

# iGUESS-SL – An integrated Geospatial Urban dEcision Support System for Smart City Logistics

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Smart Urban Transport Policy Futures, London - July 10-11,  
2014

# Background

## Freight transportation targets within the EU

- ▶ Speed up deliveries across the NWE area;
- ▶ Reduced CO<sub>2</sub> and noise in city centres and freight hubs, and reduce the carbon footprint of logistics overall;
- ▶ Ensure more reliable deliveries;
- ▶ Provide more sustainable whole-journey choices;
- ▶ Ensure enhanced collaboration between logistics businesses;
- ▶ Engender enhanced collaboration between city centre businesses.

# LaMiLo contributes to urban solutions

## LaMiLo

- ▶ **aims** at reducing CO<sub>2</sub> & noise emissions in urban areas;
- ▶ **involves** stakeholders;
- ▶ **uses** modelling tools and best practises for sustainable freight transportation;
- ▶ **develops** innovative strategies for sustainable freight transportation and logistics planning.

# LaMiLo contributes to urban solutions

## LaMiLo

- ▶ **aims** at reducing CO<sub>2</sub> & noise emissions in urban areas;
- ▶ **involves** stakeholders;
- ▶ **uses** modelling tools and best practises for sustainable freight transportation;
- ▶ **develops** innovative strategies for sustainable freight transportation and logistics planning.

⇒ **GIS can help developing sustainable solutions by integrating information across different disciplines and provide more evidence to the decision processes.**

# Objectives of GIS integration

## Smart City Logistics – a decision support platform providing:

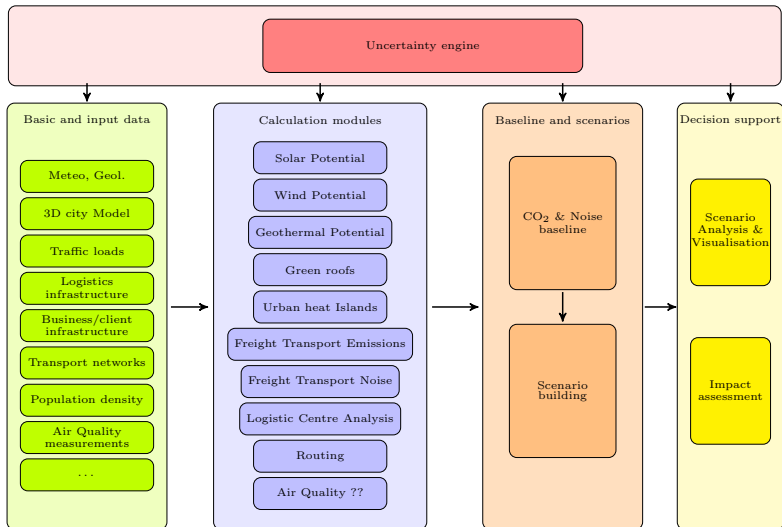
- ▶ geospatial modelling and assessment tools to determine improved last mile logistics;
- ▶ simplified access to complex spatial and temporal information for stakeholders and decision makers;
- ▶ interoperability respecting open standards to integrate distributed data sources, different modelling and analysis tools.

# Specific Objectives

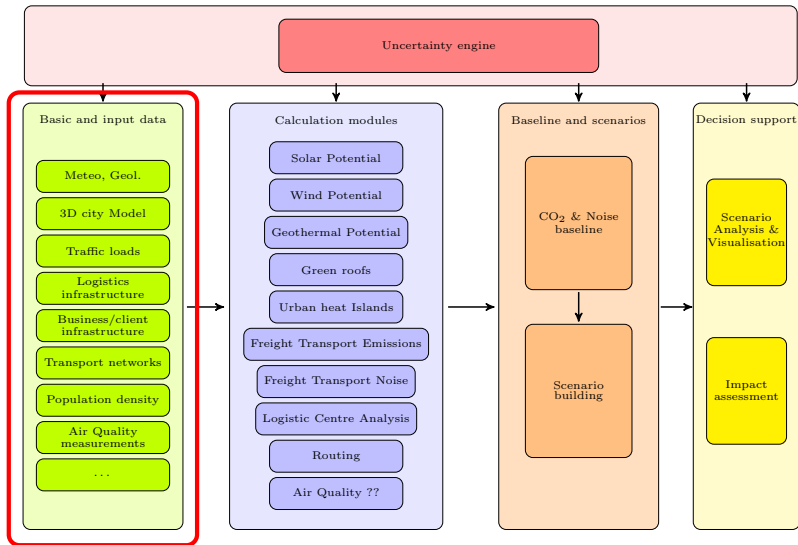
## Smart City Logistics – a decision support system which provides

1. Modelling tools for:
  - ▶ emission allocation for road segments;
  - ▶ noise allocation for road segments;
  - ▶ finding routes with least/balanced costs (minimise €, emissions, noise, environmental and population impact) connecting different modes;
2. Decisions support tools for:
  - ▶ map visualisation and scenario comparison;
  - ▶ development and testing of transport mode scenarios;
  - ▶ location analysis of potential consolidation centre.
3. Framework for interoperable data and model integration for urban freight transportation.

# The Smart City Logistics Framework

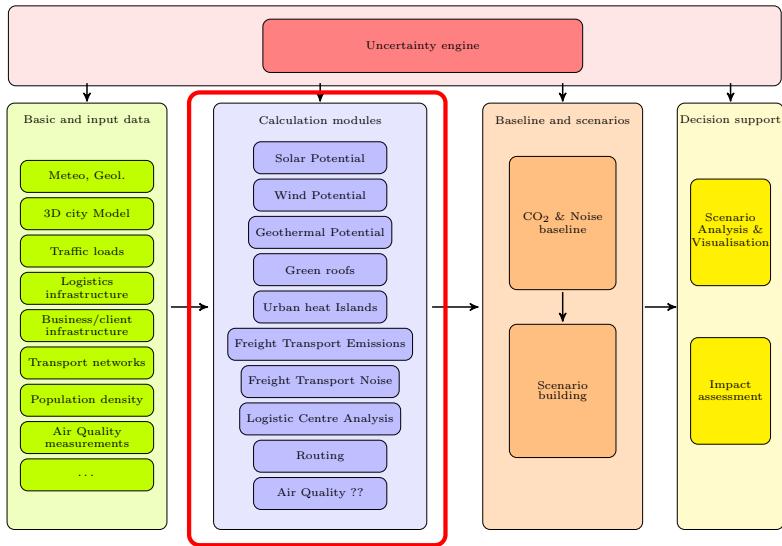


# The Smart City Logistics Framework

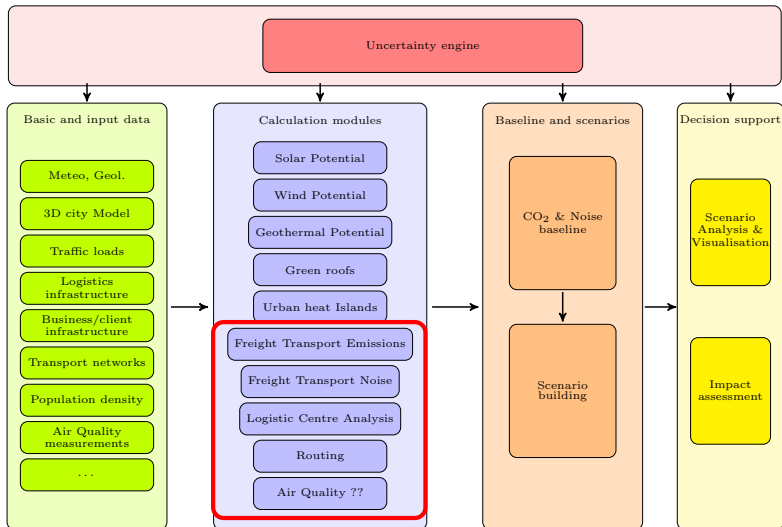




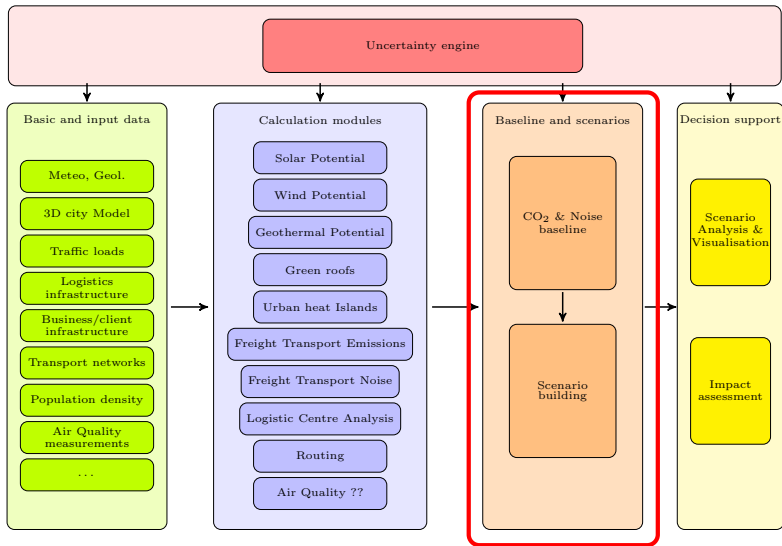
# The Smart City Logistics Framework



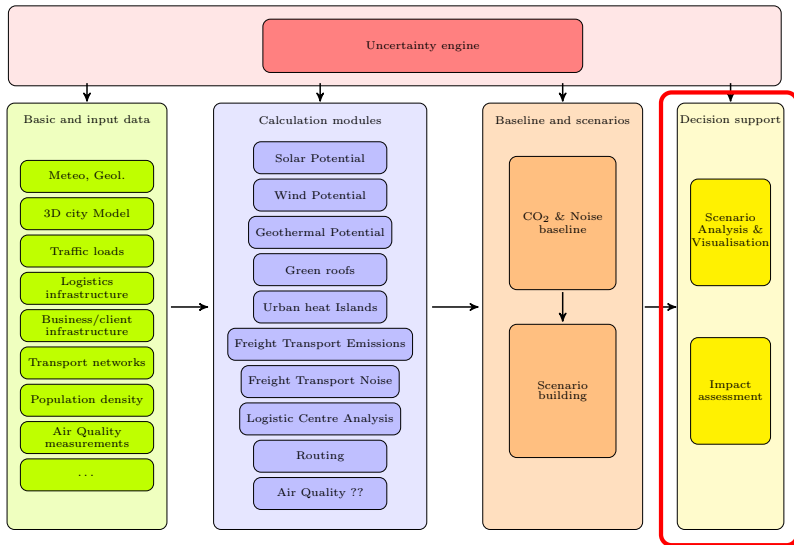
# The Smart City Logistics Framework



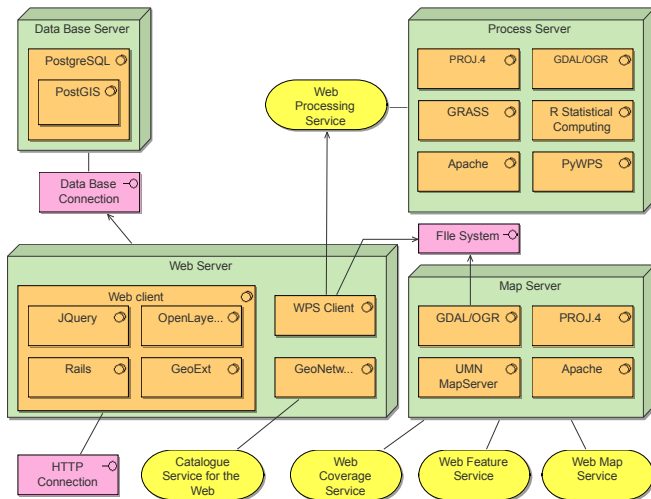
# The Smart City Logistics Framework



# The Smart City Logistics Framework



# The iGUESS Technological Architecture



## LaMiLo outputs

The major LaMiLo outputs originating from the Smart City Logistics approach are tools to:

- ▶ visualise data and modelling results,
- ▶ compute CO<sub>2</sub> (and NO<sub>x</sub>) emissions originating from freight traffic,
- ▶ model noise propagation from freight transport across 2D (3D) space and time,
- ▶ compute spatial costs associated to freight transportation,
- ▶ find optimal routes and transportation modes in inner cities,
- ▶ enable scenario development and testing,
- ▶ provide improved support to decision making by integrating information,
- ▶ provide a basis for the development of monitoring indicators.

# The Smart City Logistics Web Interface

# The Smart City Logistics Start Page

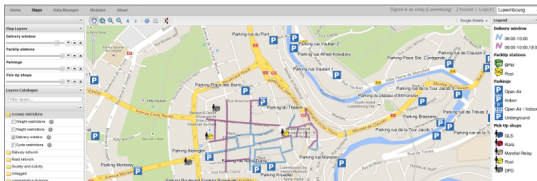


understand your options...

plan your future.


Smart City Logistics is a decision support platform for urban logistics for European cities. Smart City Logistics provides decision makers with a wide range of easy to understand information to support the development of urban freight transportation plans. Addressing urban logistics requires an integrated understanding of transport, environmental and socio-economic aspects to arrive at sustainable solutions. The Smart City Logistics platform maps information on transportation networks, access restrictions, traffic measures, delivery and transport facilities, administrative units, population, land use and emission situations. Smart City Logistics allows to assess trends and relationships from different perspectives and identify innovative and strong sustainable solutions.

## Maps Preview






# The Smart City Logistics Data manager



**Smart City Logistics**  
 powered by iGUESS



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[Maps](#)
[Data Manager](#)
[Modules](#)
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Signed in as Ulrich (Luxembourg) [Account] [Logout] Luxembourg

## Registered Datasets

Filter:  [Register New Datasets](#)

Name	Tags	Registered	Published?	Status	Server
Buildings (Commerce, non-food, big volume) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Commerce, non-food, small volume) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Food retail) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Health) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Horeca) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Industry) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Tertiary) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Buildings (Trade) ⚙	<a href="#">Buildings</a> <a href="#">Mapping</a>	2014-02-14	<input type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Bus lanes ⚙	<a href="#">Road network</a> <a href="#">Mapping</a>	2014-01-30	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Cantons ⚙	<a href="#">Administrative divisions</a> <a href="#">Mapping</a>	2014-05-12	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Charging points ⚙	<a href="#">Transport facilities</a> <a href="#">Mapping</a>	2014-03-26	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Cycle network ⚙	<a href="#">Road network</a> <a href="#">Mapping</a>	2014-01-30	<input type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Cycle restrictions ⚙	<a href="#">Access restrictions</a> <a href="#">Mapping</a>	2014-02-14	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Delivery window ⚙	<a href="#">Access restrictions</a> <a href="#">Mapping</a>	2014-01-30	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Flat rent price ⚙	<a href="#">Society and Activity</a> <a href="#">Mapping</a>	2014-03-06	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Flat sale price ⚙	<a href="#">Society and Activity</a> <a href="#">Mapping</a>	2014-03-06	<input type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Gas stations ⚙	<a href="#">Transport facilities</a> <a href="#">Mapping</a>	2014-02-17	<input checked="" type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Height restrictions ⚙	<a href="#">Access restrictions</a> <a href="#">Mapping</a>	2014-02-17	<input type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
House sale price ⚙	<a href="#">Society and Activity</a> <a href="#">Mapping</a>	2014-03-06	<input type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site
Land use (OBS 1999) ⚙	<a href="#">Society and Activity</a> <a href="#">Mapping</a>	2013-09-01	<input type="checkbox"/> Publish	Available	Web-Service Demo with data stored at TUDOR site

# Register new Data Sets in Smart City Logistics

## Register Datasets



We cannot display sample maps for some datasets on this server. The most likely cause of this problem is that the server's WMS functionality is not properly configured: either a WMS service has not been defined for a particular identifier, or I cannot get a usable bounding box for the layers you have requested.

You can see how the server responds to WMS queries by clicking here: [WMS.GetCapabilities](#)



IGUESS uses datasets stored on remote servers. To register datasets with the system, enter a server URL in the box below. IGUIESS will probe the remote server and present you a list of datasets you can register. In order to use a dataset with a module, you will need to tag it with the appropriate tags. If you want to use the dataset for mapping purposes, use the Mapping tag.

IGUESS will probe for WFS, WCS, and WMS servers at the URL provided below. Layers offered by the WMS will be available for mapping, and layers offered by the WFS/WCS will be available for using as inputs to web processes.

Reload

Select a preset

[Delete From Presets](#)

### Server: Web-Service Demo with data stored at TUDOR site

This installation serves different Web-Service types (WMS, WFS) for testing

Server has 55 layers. SRS required for processing: EPSG:2169; SRS required for mapping: EPSG:3857.

#### Buildings (Commerce, non-food, big volume)

Identifier: building\_commerce\_non\_food\_retail\_big\_volume

available for mapping **yes**

available for processing **yes**

**REGISTERED**

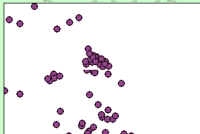
Services: WFS, WMS

Used in 0 configurations

☒ Buildings ☒ Mapping

Add Mapping Tag: ▼

Add Processing Tag: ▼



Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326

Processing Projections: EPSG:2169

#### Buildings (Commerce, non-food, small volume)

Identifier: building\_commerce\_non\_food\_retail\_small\_volume

available for mapping **yes**

available for processing **yes**

**REGISTERED**

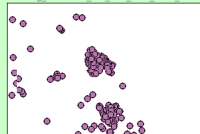
Services: WFS, WMS

Used in 0 configurations

☒ Buildings ☒ Mapping

Add Mapping Tag: ▼

Add Processing Tag: ▼



Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326

Processing Projections: EPSG:2169

# Tagging registered data sets

**Retail demand in million Euros**  
Retail demand for quarters in Luxembourg city  
Identifier: quarters\_retail\_demand

available for mapping **yes**  
available for processing **yes**

**REGISTERED**

Services: WMS, WFS  
Used in 0 configurations

☒ Society and Activity ☒ Mapping

**Society and Activity**  
Add Mapping Tag:  
Create New Tag  
Access restrictions  
Administrative divisions  
Buildings  
Delivery points  
Railway network  
Road network  
**Society and Activity**  
Transport facilities

Mapping Project: EPSG:3857; EPSG:4326

**Fiat sale price**  
Sale price for Flats [€/m² by quarter] in Luxembourg city  
Identifier: quarters\_saleprice\_flat

available for mapping **yes**  
available for processing **yes**

**REGISTERED**

Services: WMS, WFS  
Used in 0 configurations

☒ Society and Activity ☒ Mapping

Add Mapping Tag:   
Add Processing Tag:

Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326  
Processing Projections: EPSG:2169

**House sale price**  
Sale price for Houses in [€/m² by quarter] in Luxembourg city  
Identifier: quarters\_saleprice\_house

available for mapping **yes**  
available for processing **yes**

**REGISTERED**

Services: WMS, WFS  
Used in 0 configurations

☒ Society and Activity ☒ Mapping

Add Mapping Tag:   
Add Processing Tag:

Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326  
Processing Projections: EPSG:2169

**Rail network**  
Rail network  
Identifier: rail\_network

available for mapping **yes**  
available for processing **yes**

**REGISTERED**

Services: WMS, WFS  
Used in 0 configurations

☒ Railway network ☒ Mapping

Add Mapping Tag:   
Add Processing Tag:

Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326  
Processing Projections: EPSG:2169

**Road network**  
Road network  
Identifier: road\_network

available for mapping **yes**  
available for processing **yes**

**REGISTERED**

Services: WMS, WFS  
Used in 0 configurations

☒ Society and Activity ☒ Mapping

Add Mapping Tag:   
Add Processing Tag:

Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326  
Processing Projections: EPSG:2169

**Traffic Counting stations**  
Traffic Counting stations on Luxembourgish highways  
Identifier: traffic\_count\_stations

available for mapping **yes**  
available for processing **yes**

**REGISTERED**


Services: WMS, WFS  
Used in 0 configurations









☒ Society and Activity ☒ Mapping



Add Mapping Tag:   
Add Processing Tag:

Mapping Projections: EPSG:2169; EPSG:3857; EPSG:4326  
Processing Projections: EPSG:2169

# The Module Catalogue

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## Modules





- Users can create Module Configurations from a Module Template by specifying all inputs and outputs that template requires.
- A list of Module Templates can be found in the Module Catalog.

Configured Modules

Module Catalog

- Calculates a cost table for all the segments of a network.
- Nearest neighbour in available networks.
- Shortest path in a network using Dijkstra's algorithm.
- Shortest path in a network with a cost surface using Dijkstra's algorithm.
- Shortest path with a delivery van using Dijkstra's algorithm.
- Surface generation by Spline interpolation
- Surface generation by Spline interpolation

[Manage Processes](#)




**About LaMiLo**

- About Lamilo
- Influencing Change
- Benefits
- Influencing the Private Sector

**About Tudor**

- Register Your Interest: Sign up for email updates on Lamilo developments
- Tudor Website

**Interreg IWB**

iguess-sl.tudor.lu/mod\_configs#module\_catalog\_tab

# Choosing a Routing tool

## Modules



- Users can create Module Configurations from a Module Template by specifying all inputs and outputs that template requires.
- A list of Module Templates can be found in the Module Catalog.

Configured Modules

Module Catalog

- Calculates a cost table for all the segments of a network.
- Nearest neighbour in available networks.
- Shortest path in a network using Dijkstra's algorithm.
- Shortest path in a network with a cost surface using Dijkstra's algorithm.

Calculates the shortest path between two given nodes of a network, taking into account a cost surface. The cost of travelling through each network segment is directly derived from the cost surface using the `r.profile` GRASS function. Dijkstra's algorithm is then used to compute the shortest path taking these costs into account  
Hosted by: LaMILo PyWPS Server

Identifier: `dijkstraCostSurface`

### Model Inputs

Parameter Name	Identifier	Description
Cost surface from which to derive the segment cost.	[cost_map]	
Easting coordinate of the starting location.	[start_easting]	
Easting coordinate of the target location.	[target_easting]	
Northing coordinate of the starting location.	[start_northing]	
Northing coordinate of the target location.	[target_northing]	


### Model Outputs


Parameter Name	Identifier	Description
Shortest path between the given nodes in the network.	[path]	





[Create new configuration for this service](#)

# Configuring a Module

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## Module Configuration

✓ This module has been successfully run. You can now view the outputs in the Data Manager.

**Name** Test\_run\_ulll [\[Click to edit\]](#)

**Based on** Shortest path with a delivery van using Dijkstra's algorithm.

**Details** Calculates the shortest path travelled by a delivery van between two nodes of a network using the Dijkstra algorithm. It weights road segments from motorway to residential by lengths; all other segments are given a prohibitive cost.

**Note** - [\[Click to edit\]](#)

**Area of Interest** There are no datasets tagged with "Area of Interest"

**Inputs**

Parameter Name	Parameter Tag	Selected Dataset or Value
Easting coordinate of the starting location.	[start_easting]	undefined <input type="text"/>
Easting coordinate of the target location.	[target_easting]	undefined <input type="text"/>
Northing coordinate of the starting location.	[start_northing]	undefined <input type="text"/>
Northing coordinate of the target location.	[target_northing]	undefined <input type="text"/>

**Outputs**


Parameter Name	Output Dataset Identifier
Shortest path between the given nodes in the network.	Van-shortest1 <input type="text"/>

[View Configuration List](#) [Run Module Again >>>](#)

[Delete This Configuration](#)




MODULE STATUS: Run Completed

# Register New Modules



## Smart City Logistics


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### Register WPS Server








 Sample: <http://wps.iguess.tudor.lu/cgi-bin/pywps.cgi>


▼

[Delete From Presets](#)

**Server: MUSIC PyWPS Server**

This is the WPS Server of the MUSIC project. It is powered by PyWPS, see <http://pywps.wald.intevation.org> and <http://www.opengispatial.org/standards/wps>  
Owner: CRP Henri Tudor

	Solar irradiation
	PV Potential with user based input
	Aggregation service with support for slider tool
	Urban Heat Island characterisation
	Green roofs
	Geothermal cadastre
	Building stock energy consumption and savings



#### About LaMiLo

About LamiLo

- Influencing Change
- Benefits


*Influencing the Private Sector*

#### About Tudor

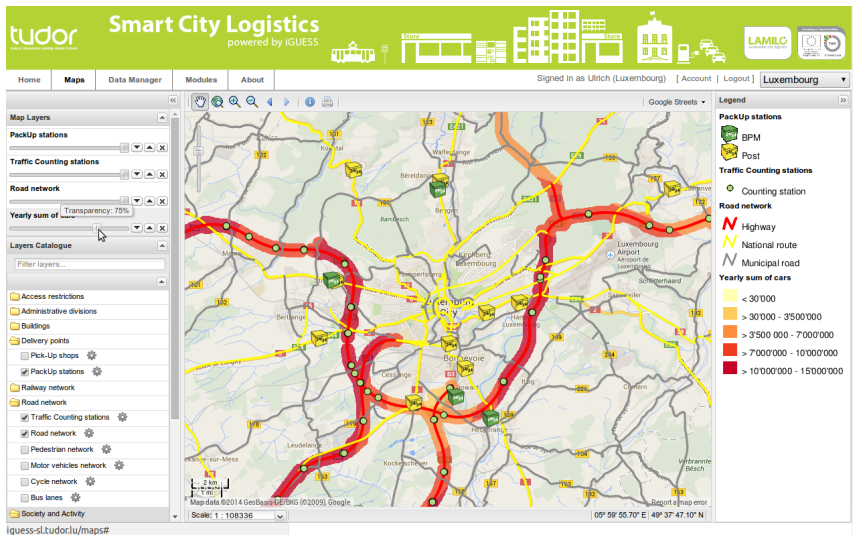
- Register Your Interest: Sign up for email updates on LamiLo developments

*Tudor Initiatives*

#### Interreg IWB

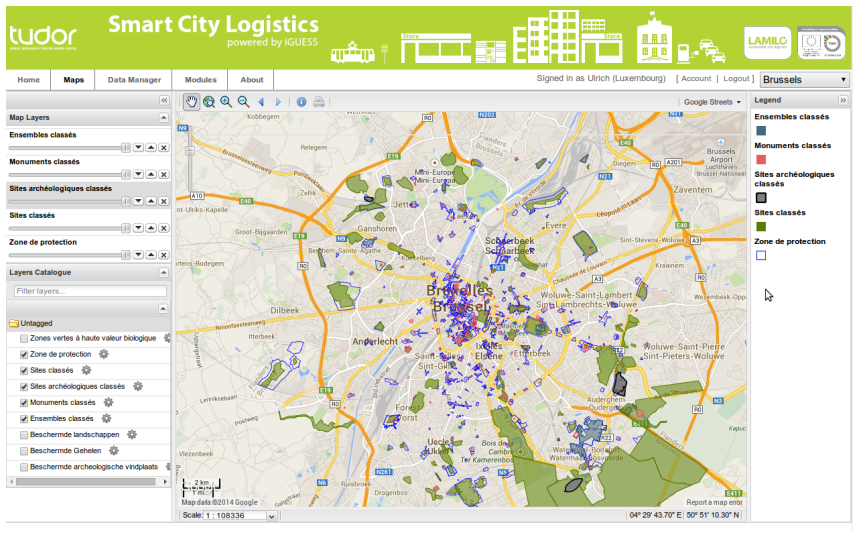


# Visualising information on Traffic





# Combining Information of different web services



# Accessing Information through the web

The screenshot displays the 'Smart City Logistics' web application, powered by iGUESS. The interface includes a header with the Tudor logo and navigation icons. A 'Cycle network' modal window is open, displaying the following information:

- Server Name:** Web-Service Demo with data stored at TUDOR site
- Data Services:** [WMS WFS Show Data](#)
- Mapping Tags:** [Road network](#)
- Processing Tags:** [Mapping](#)
- When registered:** January 30, 2014 13:25 (UTC)
- Configurations:** Not used in any configurations

Below the modal, a 'Technical details >>>' link is visible. The main map area shows a street map of Luxembourg with various transport networks overlaid. A 'Feature Info' window is open, displaying the following data:


Name	Value
Type	pedestrian
Name	Place d'Armes
DeliveryTimeWindow	06:00-10:00

The map also includes a legend for the 'Delivery window' and 'Cycle network' layers. The 'Delivery window' legend shows two time ranges: 06:00-10:00 (blue line) and 06:00-10:00, 18:00 (purple line). The 'Cycle network' legend shows two types: 'Dedicated lane' (red line) and 'Shared lane' (orange line). The map is signed in as 'Ulrich (Luxembourg)' and shows the location of 'Luxembourg'.

# Emission Scenario Modelling

## Smart City Logistics

powered by iGUESS



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### Scenario list

Filter:

Name				
<a href="#">Camden 4 weeks extrapolated</a>		<a href="#">edit</a>	<a href="#">replicate</a>	<a href="#">delete</a>
<a href="#">Normal Route Vs Optimal Route</a>		<a href="#">edit</a>	<a href="#">replicate</a>	<a href="#">delete</a>

[New Scenario](#)



#### About LaMiLo


- Influencing Change
- Benefits
- Influencing the Public Sector

#### About Tudor


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#### Interreg IVB

Investing in Opportunities



This project has received European Regional Development funding through INTERREG IVB

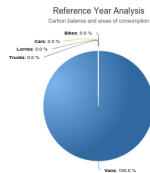
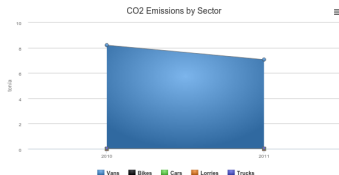


INTERREG IVB

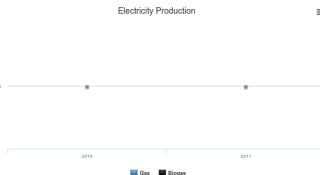
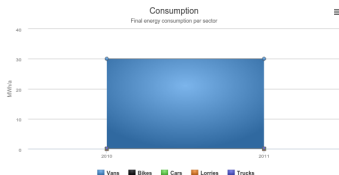
# Emission Scenario Modelling

## Nomal Route Vs Optimal Route 2010 - 2011

### Emissions



### Energy



Goal Year (2011)			
CO2	-13.89 %	7 ton	
CO2 eq	-13.89 %	7 ton	
Energy Savings	0.00 %	30 MWh	
Share of Renewables	0.00 %	0 MWh	

# Smart City Logistics impacts

- ▶ Smart City Logistics can help finding answers to complex questions;
- ▶ Smart City Logistics will support cities to develop innovative strategies, e.g. open data access, mobile app developments, optimal location finding of urban consolidation centres, strategic CO<sub>2</sub> emission reduction scenarios, link to renewables and energy savings potentials;
- ▶ it provides a flexible framework to integrate other topics, e.g. energy, air quality, etc.;
- ▶ New cities show interest for new opportunities.



For further information, please contact:

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Cindy Guerlain                      [cindy.guerlain@tudor.lu](mailto:cindy.guerlain@tudor.lu)

Smart City Logistics                      <http://iguess-sl.tudor.lu>