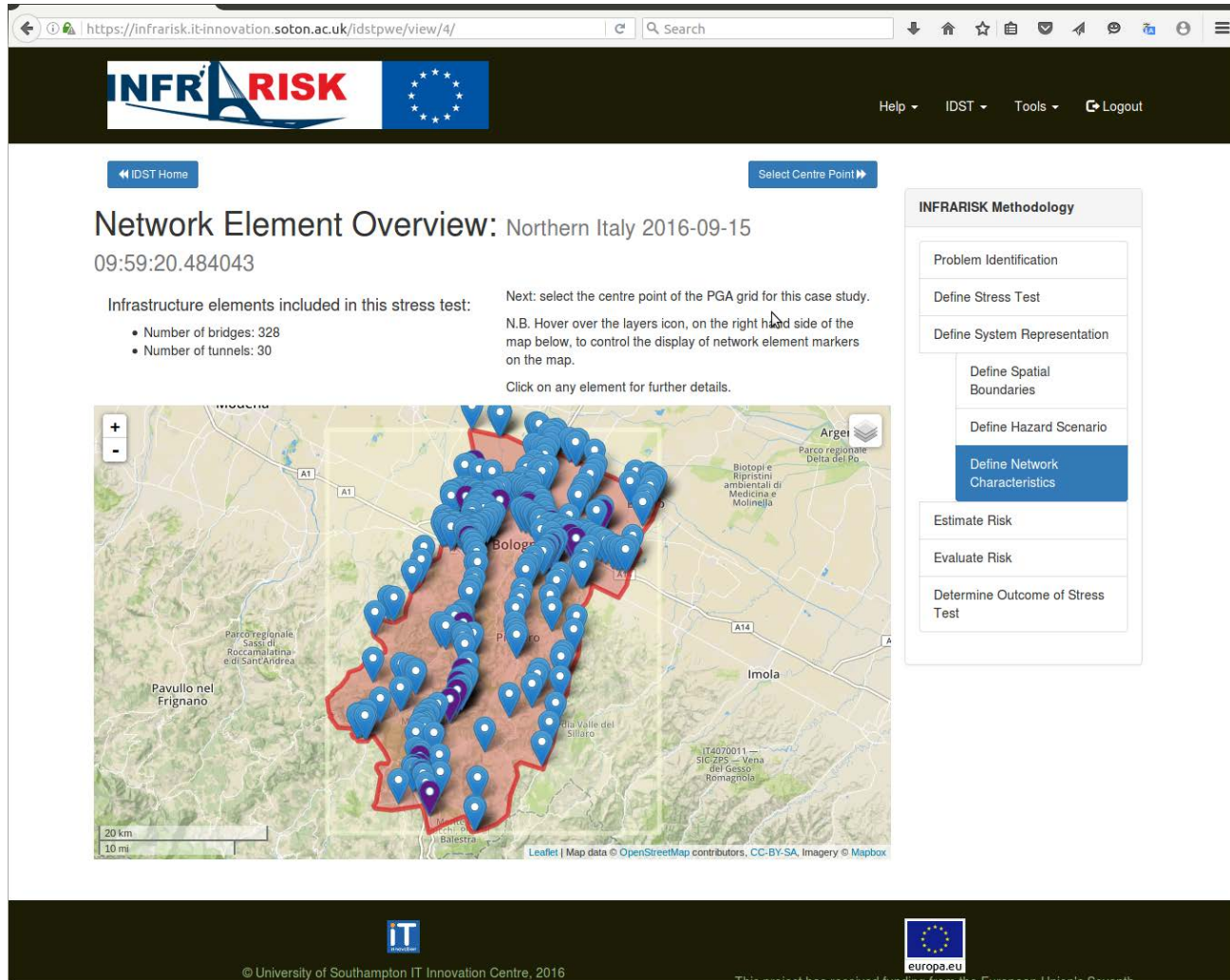
Bridge summary with assigned Fragility Curves



Tunnel summary with assigned Fragility Curves



IDST: Choose centre point of interest



The screenshot displays the INFRARISK web application interface. The browser address bar shows the URL: <https://infrarisk.it-innovation.soton.ac.uk/idstpwe/view/4/>. The page header includes the INFRARISK logo and the European Union flag. Navigation links include Help, IDST, Tools, and Logout.

The main content area is titled "Network Element Overview: Northern Italy 2016-09-15" with a timestamp of 09:59:20.484043. It provides information about the infrastructure elements included in the stress test:

- Number of bridges: 328
- Number of tunnels: 30

Instructions for the next step are provided: "Next: select the centre point of the PGA grid for this case study. N.B. Hover over the layers icon, on the right hand side of the map below, to control the display of network element markers on the map. Click on any element for further details."

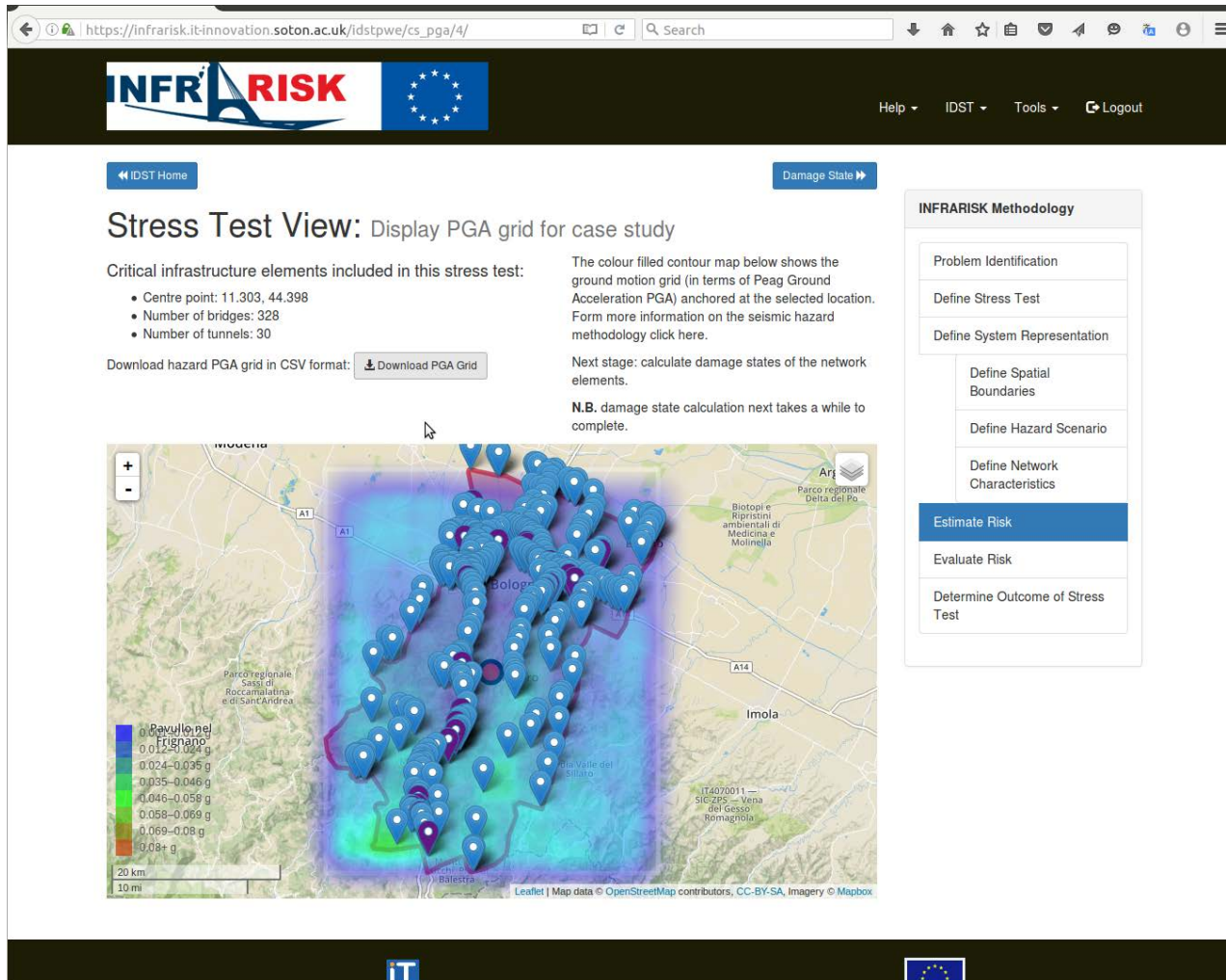
The map shows a geographical area in Northern Italy, with a red outline indicating the study area. Numerous blue location pins are overlaid on the map, representing network elements. A scale bar indicates 20 km and 10 miles.

On the right side, the "INFRARISK Methodology" section lists the following steps:

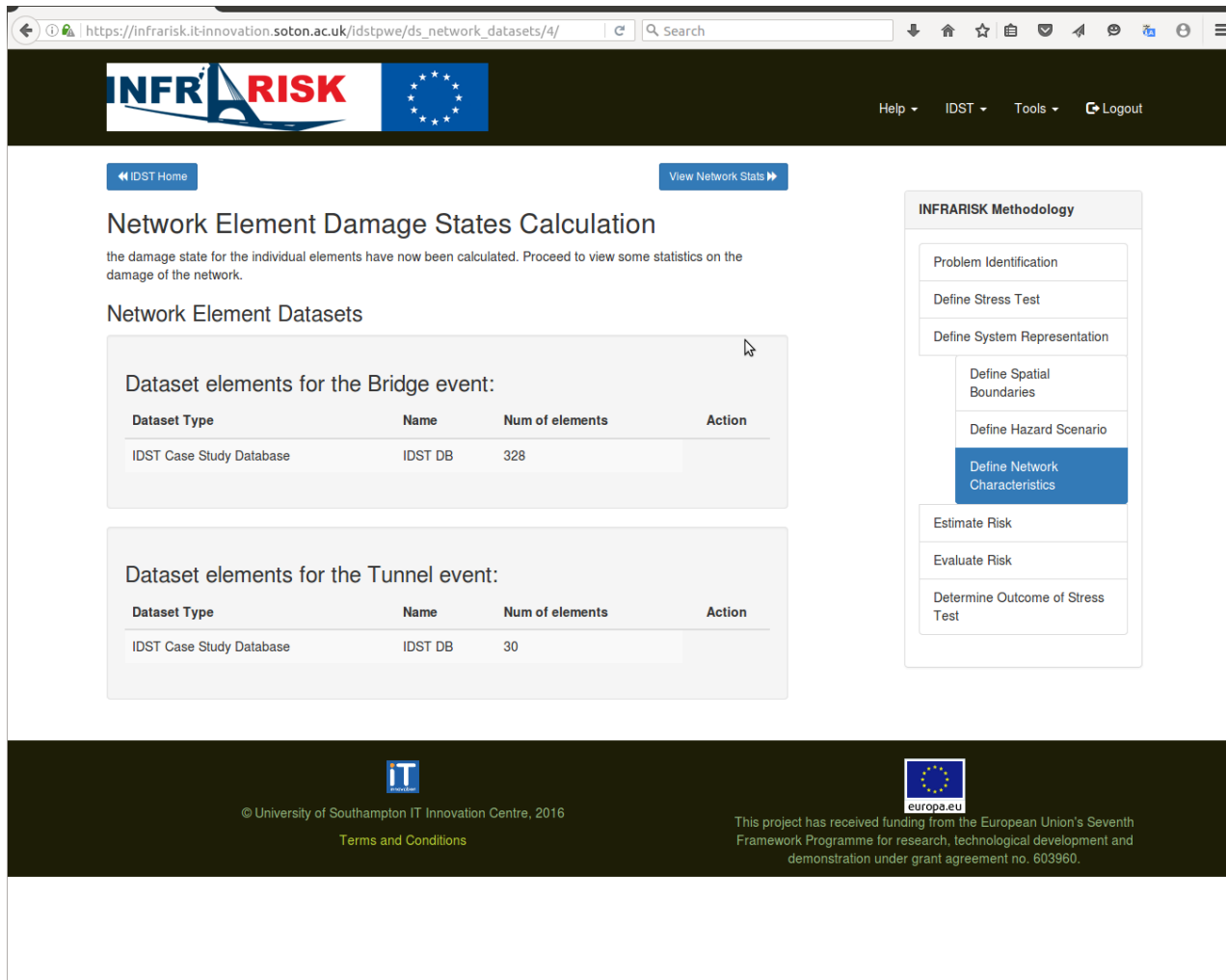
- Problem Identification
- Define Stress Test
- Define System Representation
- Define Spatial Boundaries
- Define Hazard Scenario
- Define Network Characteristics** (highlighted in blue)
- Estimate Risk
- Evaluate Risk
- Determine Outcome of Stress Test

The footer of the page includes the IT logo, the text "© University of Southampton IT Innovation Centre, 2016", the European Union flag, and the text "This project has received funding from the European Union's Seventh Framework Programme for research and innovation under grant agreement No 101019719".

IDST: Anchor PGA grid on centre point



IDST: Calculate Damage States



The screenshot shows the INFRARISK web application interface. The browser address bar displays the URL: https://infrarisk.it-innovation.soton.ac.uk/idstpwe/ds_network_datasets/4/. The page features a dark header with the INFRARISK logo and the European Union flag. Navigation links include Help, IDST, Tools, and Logout. The main content area is titled "Network Element Damage States Calculation" and includes a sub-header "Network Element Datasets". It displays two tables: "Dataset elements for the Bridge event:" and "Dataset elements for the Tunnel event:". Both tables show data from the "IDST Case Study Database" with 328 and 30 elements respectively. A sidebar on the right lists the "INFRARISK Methodology" steps, with "Define Network Characteristics" highlighted. The footer contains logos for IT Innovation and the European Union, along with copyright information and a disclaimer.

Network Element Damage States Calculation

the damage state for the individual elements have now been calculated. Proceed to view some statistics on the damage of the network.

Network Element Datasets

Dataset elements for the Bridge event:

Dataset Type	Name	Num of elements	Action
IDST Case Study Database	IDST DB	328	

Dataset elements for the Tunnel event:

Dataset Type	Name	Num of elements	Action
IDST Case Study Database	IDST DB	30	

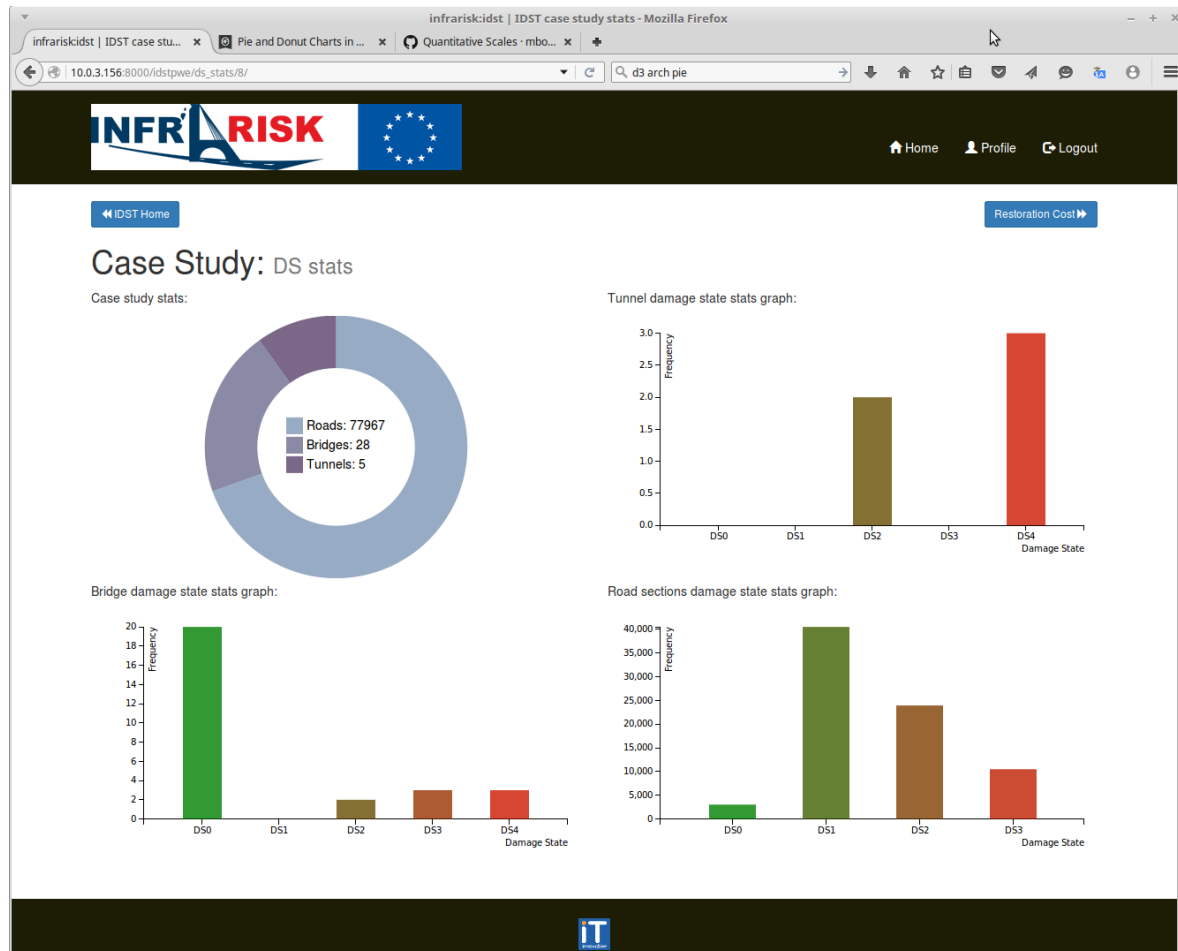
INFRARISK Methodology

- Problem Identification
- Define Stress Test
- Define System Representation
 - Define Spatial Boundaries
 - Define Hazard Scenario
 - Define Network Characteristics**
- Estimate Risk
- Evaluate Risk
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Case Study Damage State stats



Assigning provisional consequence parameters

	Functional Capacity Loss	Functional Capacity Loss during Restoration	Restoration Time	Restoration Cost
	(% Lane Closure)	(% Lane Closure)	(Days)	(Euros)
Pavements (All)				
No Damage	0	0	0	0
Slight/Minor	0	0.5	1	500
Moderate	0.5	0.5	1	1000
Extensive/Complete	1	1	1	3500
Bridges (All)				
No Damage	0	0	0	0
Slight/Minor	0	0.5	120	100000
Moderate	0.5	0.5	120	750000
Extensive/Major/Severe	1	1	150	1000000
Complete/Collapse/Failure	1	1	150	1000000
Tunnels (All)				
No Damage	0	0	0	0
Slight/Minor	0.75	0.75	120	150000
Moderate	1	1	120	1000000
Extensive/Major/Severe	1	1	120	3000000
Complete/Collapse/Failure	1	1	365	10000000

Join us to run the IDST

<https://infrarisk.it-innovation.soton.ac.uk/>

Thank You



Novel Indicators for identifying critical **INFRA**structure at **RISK** from Natural Hazards

Website

www.infrarisk-fp7.eu

Acknowledgement

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 603960