



# IT Convergence between Data Centres Pilot Study

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# 1 Introduction

## 1.1 Purpose of the Document

The purpose of this document is to report on the pilot portal developed for the IT Convergence between Data Centres Pilot Study. It details the data and services that have been included, illustrates how the services were developed, describes any problems that occurred during its development and highlights potential issues.

## 1.2 Background

In November 2005 the ‘Group of Four’ agreed on the creation of Environmental Data Centres to support the conception, development, implementation, monitoring and further improvement of environmental policies. These Data Centres provide convenient access to, manipulation of, and/or distribution of datasets pertaining to a specific thematic area.

The Environmental Data Centres are being developed to converge towards the common model defined by INSPIRE, a European Commission directive to create a legal framework for the establishment of an infrastructure for spatial information in Europe. The idea behind the IT Convergence between Data Centres Pilot Study was to attempt to demonstrate this convergence by developing a Pilot Portal containing data and services from different Data Centres.

The Pilot Portal would provide web based tools for access to and manipulation of information located at or reached through the following Data Centres:

- European Forest Data Centre
- European Soil Data Centre
- European Waste Data Centre

These three Data Centres offer a good test of interoperability as responsibility for their development lies with different members of the ‘Group of Four’. The European Soil and Forest Data Centres being developed at the Joint Research Centre (JRC) and the European Waste Data centre at Eurostat. Also the nature of the data contained within the Data Centres differs with the European Waste Data Centre focusing much more statistical data rather than geospatial data.

In developing such a portal the pilot intends to test the main principles set out within the INSPIRE directive:

- Data discovery, it should be easy to discover which geographic information is available.
- Interoperability, it must be possible to combine spatial information from different sources across Europe and share it between many users and applications.

- Data download, geographic information required should be widely available under conditions that do not restrain its use.
- Data quality and clarity (view), the geographic information should be user friendly, easy to understand and interpret.

### **1.3 Related Documentation**

The following related documentation is available:

- Directive 2007/2/EC of the European Parliament and of the Council
- INSPIRE Draft Download Services Implementing Rule (Version 2.0)
- Draft Implementing Rule: Discovery Services (Version 3.0)
- Draft Implementing Rule: View Services (Version 3.0)
- Study and Prototype Implementation for Replication of Key Geospatial Content Across JRC Ispra, EEA Copenhagen and DG Eurostat

## 2 View Service

An INSPIRE View Service is a web service to provide a visual representation of geographic and thematic information. It must implement two functions (Get Service Metadata and Get Map); a third operation (Get Feature Information) is optional. It is also mandatory that a legend is provided for each layer. The service must support the OGC WMS v1.3.0 Web Map Service specification.

Such services were already implemented within the European Soil and Forest Data Centres. Both served data through Web Map Services that produce maps of geo-referenced data. These maps could be retrieved over the internet (through WMS protocol) by software applications called Map Clients which could then visualize such maps.

The European Waste Data Centre, although it contained maps representing waste statistics which could be downloaded as PDF files, did not provide these through Web Map Services.

The challenge for the pilot portal was to analyse if an INSPIRE view service, like those used by the European Soil and Forest Data Centres for geographic data, could also be applied to the statistical data contained within the European Waste Data Centre.

## 2.1 Map Client 1

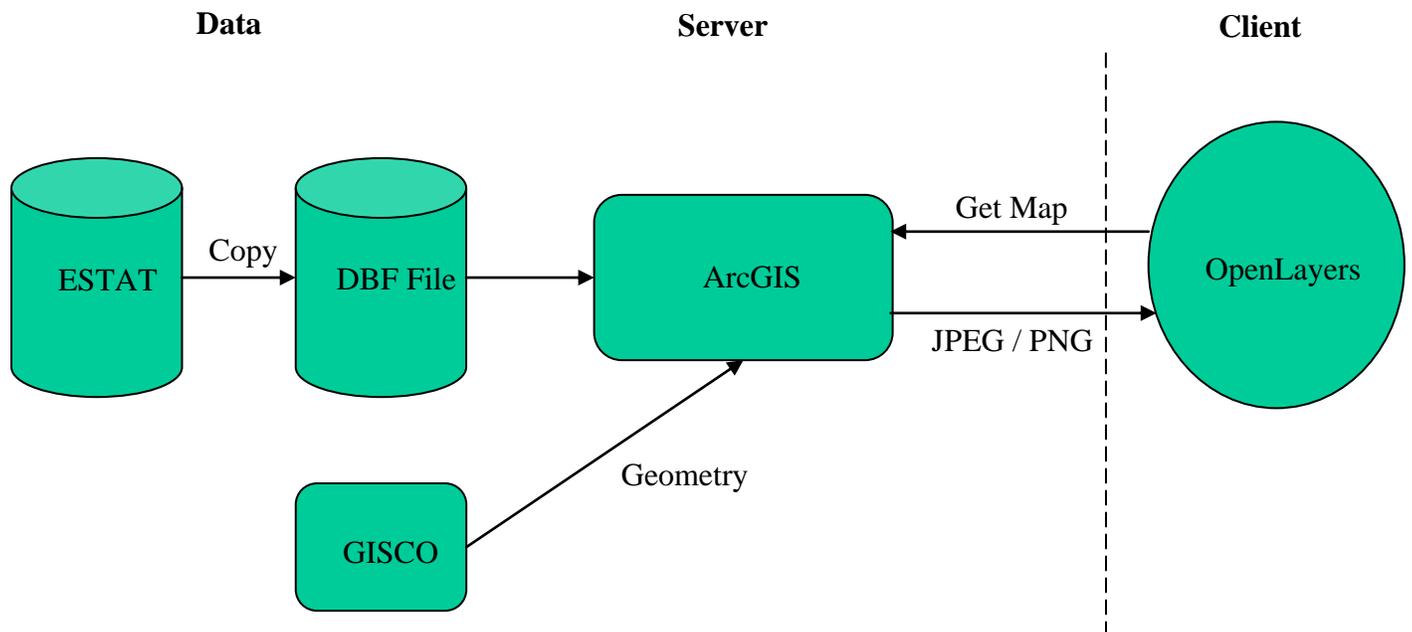
The first task was to create a Map Client to allow a user to combine map layers from each of the different Data Centres. These layers came from different Map Servers that all offered the data through the WMS protocol.

### 2.1.1 Implementation

As no Map Services for waste statistics existed they had to be created. This was achieved as follows:

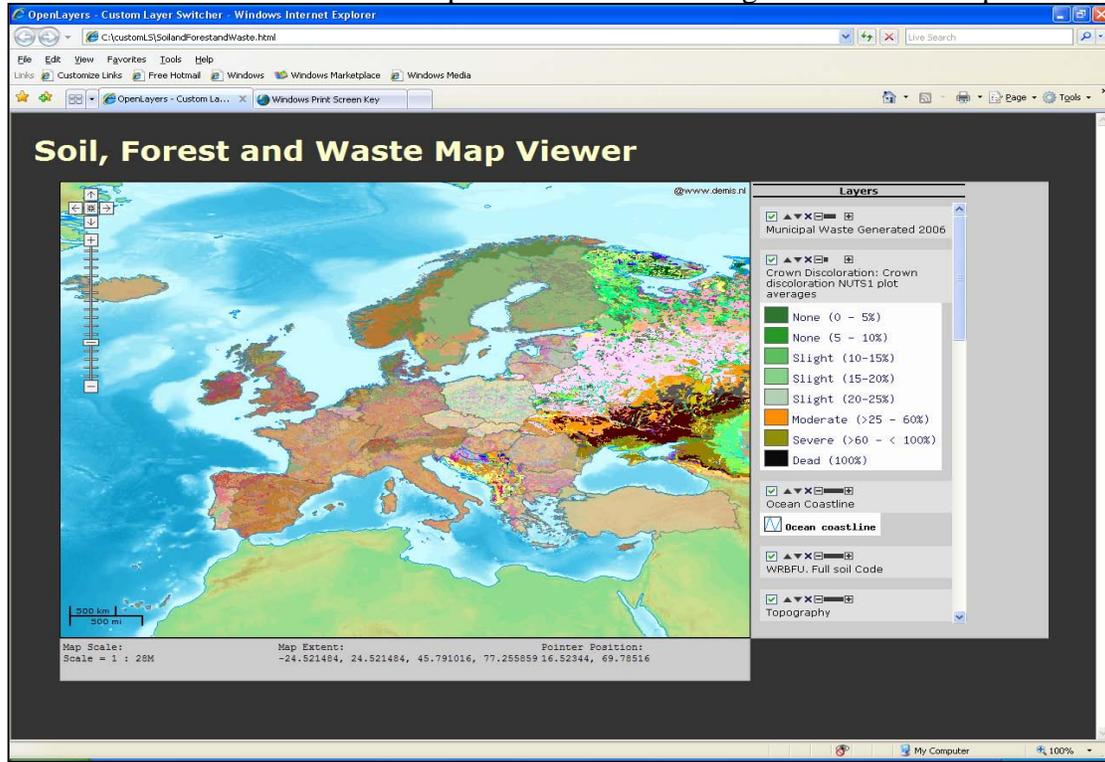
- Downloaded data from ESTAT website (data representing the key waste indicators of Municipal Waste Generated, Incinerated and Land filled was used)
- Stored the data locally as DBF files
- Used the ESRI ArcGIS suite join the DBF files of statistical data to the country boundary data available at GISCO. This give the data a geo-spatial element and allowed it to be mapped
- Used the ESRI ArcGIS suite to generate Map Services for the datasets

OpenLayers, an open source Javascript API for displaying map data in web browsers, was used to develop a Map Client (See Appendix 1 – Map Client 1 Code). When a map layer is selected from the Map Client an http encoded Get Map command is sent to the relevant Map Server which returns the requested layer as a JPEG or PNG image embedded in XML. This is represented in the following diagram: (note: this diagram only shows the Map Client interaction with the Map Service created for waste data, the Map Client also retrieves layers from the Map Servers for forest and soil layers in the same way)



## 2.1.2 Result

This screenshot demonstrates the result, the user is able to display, navigate and overlay datasets from each of the three European Data Centres using this common Map Client.



## 2.1.3 Issues

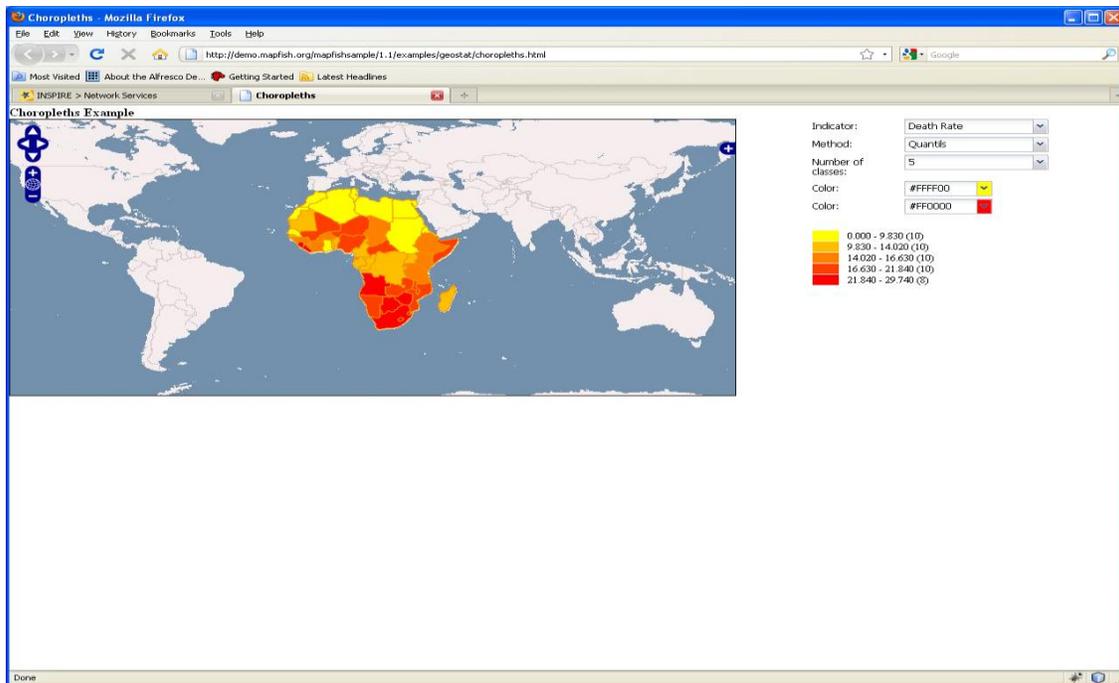
It became clear when developing this Map Client that a large number of layers would be required to represent all the waste statistics. Just for the statistics representing the key waste indicator of Municipal Waste Generated (as shown in the screenshot above), twelve layers would be required to cover the years 1995 to 2006. The complete Treatment of Waste dataset which contains statistics for different types of waste, treatments of waste, hazardous or non hazardous waste as well as for different years would require one hundred and fifteen layers. It's not practicable for a Map Client to list such a large number of layers from which the user can choose.

## 2.2 Map Client 2

The second task was to investigate the possibility of allowing a user to dynamically select the waste data required for the map whilst still staying within the INSPIRE guidelines for a view service.

### 2.2.1 MapFish

In researching any applications available that offered such a dynamic selection of maps, an interesting demonstration (MapFish Geostats) stood out that provided a good illustration of the problem being faced in staying within the INSPIRE guidelines. Details of this demonstration are given below as it also provided a template for the type features required from this Map Client.



MapFish provides a web mapping application framework (client and server side) and contains a feature called Geostats. The example demonstration of this feature, which shows a map that dynamically changes as a user selects different options from drop down lists, can be viewed here:

<http://demo.mapfish.org/mapfishsample/1.1/examples/geostat/choropleths.html>

Although this may seem like an ideal application it was not used for this project as it does not fit in with the current guidelines of INSPIRE. MapFish uses GeoJSON (Geographical Javascript Object Notation) to pass java objects (i.e. the actual data) from the server to the client and the client then generates the map. It is not using a Get Map operation to retrieve a layer as a JPEG or PNG image from the server. Generating maps on the client side like this may make it easier to create dynamic applications but

interoperability is hindered by the current lack of standardisation in the use of GeoJSON and Geostats.

This is not to say that a good solution should be discounted just because it is not INSPIRE compliant. The most important thing is that the Web Map Service provides the functionality required. However, we wanted to investigate if this type of dynamic functionality was possible through INSPIRE.

### 2.2.2 Styled Layer Descriptor (SLD)

SLD is a specification put out by the Open Geospatial Consortium (OGC) that defines an XML language to allow users to define symbolization of their feature data. It was written to compliment their Web Map Service specification, by extending it to allow users a way to define how they want to visualise their features. As such it does fall within the guidelines for an INSPIRE View Service.

SLD was investigated to see if it could be taken a step further and as well as defining the style of the features it could also be used to define which data was used in generating the map. This is probably best explained with a segment of code from a basic SLD:

```
<NamedLayer>
  <Name>Municipal Waste Generated 2006</Name>
  <UserStyle>
    <Name>Style 1</Name>
    <PropertyIsGreaterThanOrEqualTo>
      <PropertyName>Year2006</PropertyName>
      <Literal>259</Literal>
    </PropertyIsGreaterThanOrEqualTo>
    <PropertyIsLessThanOrEqualTo>
      <PropertyName>Year2006</PropertyName>
      <Literal>301</Literal>
    </PropertyIsLessThanOrEqualTo>
    <PolygonSymbolizer>
      <Fill>
        .....
      <Stroke>
        .....
```

In this code ‘Style 1’ is being applied to layer ‘Municipal Waste Generated 2006’. When the Year2006 data has a literal of between or equal to 259 and 301, the Fill and Stroke tags will determine how to draw the polygon i.e. black borders and red inside. If the Property Name tag which declares the set of data to be used in creating the map could be changed from the hard coded Year2006 above to a variable that was passed into the SLD script then the selection of data used for the map would become dynamic.

### 2.2.3 Implementation

A Map Services was created for the waste statistics using ESRI ArcGIS in the same way as for Map Client 1. This time, however, the data behind the map service was the Treatment of Waste dataset (country data only, not regions). The dataset was re-organised into the following example format:

CountryCode	TOTOTOT06	TOTOTOT04	TOTOENR06	TOTOENR04
BE	23140.966	47409.161	1740.318	1450.887
BG	1987.322	2122.182	8.429	47.831
CZ	11353.808	15735.403	650.144	787.987
DK	17512.893	8761.855	0	3168.226
DE	251113.111	213717.282	17320.807	11391.797
EE	6207.709	3603.989	256.567	267.862

The headings for the waste statistics were made up of the following categories:

#### **Waste Type + Hazard + Treatment + Year**

The following options were made available:

##### **Waste Type**

- TO - Total
- CS - Common Sludges
- CW - Chemical
- CWS - Chemical not Used Oils
- UO - Used Oils
- HC - Health Care and Bio
- MW - Metallic
- GW - Glass
- PC - Paper Cardboard
- RW - Rubber
- PW - Plastic
- WW - Wood
- TW - Textile
- PCB - PCB
- AV - Animal Vegetal
- AFP - Animal Food Prep
- AFU - Animal Faeces
- HS - Household
- MU - Mixed and Undifferentiated
- SR - Sorting Residues

##### **Hazard**

- TO - Total
- HZ - Hazardous
- NH - Non Hazardous

##### **Treatment**

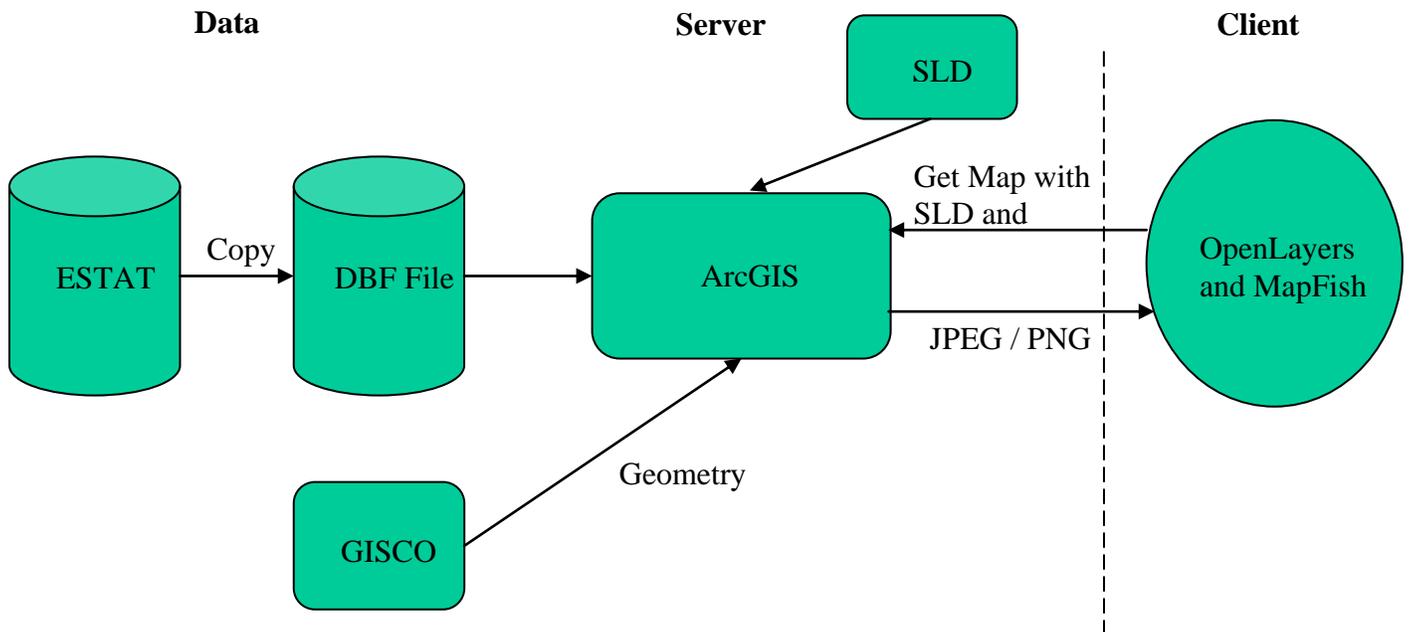
- TOT - Total
- REC - Recovery
- DIS - Disposal
- ENR - Energy Recovery
- INC - Incineration
- DEP - Deposit
- LTR - Land Treatment

**Year**

- 2004
- 2006

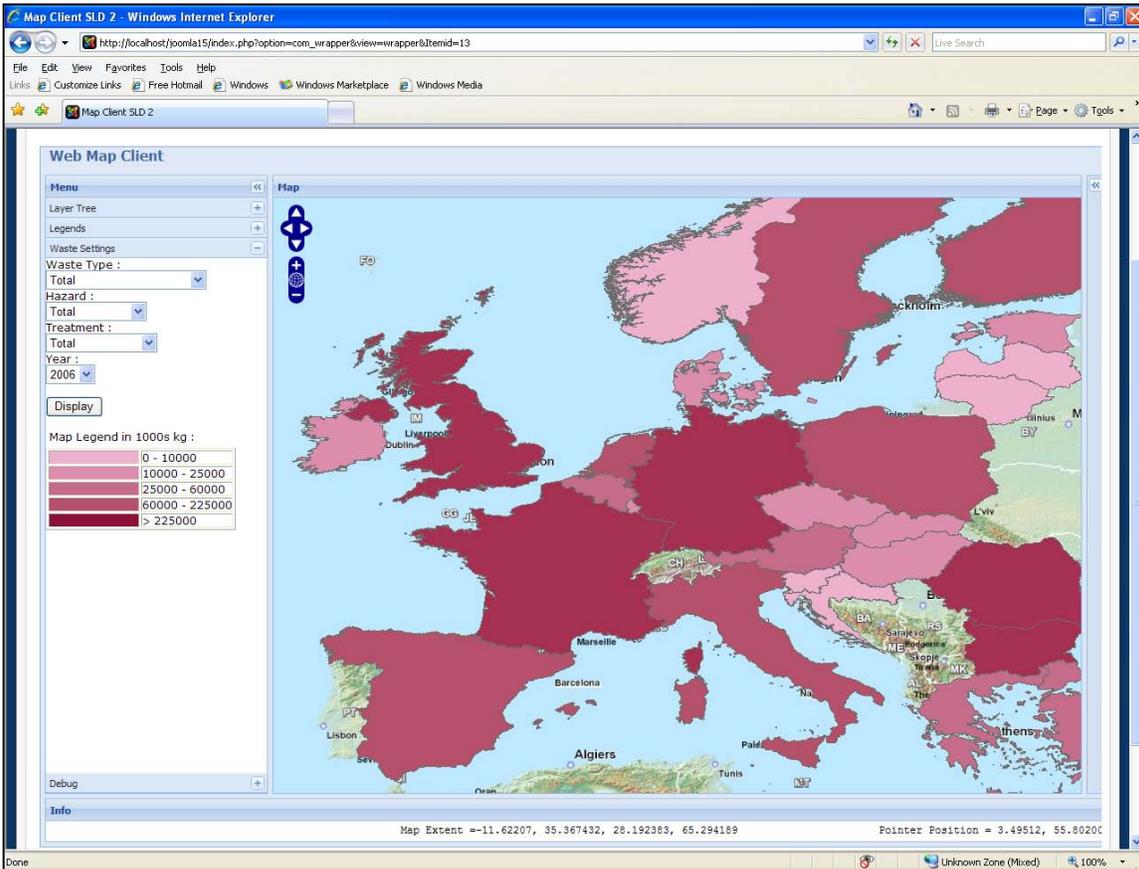
The user has to make a selection for each of these categories in order to identify the statistics required from which to generate a map. For example, the selection of total waste treated by energy recovery methods for 2006 would request the statistics in the TOTOENR06 column being used. OpenLayers and the MapFish Client javascript API's were used to develop the Map Client (See Appendix 2 – Map Client 2 Code). The forest layers work as before in that when selected from the Map Client an http encoded Get Map command is sent to the relevant Map Server which returns the requested layer as a JPEG or PNG image embedded in XML.

For the waste layer, however, the settings of Waste Type, Hazard, Treatment and Year must also be selected. The Get Map command sent to the Map Server now also includes instructions to use an SLD file (See Appendix 3 – Map Client 2 SLD File), the address of the SLD file and the four parameters selected by the user. The Map Server parses the SLD document using the four parameters to extract the style required (i.e. which statistics to use) and apply it to the layer before returning it to the Map Client as a JPEG or PNG image. This is represented in the following diagram:



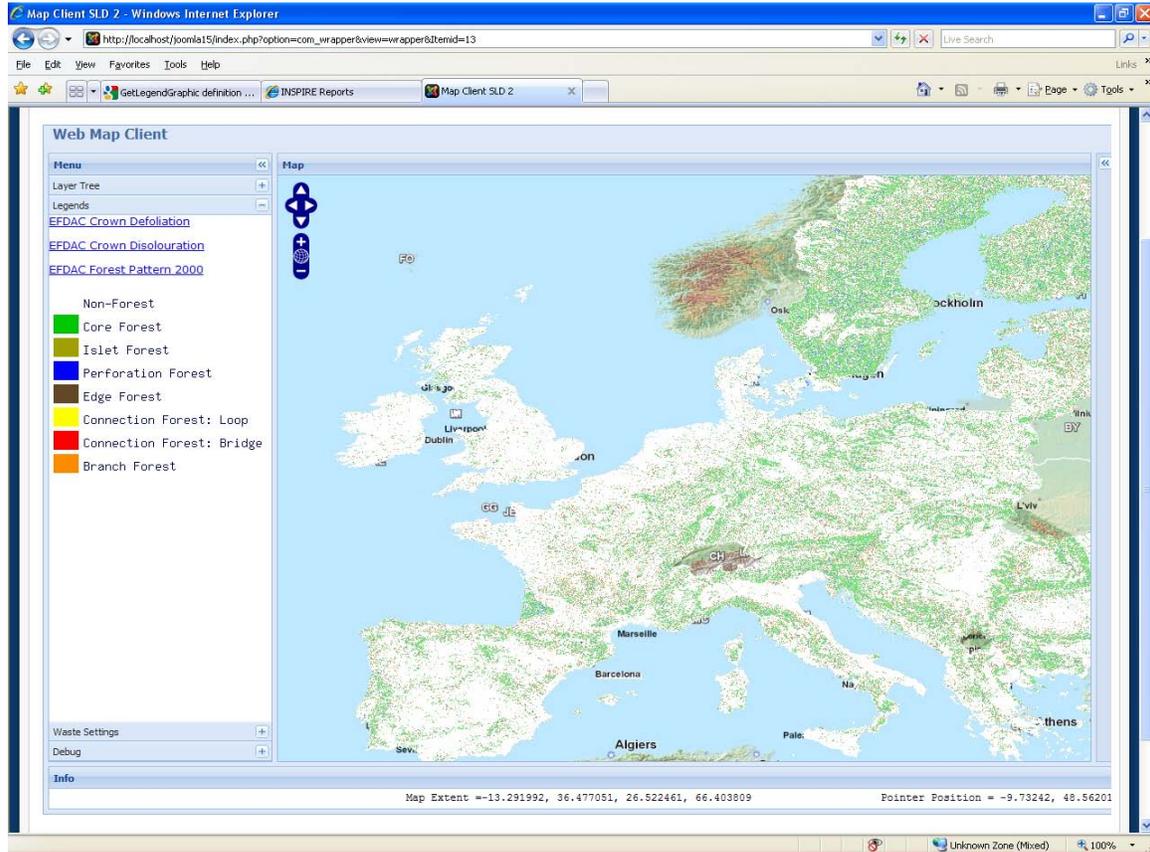
## 2.2.4 Result

This screenshot demonstrates the result; the user has chosen to display total waste for all treatment types for the year 2006. Again, the user is able to display, navigate and overlay the available layers within this Map Client.



## 2.2.5 Get Legend Graphic

Under the INSPIRE guidelines it is mandatory that a legend is provided through URL for each layer. This Map Client retrieves these legends on user request. An http encoded Get Legend Graphic command is sent to the relevant Map Server which returns the requested legend as a JPEG or PNG image embedded in XML.

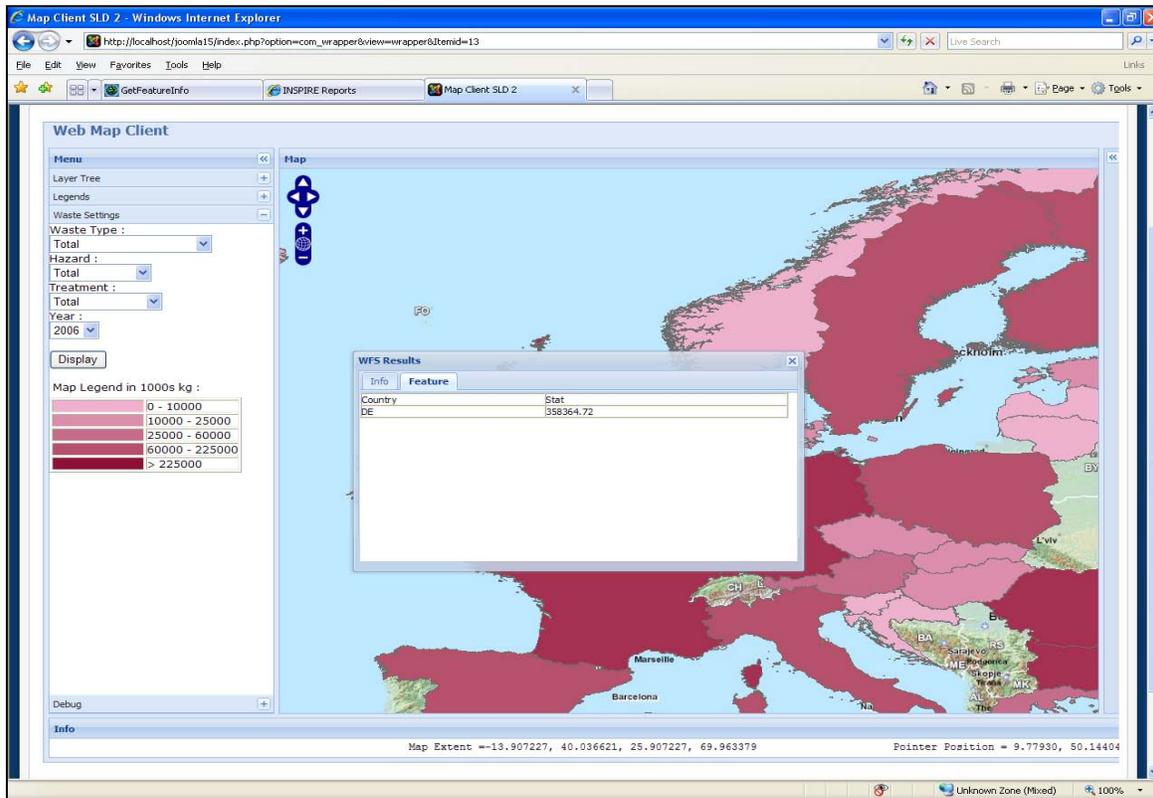


## 2.2.6 Get Feature Information

This Map Client also implements the Get Feature Information operation (optional under INSPIRE) for the waste statistics layer to provide the user with the actual value for a country rather than just having a broad range provided by a legend. This operation provides feature information identifying a point on a map based on its pixel location.

An event handler was set up to identify a mouse click on the map. An http encoded Get Feature Information command is sent to the relevant Map Server which finds all features near (within a few pixels) of the click and returns these features embedded in XML.

The dataset behind the waste statistics layer contains a large number of statistics. As the Get Feature Information command only filters based on the pixel location it returns all of these statistics (see Appendix 4 – Get Feature Information XML). The Map Client, therefore, reads the XML file and extracts the statistic required based on the users selections for the waste layer. The statistic is displayed in an external window.

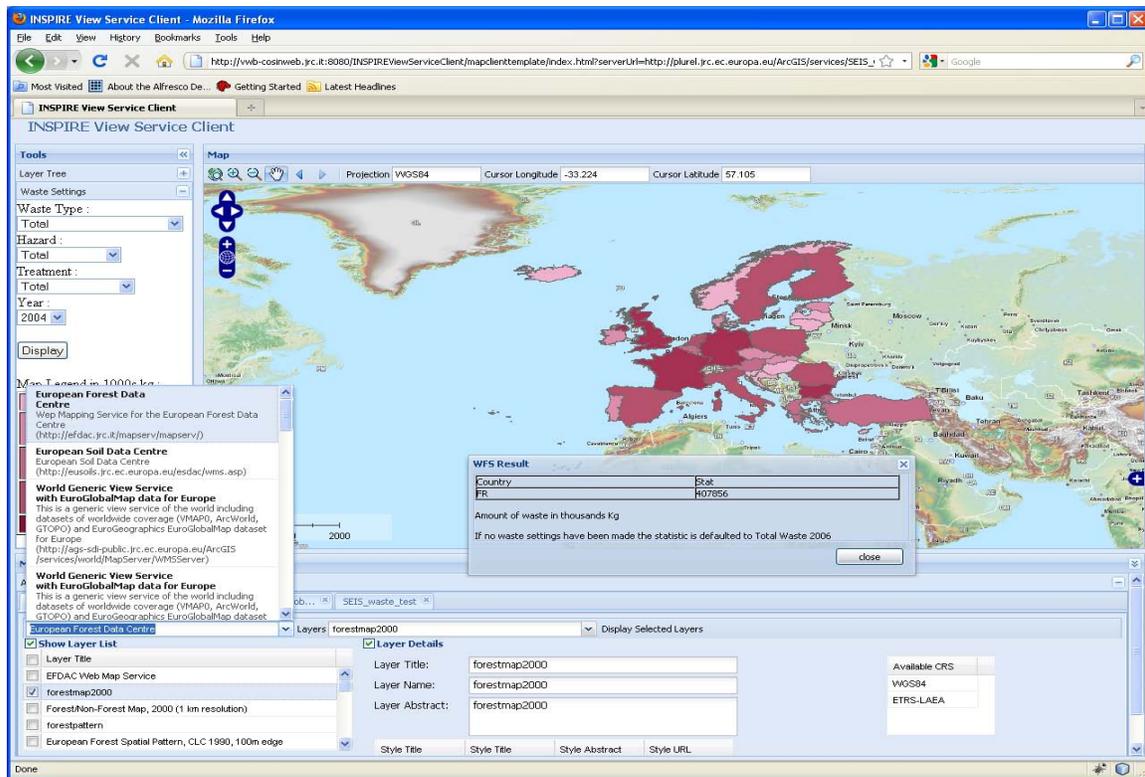


In this screenshot a user has chosen to display total waste for all treatment types for the year 2006 and has then clicked on Germany to view the actual value of the statistic.

### 2.3 INSPIRE View Service Client with Waste Statistics

The INSPIRE View Service Client, recently developed for the INSPIRE Geoportal, was designed in such a way as to allow plug-ins so any future new features developed could be easily incorporated. To demonstrate the re-usability of the ideas and features used for Map Client 2 the code was reworked as a plug-in for the INSPIRE View Service Client. In this way it was possible to combine the features of both Map Clients.

The screenshot below shows the result. Features from Map Client 2 such as the use of SLD to dynamically select the map required and a Get Feature Information function have been added to the INSPIRE View Service Client which includes features such as searching for available services and dynamically adding layers required.



## 2.4 Conclusion and Future Development

The Map Clients developed demonstrate that it is possible to implement a fully compliant INSPIRE view service for the statistical waste data held on the European Waste Data Centre. Also, that such a service is interoperable with those already implemented by the European Soil and Forest Data Centres.

How such a service should be implemented must be decided. It could be that the data required to be provided as map services is limited to the key waste indicators. In this case generating a separate layer for each indicator and offering these layers through a map server, as demonstrated in Map Client 1, may be sufficient. If, however, it is required that all the data from the Treatment of Waste and Generation of Waste datasets should be provided as map services then a solution offering dynamic selection of maps, such as using SLD as demonstrated in Map Client 2, needs to be considered.

A user wanting to create a Map Client should not have to download datasets from Eurostat, store them locally and create Map Services for the waste statistics in order to do it. These Map Services should be provided for the user. The IT architecture framework of Eurostat fits under the corporate level Commission Enterprise IT Architecture Framework (CEAF) set out by DIGIT. Therefore, if Eurostat were to provide these Map Services the development would be subject to the constraints laid out in the CEAF and how this would restrict the service being offered needs to be investigated. An alternative option could be that Eurostat supply a feed of data (or direct access to the Eurostat datasets so a copy of the data is not required) to an external contractor who provides the Map Services for them.

Finally some recommended improvements that should be included in any future developments. Currently Map Client 2 has a static legend i.e. the values are pre-defined and not based on the actual values of the statistics rendered. This is fine when looking at data for total waste for all treatment types for the year 2006. When looking at a more specific selection such as hazardous metallic waste for a treatment type of recovery for the year 2006 then all statistics fall into the smallest band of the legend and the map looks all one colour. The legend would be much more meaningful if it was dynamically created according to the users selections.

Also in Map Client 2 the choices available from the drop-down lists in the Waste Settings are pre-defined. Data is not available for some combinations of these settings and therefore no map is displayed. Dynamic drop-down lists where the system analyses the actual data and offers the user only existing choices would be desirable.

### **3 Download Service**

An INSPIRE Download Service is a web service that provides access to spatial datasets, or parts of such sets, to be downloaded and, where practicable, accessed directly. This project has concentrated on a direct access download services providing immediate access to data rather than asynchronous download services where a request for data can be made and the result is available at some later time.

Direct access download services are divided into three types; a download service providing access to a pre-defined full dataset without any querying functionality, a download service providing access to feature collections with querying functionality, and a download service providing access to coverage's with querying functionality.

Due to copyright and legal restrictions (such as the Aarhus Convention) the European Soil and Forest Data Centres did not currently implement such a service. The full waste statistic datasets, or part of these datasets based on a user query, held on the European Waste Data Centre could be downloaded and stored locally as, for example Excel files. This was, however, a manual process and no service was provided to serve up the data to client software.

There were no constraints on the use of the waste statistics and they were free of charge so the challenge for the pilot portal was to analyse if an INSPIRE Download Service could be applied to this data.

### 3.1 Download Client 1

The first task was to expose some of the waste statistics as a download service. This would allow a Download Client to access and present the statistics. A dataset of one of the key waste indicators (Municipal Waste Generated) was exposed as a service to represent the download of a pre-defined full dataset.

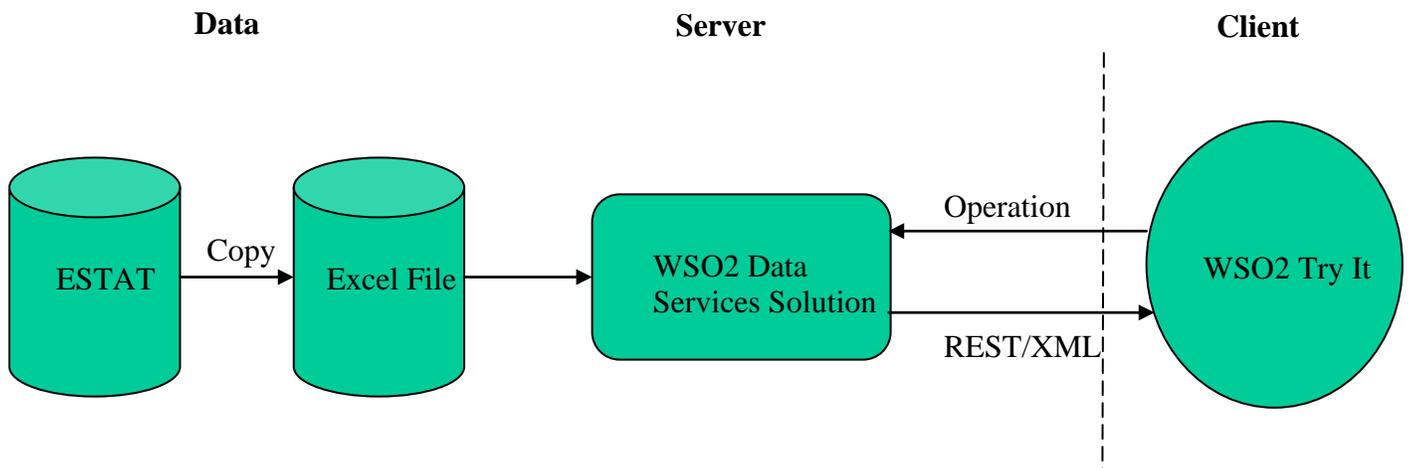
#### 3.1.1 Implementation

Exposing the Municipal Waste Generated dataset as a Download Service was achieved as follows:

- Downloaded data from ESTAT
- Stored the data locally as Excel file
- Used the WSO2 Data Services Solution (open source API, Apache Tomcat server) to expose the data locked up in the Excel file as a web services.

To expose the Excel spreadsheet, operations had to be defined. For example an operation to return the full dataset could be defined as operation GetYearAll and would be set up to return all the columns of statistics from 1995 to 2006.

The WSO2 API included a Try It feature to act as a Download Client and this was initially used to test the service set up. From this feature an Operation could be selected to call the service and retrieve from it, through Representational State Transfer (REST), the data requested embedded in XML. This is represented in the following diagram:



### 3.1.2 Result

The following screenshot shows the XML returned from the Municipal Waste Generated dataset after calling the getYear2006 operation (retrieving only data for 2006):

The screenshot displays the WSO2 Web Services Application Server Management Console. The left sidebar contains navigation options like Home, Manage, Services, Modules, Security, Transports, Keystores, Logging, Shutdown/Restart, Monitor, System, Statistics, Logs, Tracer, Flows, Tools, WSDL2Code, WSDL View, WSDL Converter, Try It, AAR Validator, and MAR Validator. The main content area shows the 'MunicipalWasteGenerated' service with a 'Try Web Service' button. Below this, there are four endpoint options: 'getYear2006', 'getYear1995', 'getYear1996', and 'getYearAll'. The 'getYear2006' option is selected, and the XML response is displayed on the right. The XML is a SOAP envelope containing a list of statistics for the year 2006, grouped by country code.

```
<?xml version='1.0' encoding='UTF-8'?>
<data:Stats2006 xmlns:xml="http://www.w3.org/XML/1998/namespace"
xmlns:data="http://ws.wso2.org/dataservice">
  <Stat2006>
    <CountryCode>CountryCode</CountryCode>
    <Year2006>Year2006</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>BE</CountryCode>
    <Year2006>475.0</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>BG</CountryCode>
    <Year2006>446.0</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>CZ</CountryCode>
    <Year2006>296.0</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>DK</CountryCode>
    <Year2006>737.0</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>DE</CountryCode>
    <Year2006>566.0</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>EE</CountryCode>
    <Year2006>466.0</Year2006>
  </Stat2006>
  <Stat2006>
    <CountryCode>IE</CountryCode>
    <Year2006>804.0</Year2006>
  </Stat2006>
</data:Stats2006>
</?xml>
```

### 3.1.3 Issues

Although this type of direct access download service may be acceptable for download of a full dataset problems would arise if wanting to provide access to data with querying functionality. In the screenshot above, four operations have been created; one returning the data for all years (1995-2006), one returning data for just 1995, one returning data for just 1996, and one returning data for just 2006. The number of operations required can soon become too large, the user may wish to retrieve the data for 1999 or 1999 and 2005 together etc. This problem intensifies for the larger datasets such as Treatment of Waste and Generation of Waste. It's not practicable for a Download Client to list such a large number of operations from which the user can choose.

## 3.2 Download Client 2

The second task was to investigate the possibility of providing access to a dataset with querying functionality. Could a user dynamically choose the waste statistics required to be downloaded? Part of the Treatment of Waste dataset (again country data only) was exposed as a RESTful service to represent a dataset where access to feature collections was required with querying functionality.

### 3.2.1 Representational State Transfer (REST)

Offering the data as a set of REST style web resources was investigated as a possible solution to the dynamic selection of waste statistics to download. As this solution was researched and used in the development of Download Client 2, some background on REST is given below.

The key to the REST methodology is to write web services using a Uniform Resource Identifier (URI) interface. Data is exchanged according to the URI address rather than the invoking of an operation. Every resource has a unique URI so, for example, to expose a total waste service in which a user enters a waste type variable to return a total amount could be done by making a script available on a web server via the following URI:

**`http://computer:port/service/getCommand?wastetypeVariable`**

Any client with http support could then easily call that service with an http Get command and the correct variables for the required resource. An XML document can then be retrieved through the resulting http response.

This method has significant benefits over Simple Object Access Protocol (SOAP) based services. Any developer can figure out how to create and modify a URI to access different web resources whereas SOAP requires specific knowledge of new XML specifications and possibly SOAP toolkits to parse results. It can also be lighter on bandwidth with short requests and responses which, unlike with SOAP, do not require XML wrapper around them. It can be argued that security is another advantage of REST as a firewall can discern the intent of each message by analysing the http command used in the request. For example, a Get request can always be considered safe because it can't modify any data.

REST is not, however, the best solution for every web service. Data that needs to be secure should not be sent as parameters in URI's. Also, large amounts of data can quickly become cumbersome or even out of bounds within a URI. In these cases, SOAP is a better solution.

### 3.2.2 Implementation

To expose the Treatment of Waste dataset as a RESTful service in which every resource had a unique URI the dataset was made available on a web server via the following:

**`http://computer:port/service/getCommand?wasteType&hazardous&treatmentType&year`**

This was achieved as follows:

- Downloaded data from ESTAT.
- Reproduce this data on a relational database (MySQL). A wastetreatment database was created containing a wastetreatmentstats table organised as per the following example:

wasteType	hazardous	treatmentType	year	countryCode	value
WT	TT	RECOV	2006	BG	1987.322
WT	TT	RECOV	2006	CZ	11353.808
WT	TT	RECOV	2006	DE	251113.111
WT	TT	RECOV	2004	DE	213717.282
WT	HZ	RECOV	2006	DE	13752.077
WT	NH	RECOV	2006	DE	237361.034
WT	TT	ENREC	2006	DE	17320.807
WT	TT	INCIN	2006	DE	15229.278
MW	TT	RECOV	2006	DE	7652.258
GW	TT	RECOV	2006	DE	2028.517

The following options were made available:

#### **wasteType**

WT - Total  
MW - Metallic  
GW - Glass

#### **Hazardous**

TT - Total  
HZ - Hazardous  
NH - Non Hazardous

#### **treatmentType**

RECOV - Recovery  
ENREC - Energy Recovery  
INCIN - Incineration

**year**

2004

2006

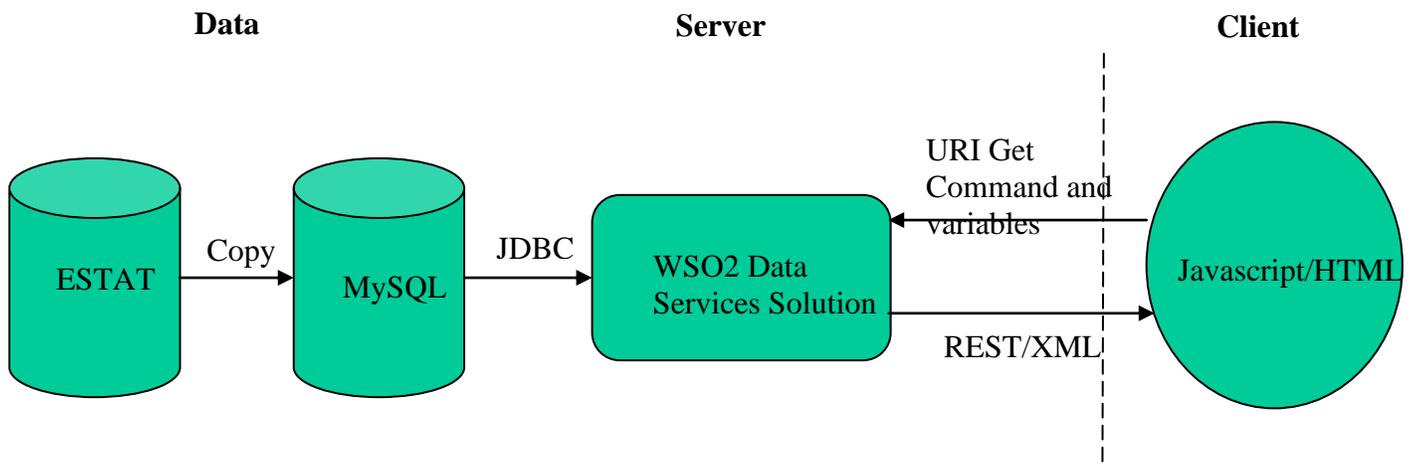
All countries were included

- Used the WSO2 Data Services Solution to expose the data locked up in the wastetreatment dataset as a web services. The following SQL query was defined in WSO2 to run on the MySQL database:

```

SELECT      countryCode,
            value
FROM        wasteTreatmentStats
WHERE       wasteType=?
AND         hazardous=?
AND         treatmentType=?
AND         year=?
    
```

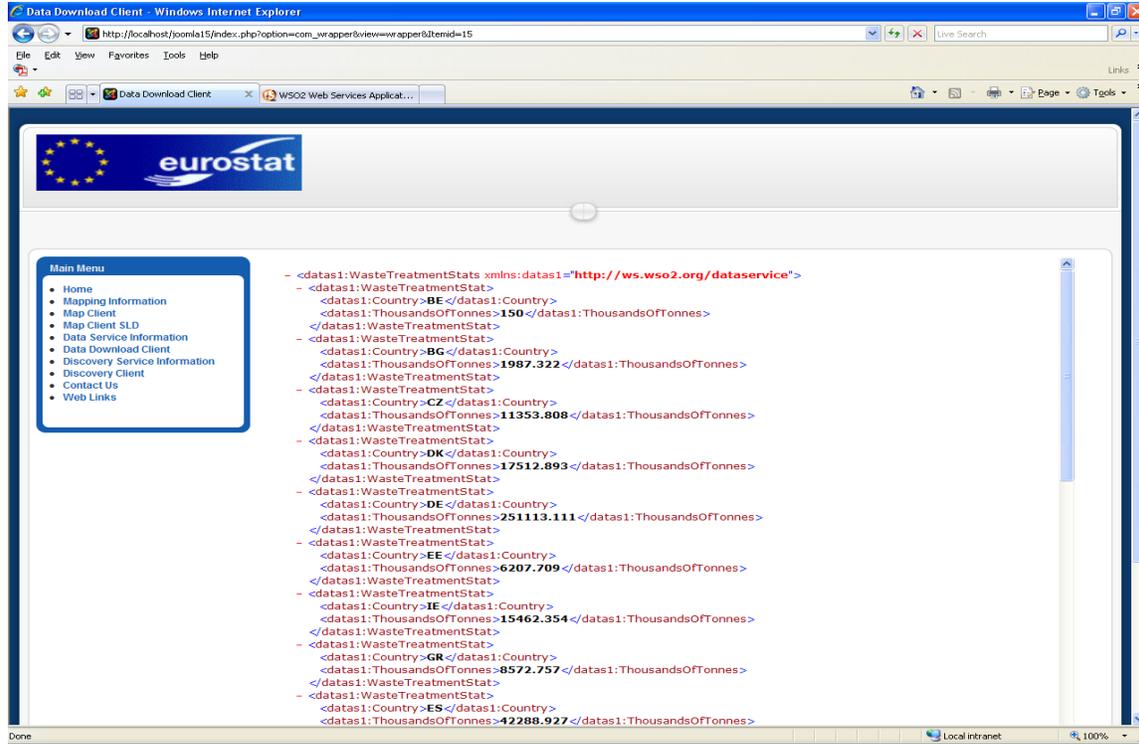
A Download Client was developed using HTML and Javascript (see Appendix 5 – Download Client Code). When the variables (Waste Type, Hazardous, Treatment Type and Year) have been selected, the Get Table button instructs the Download Client to call the RESTful waste service with a Get command and these variables making up the URI. The waste service then uses these variables within an SQL query on the wastetreatment database in MySQL (a MySQL Java Database Connectivity (JDBC) driver was required to connect the WSO2 service to the database). The Download Client then retrieves through a http response the result of the SQL query as an XML document. This XML document is parsed and the statistics and country codes returned extracted and presented in a table. This is represented in the following diagram:



Also included in the Download Client were a Get XML File button to display the actual XML document returned by the waste service and a Display REST Service URL button to display the URI used by the service.

### 3.2.3 Result

The following screenshot shows the XML returned from waste service after a user has requested to see the statistics for total waste with a treatment type of recovery in 2006:



In this screenshot the user has made the same selections but the XML file has been parsed and the result is displayed as a table:

The screenshot shows a web browser window titled "Data Download Client - Windows Internet Explorer". The address bar shows the URL: [http://localhost/joomla15/index.php?option=com\\_wrapper&view=wrapper&Itemid=15](http://localhost/joomla15/index.php?option=com_wrapper&view=wrapper&Itemid=15). The page features the Eurostat logo at the top left. A "Main Menu" is visible on the left side, listing various options such as Home, Mapping Information, Map Client, Map Client SLD, Data Service Information, Data Download Client, Discovery Service Information, Discovery Client, Contact Us, and Web Links. The main content area is titled "Waste Data Service" and contains a section for "Download Chosen Statistics". Below this section, there are four dropdown menus for "Total Waste", "Total", "Recovery", and "2006". A table of waste statistics is displayed, showing the volume of waste in thousand of tonnes for each country in 2006.

Country	Waste (thousand tonnes)
BE	150
BG	1987.322
CZ	11353.808
DK	17512.893
DE	251113.111
EE	6207.709
IE	15462.354
GR	8572.757
ES	42288.927
FR	264777.97
IT	0
CY	605.229
LV	455.855
LT	2119.252

### 3.2.4 Update

Such a RESTful service was also used to allow a user to update the statistics. Using the same waste service as created above a Put operation was created. Whereas a Get command was used to download data requested, the Put command was used to update a value.

To allow every possible statistic of the Treatment of Waste dataset to be updated the dataset was made available on a web server via the following URI:

**`http://computer:port/service/putCommand?newValue&wasteType&hazardous&treatmentType&year&countryCode`**

In MySQL a stored procedure was then created called updateValue() which accepted six variables and updated the wastetreatmentstats table as follows:

```
CREATE PROCEDURE updateValue
(
    newVal          INTEGER,
    wType          VARCHAR,
    haz            VARCHAR,
    tType          VARCHAR,
    year           VARCHAR,
    cCode          VARCHAR
)
BEGIN
    UPDATE wastetreatmentstats
    SET value = newVal
    WHERE wasteType = wType
    AND hazardous = haz
    AND treatmentType = tType
    AND year = year
    AND countryCode = cCode
END
```

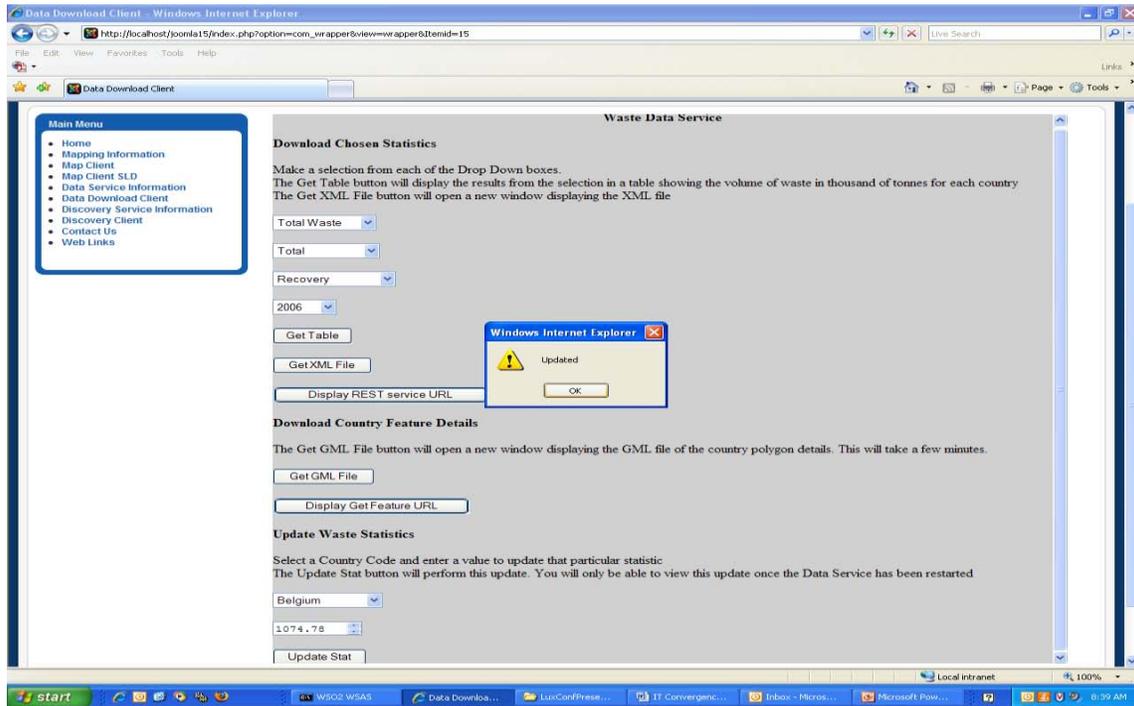
The following SQL procedure call was defined in WSO2 to run on the MySQL database:

```
CALL updateValue(?,?,?,?,?)
```

Now in the Download Client when all six variables have been selected/entered by the user (Waste Type, Hazardous, Treatment Type and Year as for data download and also the two new variables of Country Code and Value to be updated to), the Update Stat button instructs the Download Client to call the RESTful waste service with a Put

command and these variables making up the URI. The waste service then uses these variables within the updateValue SQL procedure call. MySQL runs the procedure to update the wastetreatmentstats table. The waste service has been restarted before the Download Client will pick up these updates.

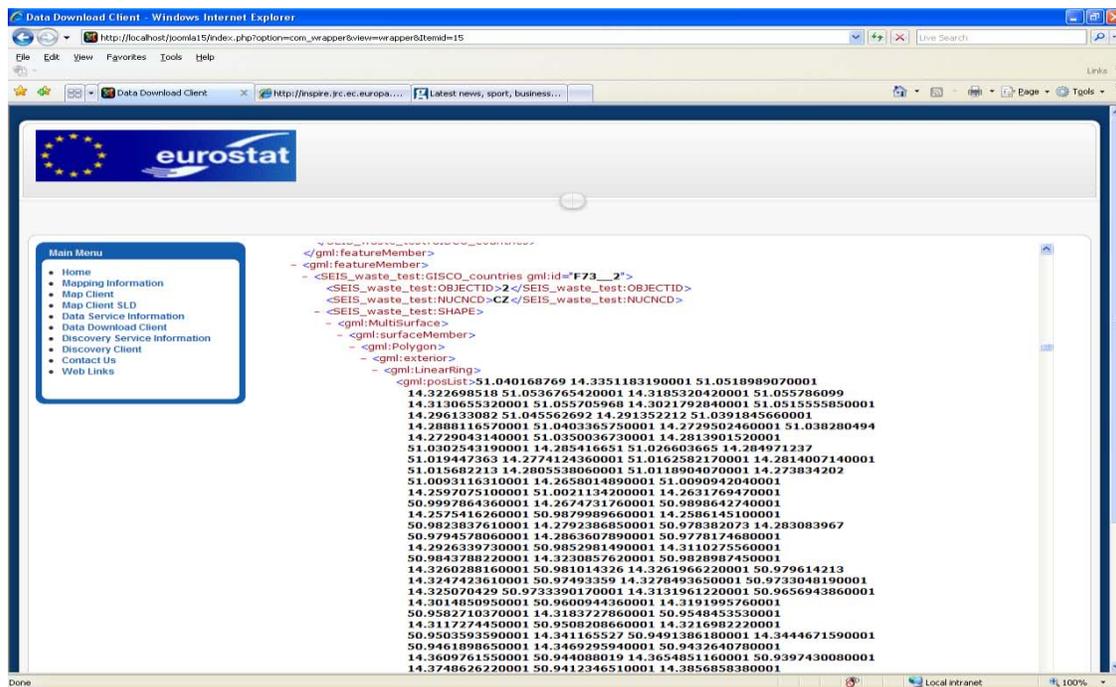
In the following screenshot the user has updated the value for total waste with a treatment type of recovery for year 2006 in Belgium to 1074.78:



### 3.2.5 Get Feature

An INSPIRE Download Service must also provide access to the geometry data as well as to the waste statistics. A user must be able to download not only particular statistics for a country but also details of the co-ordinates used to determine the polygon of a country. INSPIRE recommends to implement direct access of this data using the Web Feature Service (WFS). Also, the retrieved features should be returned embedded in Geography Markup Language (GML).

When the Map Services for waste statistics were created in the ESRI ArcGIS suite (see section 2.1.1) they were published with both WMS and WFS enabled. The Download Client, therefore, needed to utilise these WFS abilities. To do this a Get GML File button was included that implements a Get Feature operation. When selected an http encoded Get Feature command is sent to the server which returns the features that make up the map (the country polygon details) embedded in GML. The following screenshot shows such a GML return of the polygon details for the Czech Republic:



Also included in the Download Client was a Display Get Feature URL button to display the Get Feature command used.

In this Download Client the retrieval of statistics and the country features were separate. The user selects a set of statistics to download and then downloads the country features for all countries. As the selection of statistics always results in one value for each country making up Europe, it was assumed that feature information would be required for each of those countries.

### 3.3 Conclusion and Future Development

The Download Clients developed demonstrate that it is possible to offer INSPIRE type direct access download services for the statistical waste data held on the European Waste Data Centre. The download service could provide access to complete pre-defined datasets or it could include querying functionality depending on the requirements.

A user wanting to create a Download Client should not have to download the waste statistic datasets from Eurostat, re-organise and store them locally and then create the Download Services in order to do it. These Download Services should be provided for the user. This is the same problem as for the Map Clients and the same alternatives exist to solve it. Eurostat could provide the Download Service (again the development would be subject to the constraints laid out by DIGIT in the CEAF and how this would restrict the service being offered needs to be investigated). Alternatively Eurostat could provide a feed of data to an external contractor who provides the Download Service for them.

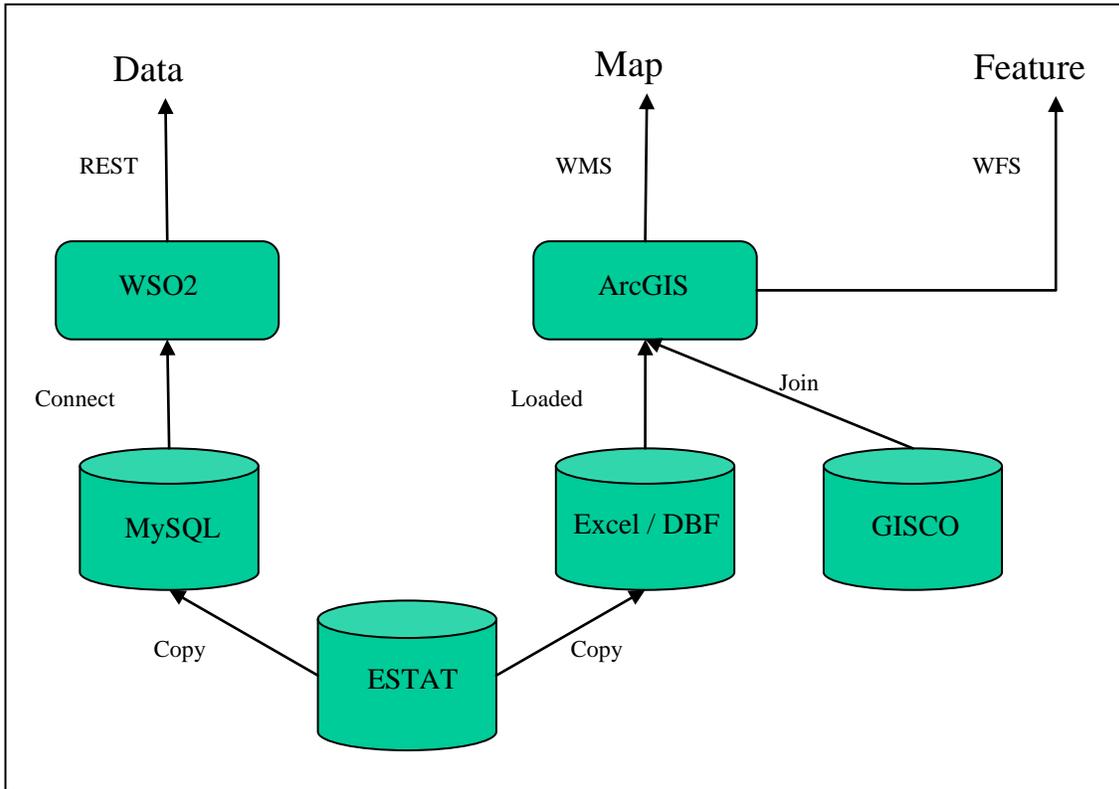
The type of query facility required must be decided. The INSPIRE guidelines mention using a query facility (Filter Encoding) based on the feature (the statistic) but this is not currently provided. Such a query could be, for example, to return the statistics with a value greater than 100,000. This could return many statistics for the same country. The query facility used in this pilot is, instead, based on a selection of details about the feature (the type of waste, whether it's hazardous or not, the treatment type and the year) that always provides a unique statistic for each country. If it is decided that query facilities on the features are required then further investigation would be needed into how to translate these queries into the SQL procedures required by applications such as WSO2 when exposing data as a set of REST style web resources.

Discussions are ongoing in the corresponding INSPIRE Technical Committee into the recommendation of a framework for implementing Download Services but in all probability a SOAP framework will be proposed. The Download Services developed for this pilot have, however, used a REST framework as it was easier to implement and more lightweight for the client. Some further investigation into a Download Service that uses SOAP is therefore required (the WSO2 Data Services Solution software used in this pilot could still be used as it does support SOAP). This is not to say that the RESTful solution should be discounted, the most important thing is to have a service that does what is required. The strength of service oriented architecture is that INSPIRE compliant SOAP services as well as REST services in many formats (GML, KML etc.) can be provided without much additional work.

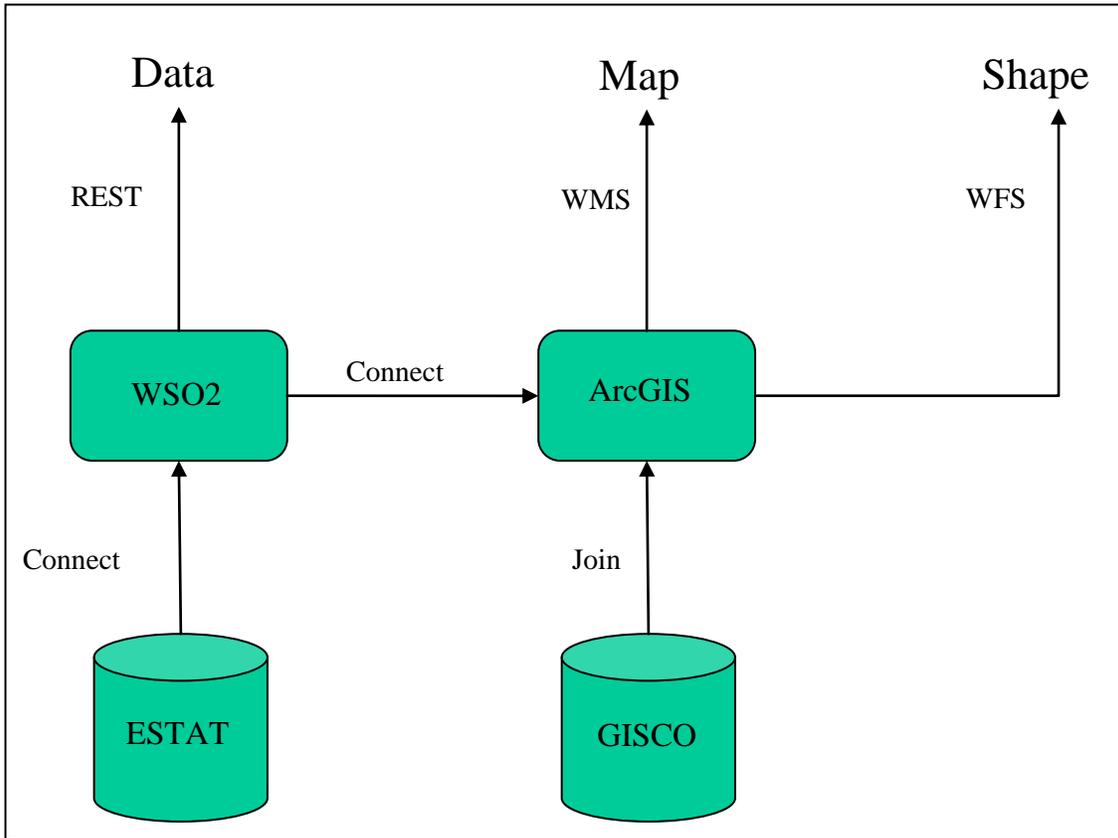
Finally, an improvement that should be considered in any future development is to include the statistical data with the geometry data. Currently download of the geometry data and the statistics is separate but it would be useful to include statistics for the countries within the GML that includes the polygon data that makes up the countries.

## 4 View and Download Service Summary

The following diagram demonstrates the structure of the view and download services in the pilot portal:



This diagram demonstrates how I see the ideal structure of a view and download service to be:



The above would be an ideal solution as it does not involve any copying of data whereas in the first diagram the Eurostat data is copied into two separate places. The Download Service would run directly off the Eurostat datasets and the ESRI ArcGIS Map Services would run off the data offered by this download service. The technical investigation of running ArcGIS off a Download Service such as WSO2 Data Services Solutions was beyond the scope of this project.

## 5 Discovery Service

An INSPIRE Discovery Service is a web service that makes it possible to search for spatial datasets and services on the basis of the content of the corresponding metadata and to display the content of the metadata. It must implement three functions, Get Discovery Service Metadata, Discover Metadata and Get Metadata. The service must support the OGC CSW v2.0.2 Web Map Service specification.

Such services were already implemented within the European Soil and Forest Data Centres. Both served metadata through a Catalogue Service for Web (CSW) that produced a catalogue of geo-referenced data (although as they shared the same database only one catalogue was produced). This catalogue could be retrieved over the internet (through CSW protocol) and searched through by software applications called Discovery Clients which could then display the content of the metadata. The European Waste Data Centre does not provide such a service.

The challenge for the pilot portal was to analyse if an INSPIRE discovery service, like those used by the European Soil and Forest Data Centres for geographic data, could also be applied to the statistical data contained within the European Waste Data Centre.

## 5.1 Metadata

An INSPIRE Discovery Service requires a particular set of metadata (based on the ISO 19115/19119 information models for geographic information and services). The European Waste Data Centre supplied metadata for the waste statistics but to a different standard, Special Data Dissemination Standard (SDDS). For the purpose of this pilot we are assuming that the waste statistics are geo-referenced as they include a country code. For these waste statistics to be included in an INSPIRE Discovery Service the information included in this SDDS standard had to be mapped to the format required by INSPIRE.

A number of mapping exercises were undertaken (see Appendix 6 – Metadata Mapping for details of the mapping of the SDDS Base Page and SDDS Summary Methodology to the mandatory INSPIRE fields with manual adjustment):

- Mapping SDDS Base Page and SDDS Summary Methodology directly to INSPIRE format (mandatory fields only)
- Mapping SDDS Base Page and SDDS Summary Methodology to INSPIRE format (mandatory fields only) with manual adjustments
- Mapping SDDS Base Page and SDDS Summary Methodology to INSPIRE format (with optional fields)
- Mapping SDDS Base Page and SDDS Summary Methodology to INSPIRE format (with optional fields) with manual adjustments
- Mapping SDDS Base Page to INSPIRE format (mandatory fields only) and include links to the SDDS summary methodology

The possibility of developing an application to map the SDDS metadata into INSPIRE metadata was considered but due to the following it was decided that manual creation of the INSPIRE metadata would be the quickest and easiest thing to do:

- Format issues, for example, geographic coverage would need to be transformed from free text to a bounding box.
- The delivery format was in HTML which does not have a clear tag structure.
- Differing number of catalog entries required. The SDDS metadata for municipal waste requires three entries (generated, incinerated and landfilled). The SDDS metadata for the waste statistics in general would require two entries (generation and treatment).
- Amendment of free text fields. For example, the abstract in the SDDS metadata for municipal waste mentions generation, incineration and landfilled. This would need to be split up for the three separate catalogue entries.
- The number of catalogue entries required. The waste datasets currently on the European Waste Data Centre can be covered by five catalogue entries.

## 5.2 Discovery Client 1

The first task was to add some of the waste metadata created into a catalogue service. This would allow a Discovery Client to access and search this metadata.

### 5.2.1 Implementation

Geonetwork, an open source catalogue application to manage spatially referenced resources through the web, was used for this task. It provided the tools (both server and client side) for editing and publishing metadata, a search function, the ability to perform a distributed search providing access to metadata published by different servers, a web based interactive map viewer where, if applicable, a summary of the metadata could be viewed. The waste metadata was manually created using the edit and publish tools. The search function provided was used as the Discovery Client.

### 5.2.2 Results

This screenshot demonstrates the result of a search on the keywords of Municipal and Waste. The results have been listed and a summary of the Municipal Waste Generated dataset found has been displayed in the interactive map viewer:



### **5.2.3 Issues**

It was not possible to perform a distributed search that included the European Soil Data Centre (ESDAC) catalogue and the waste metadata created. In trying to import the ESDAC catalogue (forest and soil metadata) into Geonetwork for the search, parsing errors occurred in trying to validate the XML schema.

The ESDAC catalogue was created in terraCatalog version 2.1 (the OGC Web Catalogue Service for geospatial data infrastructures provided by Conterra). Although both this and Geonetwork claim to satisfy the requirements of the INSPIRE directive and so should be interoperable, in practice this is not the case and an adaptor would need to be developed to convert the terraCatalog 2.1 XML schema into the Geonetwork XML schema for this distributed search to be possible.

## **5.3 Discovery Client 2**

The second task was to demonstrate a distributed search across waste metadata from different Catalogue Servers that all offered the metadata through CSW protocol. This search would include the waste metadata created and the ESDAC catalogue's soil and forest metadata.

### **5.3.1 Implementation**

Due to the interoperability problem in validating XML schemas from different Web Catalogue Service applications, the waste metadata was manually created and published using terraCatalog (like Geonetwork this also provided the server and client side tools for editing, publishing and searching metadata). This is the same application as used for the ESDAC catalogue.

Initially, however, the same problems were discovered between application versions as were discovered between applications. The waste metadata had been added to the latest version (2.2) of terraCatalog available at the JRC but the ESDAC catalogue had been created using an earlier version of terraCatalog (2.1). Even in using the same Web Catalogue Service application, with the versions differing, the problem with validating XML schemas remained. Fortunately, in this case an adaptor had been provided by Conterra to convert the terraCatalog 2.1 XML schema into the terraCatalog 2.2 XML schema.

### 5.3.2 Results

This screenshot demonstrates the result of a distributed search on the keyword of Waste. The results have been listed. Those in green can be seen to have come from the ESDAC catalogue and those in pink are the waste metadata created:

The screenshot displays the terraCatalog interface with the following components:

- Navigation Menu (Left):** Includes sections for Search (Simple Search, Extended Search, Browse by Theme, Settings), Maps, Publish, Editorial, Administration (Federated Catalogues), and Your Authentication (User Group: SDI, User Name: matthew, Log off).
- Search Results (Center):** A list of datasets with descriptions.
  - Pink entries (Waste metadata):**
    - Municipal Waste Generated - Kg per person per year
    - Municipal Waste Landfilled - Kg per person per year
    - Waste Treatment Statistics
    - Waste Generated Statistics
  - Green entries (ESDAC catalogue):**
    - Mean plot characteristics at NUTS level 3 for Europe for Forest Focus Level 1 plots
    - Forest Focus Level 2 Database: Site and Stand Characteristics
    - European Soil Data Centre --- SPADE-2 v1.0 - Soil Profile Analytical Database of Europe
- Map (Right):** A geographical map showing the distribution of search results, with a search bar below it set to 'Bundeslaender'.

## 5.4 INSPIRE Geoportal Discovery with Waste Statistics

The INSPIRE Geoportal includes a discovery client which includes its own caching process. A copy of this software was taken and the caching was amended to include the waste metadata. Currently only metadata from terraCatalog applications are cached so it does not add much to Discovery Client 2 above. However, developments are currently ongoing to extend this caching process to include metadata served through GeoNetwork and Geoportal Toolkit applications.

This screenshot demonstrates the result of a distributed search on the keywords of ‘waste’ and ‘soil’. The results have been listed. These can be seen to have come from the ESDAC catalogue, EFDAC catalogue and also include the waste metadata created for Discovery Client 2.

The screenshot shows the INSPIRE Metadata Search interface in Mozilla Firefox. The search query is "waste soil". The results list includes the following items:

- ESDB v2.0 (European Soil Database v2.0)
- European Topsoil Organic Carbon content (OCTOP)
- Forest Focus Level 1 Database: Soil Chemistry (EFDAC)
- Forest Focus Level 2 Database: Soil condition (EFDAC)
- Forest Focus Level 2 Database: Soil solution (EFDAC)
- MEUSIS (Multiscale European Soil Information System) - Alpine Grid 100km
- Municipal Waste Generated - Kg per person per year
- Municipal Waste Incinerated - Kg per person per year
- Municipal Waste Landfilled - Kg per person per year
- PESERA: Pan-European Soil Erosion Risk Assessment

Statistics:

Resource Type Statistic	
Total records found	42
dataset	35
service	7

Topic Category Statistic	
Total records found	42
environment	26
notDefined	11
geoscientificInformation	5

## 5.5 Conclusion and Future Development

This Discovery Client demonstrates that if waste statistics are considered geospatial information (given that they include a country code) and metadata is created that includes all the INSPIRE elements, then it is possible to implement an INSPIRE type Discovery Service for this statistical waste data that is interoperable with the catalogue services offered by the European Soil and Forest Data Centres.

The problem at the moment lies with the interoperability of the current Catalogue Service for Web (CSW) applications available. In serving metadata through a CSW it must be possible to use any INSPIRE compliant CSW application as it is not feasible that all catalogues of geo-referenced data will get served through the same application type. It is, therefore, vital that further work is done on extending the Geoportal caching process to include other applications such as GeoNetwork and the Geoportal Toolkit.

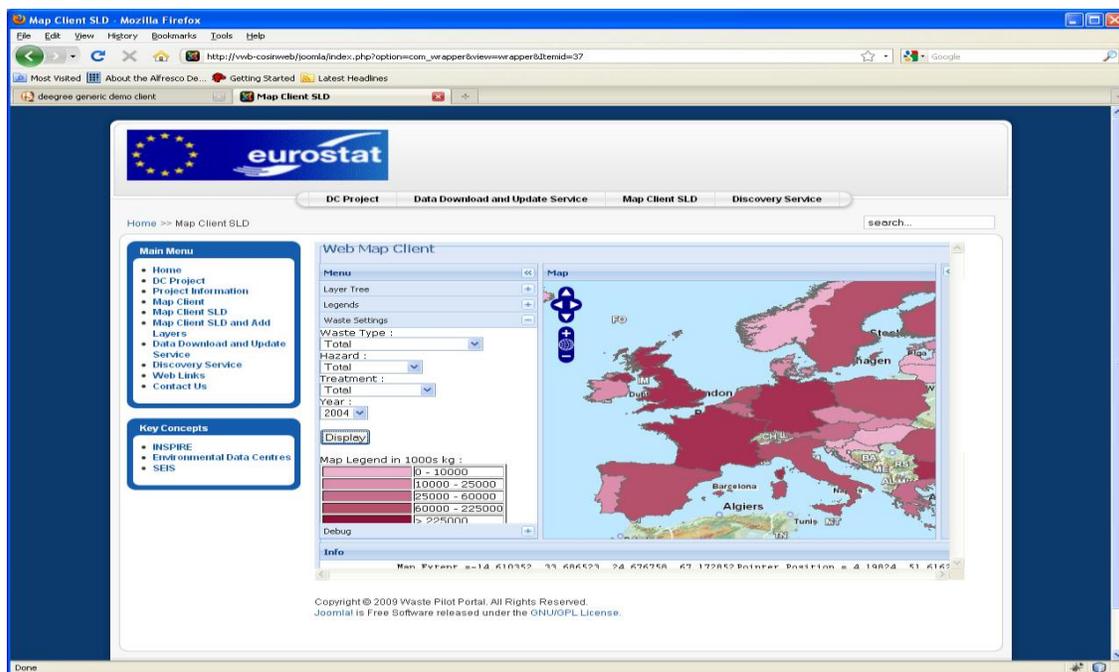
A user wanting to create a Discovery Client to use waste metadata with soil and forest metadata should not have to download and re-format the SDDS waste metadata and then edit and publish it as INSPIRE metadata in order to do it. The waste metadata should be provided in a catalogue meeting the INSPIRE format required and served through a Catalogue Service for Web. This is the same problem as for the Map and Download Clients and the same alternatives exist to solve it. Eurostat could provide the Catalogue Service (again the development would be subject to the constraints laid out by DIGIT in the CEAF and how this would restrict the service being offered needs to be investigated). Alternatively Eurostat could provide a feed of data to an external contractor who provides the Catalogue Service for them.

## 6 Portal

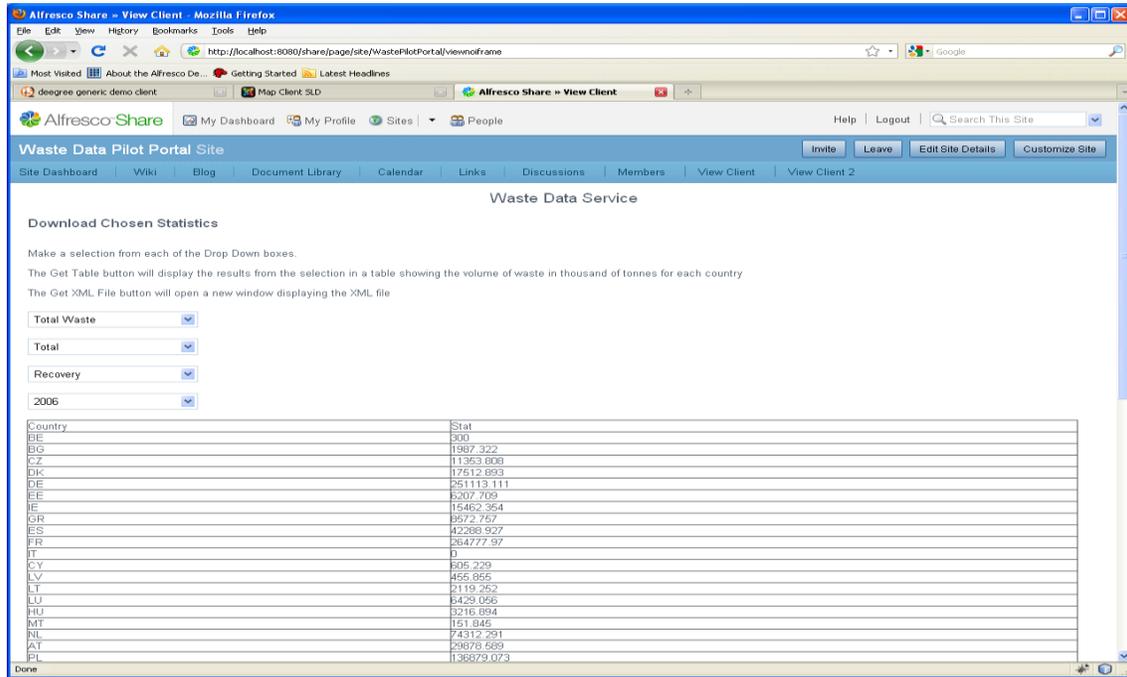
There are a number of ways a web portal, a website that acts as a single point of access for a wide variety of information, could be developed to host the view, download and discovery services covering waste, soil and forest information.

A wide variety of portal server software is available that already has common portal functionality in place (login/logout, creating users, creating links etc.). This reduces the amount of code you have to write to get a portal up and running. It also makes the portal easier to maintain/upgrade. The disadvantage is that it might not be as flexible as you want.

Such a software (Joomla) was chosen to develop the portal on which to demonstrate the services developed for this project. This is free open source content portal server software for publishing content on the World Wide Web. The technologies it uses are PHP, MySQL and Apache. The different services were included in the portal as simple iframes. The ability to create an iframe was included in the common portal functionality.



Alfresco, another Open Source Content Management System (CMS) was also researched. As well as including the services as iframes the possibility of including the actual code for the services within the Content Management System (i.e. adding to the Alfresco code) was investigated. The advantage of this is to have all the code within the same system working together i.e. the user privileges of the CMS with the Map Client functionality. The disadvantage is that a great deal more knowledge of the Content Management System is required to develop it.



Java Portlets allow you to write your own code and plug it into the portal. These were looked at as a possible way of providing the view, download and discovery clients to the portal. The benefit of a standardised Portlet, as defined by the JSR 168 Java Portlet Specification, is that it can be deployed into any compliant portal server. There are also a wide array of vendors that provide software for Portlet development and support the JSR 168 specification such as Liferay, Apache and Exo. These were not used for this project however as the application programming interfaces were not as user friendly and a greater knowledge of coding was required.

## 7 Agile Development

It was envisaged that this project would follow an agile development methodology. For each service developed on the portal, Eurostat would play an active role in frequently inspecting and offering advice on how to adapt and improve the service to meet their needs. Unfortunately, due to network problems, this proved rather difficult and progress reports were made by way of documents with screen shots rather than with working applications. This reduced the effectiveness of the agile methodology and is an issue that will need to be addressed in future projects between the Joint Research Centre (JRC) and Eurostat.

At the beginning of the project this problem was thought to be due to the fact that the JRC and Eurostat had different network specifications. The JRC was hosted on the Scientific European Commission network (also known as the 'Green' network). Eurostat was hosted on the Internal Commission network (also known as the 'Blue' network). Halfway through the project, however, it was announced that this traditional Green/Blue network divide was part of history and therefore Eurostat now had easy access to all internal JRC resources. The services developed were, therefore, installed on an internal JRC server for Eurostat to retrieve. Unfortunately, although Eurostat could view the services, the access was still too slow to be of much use.

Two possible explanations for this slowness are latency and bandwidth. Latency refers to any of several kinds of delays typically incurred in processing network data. These delays include transmission delays, such as physical distance, and processing delays, such as passing the data through proxy servers. The higher the latency, the longer the delays will be. Bandwidth is the overall capacity of the network connection i.e. the data throughput rate of network access. The greater this capacity is, the better the performance of the network.

A study has already been carried out that included testing the network connection between the JRC and Eurostat (see the 'Study and Prototype Implementation for Replication of Key Geospatial Content across JRC Ispra, EEA Copenhagen and DG Eurostat'). Some of the results and conclusions from this study are stated below to give an idea as to what the problem could be. The results used are from the connectivity tests between 'Blue' machines at the JRC and Eurostat (a few users at the JRC were working on 'Blue' machines i.e. they were on the same network as Eurostat) as this is the closest representation to the current situation where the Green/Blue network divide no longer exists.

This study carried out ping tests for connectivity, this test is a good measure of latency. The results indicated a round trip time of between 70 and 80 milliseconds (ms) between a database at Eurostat and a remote computer on the same network at the JRC. A typical ping test result would be less than 100 ms and a desired result would be less than 25 ms. This seems to indicate that although the connection was not perfect, latency did not completely account for the slowness of the connection.

Network bandwidth tests were also carried out that involved downloading a file through HTTP. The conclusion was that the average bandwidth of the connectivity between Eurostat and the JRC is strongly reduced (3.1 Mb/s) compared to that between Eurostat and the European Environment Agency (EEA) (10.7 Mb/s). Bandwidth, therefore, seems to be a bigger problem than latency for access between the JRC and Eurostat.

## 8 Appendices

### 8.1 Appendix 1 - Map Client 1 Code

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-
transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta content="text/html; charset=utf-8" http-
equiv="Content-Type" />
<link rel="stylesheet" href="css/style.css" type="text/css"
media="screen, projection" />
<title>OpenLayers - Custom Layer Switcher</title>
<script type="text/javascript"
src="OpenLayers/lib/OpenLayers.js"></script>

    <script type="text/javascript">

        OpenLayers.IMAGE_RELOAD_ATTEMPTS = 2;
        OpenLayers.Util.onImageLoadErrorColor =
"transparent";

        var layerOptions = {
            isBaseLayer: false,
            singleTile: true,
            buffer: 0,
            ratio: 1
        };

        var format = new
OpenLayers.Format.WMC({'layerOptions': layerOptions});
        var map, context, layerSwitcher;

        function initMap()
        {
            // parse wmc into context object
            var wmc =
document.getElementById('hidWMC').value;

            if(wmc)
            {
                context = format.read(wmc, {map: map});

                for (var i=0; i<context.layers.length;i++)
```

```
{
    var layer = context.layers[i];
    layer.params.TRANSPARENT = 'TRUE';
}

// construct a map
var mapOptions = {
    // maxExtent: context.bounds, - Turned
this off to allow users to pan beyond context extent
    projection: context.srs
};

map = new OpenLayers.Map("map", mapOptions);

// remove default PanZoom control
map.removeControl (map.controls [1]);

// load controls
var ctrl = new
OpenLayers.Control.PanZoomBar();
ctrl.zoomWorldIcon = true;
map.addControl (ctrl);
map.addControl(new
OpenLayers.Control.MousePosition({'div':OpenLayers.Util.getE
lement('mousepos')}));
map.addControl(new
OpenLayers.Control.Scale($('scale'))); //don't ask me why,
but coding convention is different for the Scale Control
map.addControl(new
OpenLayers.Control.ScaleLine());

// add the LayerSwitcher (a.k.a. Map Legend)
layerSwitcher = new
OpenLayers.Control.LayerSwitcher({'div':OpenLayers.Util.getE
lement('layerswitch'), activeColor:'transparent'});
layerSwitcher.ascending = false;
map.addControl(layerSwitcher);

var layerSwDIV =
document.getElementById('layerswitch'); //hack: to override
the white-blue style of this control, which is made
programmatically (at constructor level), and not in css.
layerSwDIV.style.position = "relative";
layerSwDIV.style.top = "0";
layerSwDIV.style.right = "0";
layerSwDIV.style.left = "";
layerSwDIV.style.fontFamily = "";
```

```
        layerSwDIV.style.fontWeight = "";
        layerSwDIV.style.marginTop = "";
        layerSwDIV.style.marginLeft = "";
        layerSwDIV.style.marginBottom = "";
        layerSwDIV.style.fontSize = "";
        layerSwDIV.style.color = "";
        layerSwDIV.style.backgroundColor = "";
        //layerSwDIV.style.width = "250px";
        //layerSwDIV.style.height = "800px";
        // BDL: to set the height of the layer
list from the constructor, go to LayerSwitcher.js on line
806
```

```
        // create a fake base layer
        var baseLayerOptions = {
            isBaseLayer: true,
            displayInLayerSwitcher: false
        };

        var fake = new OpenLayers.Layer('fake',
baseLayerOptions);
        map.addLayer(fake);

        // add the context layers to the map
        map.addLayers(context.layers);

        // zoom to the extent
        map.zoomToExtent(context.bounds);

        // zoom in one level - bug workaround
        map.zoomIn();

        // load the legend images
        layerSwitcher.getLegendGraphics(true);

        // create a new event handler for single
click query
        var clickEventHandler = new
OpenLayers.Handler.Click({ 'map': map }, { 'click':
function(e) { doGetFeatureInfo(e); } });
        clickEventHandler.activate();

        // the part below is just to make the
bounds show up on the page
        var boundsOutput =
document.getElementById('bounds');
```

```
        function updateBounds() {
            var code =
map.getExtent().toBBOX().replace(/,/g, ' ');
            boundsOutput.innerHTML = code;
        }
        // update the bounds with each map move
map.events.register('moveend', map,
updateBounds);
        // and update the bounds on first load
updateBounds();

    }
}

function doGetFeatureInfo(evt)
{
    var layerId = layerSwitcher.activeLayer;

    if(evt)
    {
        var activeLayer = map.getLayer(layerId);

        if(activeLayer)
        {
            var url =
activeLayer.getFullRequestString({
                REQUEST: "GetFeatureInfo",
                EXCEPTIONS:
"application/vnd.ogc.se_xml",
                BBOX:
activeLayer.map.getExtent().toBBOX(),
                X: evt.xy.x,
                Y: evt.xy.y,
                INFO_FORMAT: 'text/html',
                QUERY_LAYERS:
activeLayer.params.LAYERS,
                WIDTH:
activeLayer.map.size.w,
                HEIGHT:
activeLayer.map.size.h});

            var popupWindow = window.open(url,
"GetFeatureInfo",
"width=550,height=350,status=yes,scrollbars=yes,resizable=yes");

            if(popupWindow)
```

```
        {
            popupWindow.focus();
        }
        else
        {
            return true;
        }

        OpenLayers.Event.stop(evt);

    }
}
</script>

</head>

<body onload="initMap()" >
<div id = "banner">
    <h1>Soil, Forest and Waste Map Viewer</h1>
</div>
<table id="layouttable" border="0" cellpadding="0"
cellspacing="0">
    <tr>
        <td>
            <div id="map"></div>
        </td>
        <td id="cellA1">
            <h2>Layers</h2>
            <div id="layerswitch"></div>
            &nbsp;
        </td>
    </tr>
    <tr>
        <td id="cellB2">
            <table width="100%" align="center" border="0"><tr>
                <td width="34%">
                    <pre>Map Scale:<br /><span
id="scale"></span></pre>
                </td>
                <td width="33%">
                    <pre>Map Extent:<br /><span
id="bounds"></span></pre>
                </td>
                <td width="33%" >
```

```
        <pre>Pointer Position:<br /><span id="mousepos"
class="olControlMousePosition"></span></pre>
        </td>
    </tr></table>
</td>
<td>&nbsp;</td>
</tr>
</table>
<input type="hidden" id="hidWMC" value='<?xml version="1.0"
encoding="utf-8"?>
<ViewContext id="WMC"
xsi:schemaLocation="http://www.opengis.net/context
http://schemas.opengis.net/context/1.1.0/context.xsd"
version="1.1.0" xmlns="http://www.opengis.net/context"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <General>
        <Window width="800" height="600" />
        <BoundingBox SRS="EPSG:4326" minx="-180" miny="-90"
maxx="180" maxy="90" />
        <Title>Temporary Map</Title>
        <Abstract />
    </General>
    <LayerList>
        <Layer queryable="1" hidden="0">
            <Server service="OGC:WMS" version="1.1.1"
title="Demis World Map">
                <OnlineResource
xlink:href="http://www2.demis.nl/wms/wms.asp?wms=WorldMap"/>
            </Server>
            <Name>Bathymetry</Name>
            <Title>Bathymetry</Title>
            <Abstract>no abstract provided by host</Abstract>
            <SRS>EPSG:4326</SRS>
            <FormatList>
                <Format current="1">image/png</Format>
            </FormatList>
        </Layer>
        <Layer queryable="0" hidden="0">
            <Server service="OGC:WMS" version="1.1.1" title="Demis
World Map">
                <OnlineResource
xlink:href="http://www2.demis.nl/wms/wms.asp?wms=WorldMap"/>
            </Server>
            <Name>Topography</Name>
            <Title>Topography</Title>
```

```
<Abstract>no abstract provided by host</Abstract>
<SRS>EPSG:4326</SRS>
<FormatList>
  <Format current="1">image/png</Format>
</FormatList>
</Layer>
<Layer queryable="0" hidden="0">
  <Server service="OGC:WMS" version="1.1.1" title="Atlas
of Canada Framework Data Sets WMS">
    <OnlineResource xlink:href="http://atlas.gc.ca/cgi-
bin/atlaswms_en" />
  </Server>
  <Name>wld_coast</Name>
  <Title>Ocean Coastline</Title>
  <Abstract>Ocean coastline of the world.</Abstract>
  <SRS />
  <FormatList>
    <Format current="1">image/png</Format>
  </FormatList>
</Layer>
  <Layer hidden="true" queryable="true">
    <Server service="OGC:WMS" title="ESDAC Web Map
Service" version="1.1.1">
      <OnlineResource
ns3:href="http://eusoils.jrc.it:80/wmsconnector/com.esri.wms
.Esrimap/EusoilsINSPIRE" ns3:type="simple"
xmlns:ns3="http://www.w3.org/1999/xlink"/>
    </Server>
    <Name>73</Name>
    <Title>VS. Volume of stones</Title>
    <SRS>EPSG:4326</SRS>
    <SRS>EPSG:4267</SRS>
    <SRS>EPSG:4269</SRS>
    <FormatList>
      <Format current="true">image/png</Format>
      <Format current="false">image/jpeg</Format>
      <Format current="false">image/gif</Format>
    </FormatList>
    <StyleList/>
  </Layer>
  <Layer hidden="true" queryable="true">
    <Server service="OGC:WMS" title="ESDAC Web Map
Service" version="1.1.1">
      <OnlineResource
ns4:href="http://eusoils.jrc.it:80/wmsconnector/com.esri.wms
.Esrimap/EusoilsINSPIRE" ns4:type="simple"
xmlns:ns4="http://www.w3.org/1999/xlink"/>
```

```
</Server>
<Name>11</Name>
<Title>PARMADO. Dominant Parent Material</Title>
<SRS>EPSG:4326</SRS>
<SRS>EPSG:4267</SRS>
<SRS>EPSG:4269</SRS>
<FormatList>
  <Format current="true">image/png</Format>
  <Format current="false">image/jpeg</Format>
  <Format current="false">image/gif</Format>
</FormatList>
<StyleList/>
</Layer>
<Layer hidden="true" queryable="true">
  <Server service="OGC:WMS" title="ESDAC Web Map
Service" version="1.1.1">
    <OnlineResource
ns5:href="http://eusoils.jrc.it:80/wmsconnector/com.esri.wms
.Esrimap/EusoilsINSPIRE" ns5:type="simple"
xmlns:ns5="http://www.w3.org/1999/xlink"/>
  </Server>
  <Name>23</Name>
  <Title>TXSRFDO. Dom.surface text.class</Title>
  <SRS>EPSG:4326</SRS>
  <SRS>EPSG:4267</SRS>
  <SRS>EPSG:4269</SRS>
  <FormatList>
    <Format current="true">image/png</Format>
    <Format current="false">image/jpeg</Format>
    <Format current="false">image/gif</Format>
  </FormatList>
  <StyleList/>
</Layer>
<Layer hidden="false" queryable="true">
  <Server service="OGC:WMS" title="ESDAC Web Map
Service" version="1.1.1">
    <OnlineResource
ns6:href="http://eusoils.jrc.it:80/wmsconnector/com.esri.wms
.Esrimap/EusoilsINSPIRE" ns6:type="simple"
xmlns:ns6="http://www.w3.org/1999/xlink"/>
  </Server>
  <Name>34</Name>
  <Title>WRBFU. Full soil Code</Title>
  <SRS>EPSG:4326</SRS>
  <SRS>EPSG:4267</SRS>
  <SRS>EPSG:4269</SRS>
  <FormatList>
```

```
        <Format current="true">image/png</Format>
        <Format current="false">image/jpeg</Format>
        <Format current="false">image/gif</Format>
    </FormatList>
    <StyleList/>
</Layer>
<Layer hidden="false" queryable="true">
    <Server service="OGC:WMS" title="ESDAC Web Map
Service" version="1.1.1">
        <OnlineResource
ns7:href="http://eusoils.jrc.it:80/wmsconnector/com.esri.wms
.Esrimap/EusoilsINSPIRE" ns7:type="simple"
xmlns:ns7="http://www.w3.org/1999/xlink"/>
        </Server>
        <Name>0</Name>
        <Title>Country Boundaries</Title>
        <SRS>EPSG:4326</SRS>
        <SRS>EPSG:4267</SRS>
        <SRS>EPSG:4269</SRS>
        <FormatList>
            <Format current="true">image/png</Format>
            <Format current="false">image/jpeg</Format>
            <Format current="false">image/gif</Format>
        </FormatList>
        <StyleList/>
    </Layer>
<Layer hidden="false" queryable="true">
    <Server service="OGC:WMS" title="EFDAC Web Map
Service" version="1.1.1">
        <OnlineResource
ns8:href="http://efdac.jrc.it/mapserv/mapserv/"
ns8:type="simple" xmlns:ns8="http://www.w3.org/1999/xlink"/>
        </Server>
        <Name>forestmap_1000</Name>
        <Title>forestmap2000: Forest/Non-Forest Map,
2000 (1 km resolution)</Title>
        <SRS>EPSG:3035</SRS>
        <SRS>EPSG:4326</SRS>
        <FormatList>
            <Format current="false">image/gif</Format>
            <Format current="true">image/png</Format>
            <Format current="false">image/png;
mode=24bit</Format>
            <Format current="false">image/jpeg</Format>
            <Format current="false">image/wbmp</Format>
            <Format current="false">image/tiff</Format>
        </FormatList>
```

```
        <StyleList/>
    </Layer>
    <Layer hidden="true" queryable="true">
        <Server service="OGC:WMS" title="EFDAC Web Map
Service" version="1.1.1">
            <OnlineResource
ns9:href="http://efdac.jrc.it/mapserv/mapserv/"
ns9:type="simple" xmlns:ns9="http://www.w3.org/1999/xlink"/>
            </Server>
            <Name>forestpattern2000</Name>
            <Title>forestpattern: European Forest Spatial
Pattern, CLC 2000, 100m edge</Title>
            <SRS>EPSG:3035</SRS>
            <SRS>EPSG:4326</SRS>
            <FormatList>
                <Format current="false">image/gif</Format>
                <Format current="true">image/png</Format>
                <Format current="false">image/png;
mode=24bit</Format>
                <Format current="false">image/jpeg</Format>
                <Format current="false">image/wbmp</Format>
                <Format current="false">image/tiff</Format>
            </FormatList>
            <StyleList/>
        </Layer>
    <Layer hidden="true" queryable="true">
        <Server service="OGC:WMS" title="EFDAC Web Map
Service" version="1.1.1">
            <OnlineResource
ns10:href="http://efdac.jrc.it/mapserv/mapserv/"
ns10:type="simple"
xmlns:ns10="http://www.w3.org/1999/xlink"/>
            </Server>
            <Name>discolouration_nuts1</Name>
            <Title>Crown Discoloration: Crown discoloration
NUTS1 plot averages</Title>
            <SRS>EPSG:3035</SRS>
            <SRS>EPSG:4326</SRS>
            <FormatList>
                <Format current="false">image/gif</Format>
                <Format current="true">image/png</Format>
                <Format current="false">image/png;
mode=24bit</Format>
                <Format current="false">image/jpeg</Format>
                <Format current="false">image/wbmp</Format>
                <Format current="false">image/tiff</Format>
            </FormatList>
```

```
        <StyleList/>
    </Layer>
    <Layer hidden="true" queryable="true">
        <Server service="OGC:WMS" title="EFDAC Web Map
Service" version="1.1.1">
            <OnlineResource
ns11:href="http://efdac.jrc.it/mapserv/mapserv/"
ns11:type="simple"
xmlns:ns11="http://www.w3.org/1999/xlink"/>
            </Server>
            <Name>defoliation_nuts1</Name>
            <Title>Crown Defoliation: Crown defoliation
NUTS1 plot averages</Title>
            <SRS>EPSG:3035</SRS>
            <SRS>EPSG:4326</SRS>
            <FormatList>
                <Format current="false">image/gif</Format>
                <Format current="true">image/png</Format>
                <Format current="false">image/png;
mode=24bit</Format>
                <Format current="false">image/jpeg</Format>
                <Format current="false">image/wbmp</Format>
                <Format current="false">image/tiff</Format>
            </FormatList>
            <StyleList/>
        </Layer>
        <Layer hidden="true" queryable="true">
            <Server service="OGC:WMS" title="OGC:WMS"
version="1.1.1">
                <OnlineResource ns12:href="http://s-
jrciprap242p/arcgis/services/SEIS_waste_test/MapServer/WMSSe
rver?" ns12:type="simple"
xmlns:ns12="http://www.w3.org/1999/xlink"/>
                </Server>
                <Name>0</Name>
                <Title>Municipal Waste Generated 2006</Title>
                <SRS>EPSG:4326</SRS>
                <SRS>EPSG:4258</SRS>
                <FormatList>
                    <Format current="false">image/gif</Format>
                    <Format current="true">image/png</Format>
                    <Format current="false">image/png;
mode=24bit</Format>
                    <Format current="false">image/jpeg</Format>
                    <Format current="false">image/wbmp</Format>
                    <Format current="false">image/tiff</Format>
                </FormatList>
```

```
        <StyleList/>
    </Layer>
    <Layer hidden="true" queryable="true">
        <Server service="OGC:WMS" title="OGC:WMS"
version="1.1.1">
            <OnlineResource ns13:href="http://s-
jrciprap242p/arcgis/services/MunicipalWasteIncinerated1995/M
apServer/WMServer?" ns13:type="simple"
xmlns:ns13="http://www.w3.org/1999/xlink"/>
        </Server>
        <Name>0</Name>
        <Title>Municipal Waste Incinerated 1995</Title>
        <SRS>EPSG:4326</SRS>
        <SRS>EPSG:4258</SRS>
        <FormatList>
            <Format current="false">image/gif</Format>
            <Format current="true">image/png</Format>
            <Format current="false">image/png;
mode=24bit</Format>
            <Format current="false">image/jpeg</Format>
            <Format current="false">image/wbmp</Format>
            <Format current="false">image/tiff</Format>
        </FormatList>
        <StyleList/>
    </Layer>
    <Layer hidden="true" queryable="true">
        <Server service="OGC:WMS" title="OGC:WMS"
version="1.1.1">
            <OnlineResource ns14:href="http://s-
jrciprap242p/arcgis/services/MunicipalWasteLandfilled1995/Ma
pServer/WMServer?" ns14:type="simple"
xmlns:ns14="http://www.w3.org/1999/xlink"/>
        </Server>
        <Name>0</Name>
        <Title>Municipal Waste Landfilled 1995</Title>
        <SRS>EPSG:4326</SRS>
        <SRS>EPSG:4258</SRS>
        <FormatList>
            <Format current="false">image/gif</Format>
            <Format current="true">image/png</Format>
            <Format current="false">image/png;
mode=24bit</Format>
            <Format current="false">image/jpeg</Format>
            <Format current="false">image/wbmp</Format>
            <Format current="false">image/tiff</Format>
        </FormatList>
        <StyleList/>
```

```
        </Layer>
    </LayerList>
</ViewContext>' />
</body>

</html>
```

## 8.2 Appendix 2 - Map Client 2 Code

Highlighted in yellow is the code that represents the use of the SLD.

```
// THE MAIN FUNCTION, INITIALISING THE APP
Ext.onReady(function() {
    // reference local blank image
    Ext.BLANK_IMAGE_URL =
'lib/ext/resources/images/default/s.gif';

    OpenLayers.IMAGE_RELOAD_ATTEMPTS = 2;
    OpenLayers.Util.onImageLoadErrorColor = "transparent";
    format = new OpenLayers.Format.WMC({'layerOptions':
{buffer: 0}});

    // create map using adhoc funciton
    myMapInit();

    var wms1 = new OpenLayers.Layer.WMS("EFDAC Crown
Defoliation", "http://efdac.jrc.it/mapserv/mapserv/",
{layers: 'defoliation_nuts1', transparent:true},
{isBaseLayer:false, visibility:false});
    var wms2 = new OpenLayers.Layer.WMS("EFDAC Crown
Discolouration", "http://efdac.jrc.it/mapserv/mapserv/",
{layers: 'discolouration_nuts1', transparent:true},
{isBaseLayer:false, visibility:false});
    var wms3 = new OpenLayers.Layer.WMS("EFDAC Forest
Pattern 2000", "http://efdac.jrc.it/mapserv/mapserv/",
{layers: 'forestpattern2000', transparent:true},
{isBaseLayer:false, visibility:false});
    wms4 = new OpenLayers.Layer.WMS("Waste test
service",
"http://plurel.jrc.ec.europa.eu/ArcGIS/services/SEIS_waste_t
est/MapServer/WMServer?", {layers: '0', transparent:true,
version:'1.3.0', crs:'crs:84'}, { isBaseLayer:false});

    var wms5 =
        new OpenLayers.Layer.WMS("World basemap",
"http://plurel.jrc.ec.europa.eu/ArcGIS/services/worldwithEGM
/mapserv/wmserver?service=WMS&request=GetMap", {
        layers:
'0,2,3,4,5,7,8,9,10,13,14,15,16,18,19,20,21,22,23,26,27,28,3
0,31,32,33,35,36,37,39,40,41',
        version: '1.3.0',
        crs:'crs:84'
    }, {isBaseLayer: false});
```

```
map.addLayers([wms5,wms4,wms3,wms2,wms1]); //notice
that the last added is on top (=> order has csq on display)
```

```
var clickEventHandler = new
OpenLayers.Handler.Click({ 'map': map }, { 'click':
function(e) { doGetFeatureInfo(e); } });
clickEventHandler.activate();
```

```
//*****EXT
interface*****
var panel = new Ext.Container({
  el: 'wrapper',
  renderTo: Ext.getBody(),
  layout: 'border',
  items: [
    new Ext.BoxComponent({ // raw
      region: 'north',
      el: 'north',
      height: 32
    }), {
      region: 'south',
      contentEl: 'south',
      split: true,
      height: 50,
      collapsible: false,
      title: 'Info',
      margins: '0 5 5 5'
    }, {
      region: 'west',
      id: 'west-panel',
      title: 'Menu',
      split: true,
      width: 250,
      minSize: 175,
      maxSize: 400,
      collapsible: true,
      margins: '0 0 0 5',
      layout: 'accordion',
      layoutConfig: {
        animate: true
      },
      items: [{
        contentEl: 'west',
        title: 'Layer Tree',
        border: false,
        xtype: 'layertree',
```

```
        showWmsLegend: true,
        map: map,
        plugins:
[mapfish.widgets.LayerTree.createContextualMenuPlugin(['opacitySlide', 'remove'])],
        ascending: false,
        enabledDD: true
    }, {
        title: 'Legends',
        //html: '',
        html: '<p><a href="#"
onclick="return
getImage(\'placeholder\', \'http://efdac.jrc.it/mapserv/mapserv/?version=1.1.1&service=WMS&request=GetLegendGraphic&layer=defoliation_nuts1&format=image/png\');">EFDAC Crown
Defoliation</a></p><br /><p><a href="#" onclick="return
getImage(\'placeholder\', \'http://efdac.jrc.it/mapserv/mapserv/?version=1.1.1&service=WMS&request=GetLegendGraphic&layer=discolouration_nuts1&format=image/png\');">EFDAC Crown
Discolouration</a></p><br /><p><a href="#" onclick="return
getImage(\'placeholder\', \'http://efdac.jrc.it/mapserv/mapserv/?version=1.1.1&service=WMS&request=GetLegendGraphic&layer=forestpattern2000&format=image/png\');">EFDAC Forest
Pattern 2000</a></p><br /><p></p>',
        margins: '5 5 5 5',
        border: false
    }, {
        title: 'Waste Settings',
        html: '<form
name="myform"><label>Waste Type : </label><br /><select
name="wastetypeselect" size="1"><option
value="TO">Total</option><option value="CS">Common
Sludges</option><option value="CW">Chemical</option><option
value="CWS">Chemical not Used Oils</option><option
value="UO">Used Oils</option><option value="HC">Health Care
and Bio</option><option value="MW">Metalic</option><option
value="GW">Glass</option><option value="PC">Paper
Cardboard</option><option value="RW">Rubber</option><option
value="PW">Plastic</option><option
value="WW">Wood</option><option
```

```

value="TW">Textile</option><option
value="PCB">PCB</option><option value="AV">Animal
Vegetal</option><option value="AFP">Animal Food
Prep</option><option value="AFU">Animal
Faeces</option><option value="HS">Household</option><option
value="MU">Mixed and Undifferentiated</option><option
value="SR">Sorting Residues</option></select><br
/><label>Hazard : </label><br /><select name="hazardselect"
size="1"><option value="T0">Total</option><option
value="HZ">Hazardous</option><option value="NH">Not
Hazardous</option></select><br/><label>Treatment :
</label><br /><select name="treatselect" size="1"><option
value="TOT">Total</option><option
value="REC">Recovery</option><option
value="DIS">Disposal</option><option value="ENR">Energy
Recovery</option><option
value="INC">Incineration</option><option
value="DEP">Deposit</option><option value="LTR">Land
Treatment</option></select><br/><label>Year : </label><br
/><select name="yearselect" size="1"><option
value="04">2004</option><option
value="06">2006</option></select><br /><br /><input
name="clickbutton" type="button" value="Display"
onclick="UseSLD(myform.wastetypeselect.options[myform.wastet
ypeselect.selectedIndex].value +
myform.hazardselect.options[myform.hazardselect.selectedInde
x].value +
myform.treatselect.options[myform.treatselect.selectedIndex]
.value +
myform.yearselect.options[myform.yearselect.selectedIndex].v
alue);" /><br /><br /><table border="1"><caption>Map Legend
in 1000s kg :</caption><tr><td width="100"
bgcolor="#EFB2CE">&nbsp;</td><td>0 - 10000</td></tr><tr><td
bgcolor="#DE8EAD">&nbsp;</td><td>10000 -
25000</td></tr><tr><td
bgcolor="#C66D8C">&nbsp;</td><td>25000 -
60000</td></tr><tr><td
bgcolor="#B5516B">&nbsp;</td><td>60000 -
225000</td></tr><tr><td bgcolor="#8C1039">&nbsp;</td><td>>
225000</td></tr></table>',
        margins: '5 5 5 5',
        border: false
    }, {
        title: 'Debug',
        html: 'Projection: <span
id="proj"></span><br />Units: <span id="units"></span><br
/>Resolution: <span id="resolution"></span><br />Max Ext:

```

```
<span id="maxext"></span><br />Max Resolution: <span  
id="maxresol"></span><br />Map size: <span  
id="size"></span><br />Num Zoom levels: <span  
id="numzoom"></span><br />Zoom: <span id="zoom"></span><br  
>',
```

```
        margins: '5 5 5 5',  
        border: false  
    }  
    }, {  
        region: 'center',  
        title: 'Map',  
        layout: 'fit',  
        xtype: 'mapcomponent',  
        map: map  
    }  
    , {  
        region: 'east',  
        title: 'WMC',  
        contentEl: 'east',  
        width: 400,  
        margins: '0 5 0 5',  
        collapsible: true,  
        collapsed : true  
        //items: [  
        //  new Ext.form.TextArea({  
        //  el:'wmc',  
        //width:398,  
        //height:550  
        //})  
        //]  
    }  
    ]  
    });  
});
```

```
// functions that manage the 'loading' animation
```

```
var loading = Ext.get('loading');  
var mask = Ext.get('loading-mask');  
mask.setOpacity(.8);  
mask.shift({  
    xy:loading.getXY(),  
    width:loading.getWidth(),  
    height:loading.getHeight(),  
    remove:true,  
    duration:1,  
    opacity:.3,
```

```
        easing:'bounceOut',
        callback : function(){
            loading.fadeOut({duration:.2,remove:true});
        }
    });

// functions related to the map
function myMapInit (){
    var options = {
        projection: "EPSG:4326",
        units: "degrees"
    };
    map = new OpenLayers.Map('center', options);
    //add a basemap, it is necessary to avoid a "map
has no map extent" error, if you want, you can use a fake
one, and set the "displayInLayerSwitcher" property to false
    //aslo, notice that the default extent of the map
is the one of this baselayer
    map.addLayer(new OpenLayers.Layer('None',
    {isBaseLayer: true, displayInLayerSwitcher:false}));

    //map.addControl(new
OpenLayers.Control.LayerSwitcher());
    map.setCenter(new OpenLayers.LonLat(6, 55), 5);
    map.addControl(new
OpenLayers.Control.Scale($('scale')));
    map.addControl(new
OpenLayers.Control.MousePosition({'div':OpenLayers.Util.getE
lement('mousepos')}));

    // update the bounds with each map move
    map.events.register('moveend', map, updateBounds);
}

// the part below is just to make the bounds show up on
the page
function updateBounds() {
    var boundsOutput =
document.getElementById('bounds');
    var code = "Map Extent =" +
map.getExtent().toBBOX().replace(/,/g, ', ');
    boundsOutput.innerHTML = code;
    displayDebug();
}
```

```
function displayDebug() {
    document.getElementById("proj").innerHTML =
map.getProjection();
    document.getElementById("units").innerHTML =
map.getUnits();
    document.getElementById("resolution").innerHTML =
map.getResolution();
    document.getElementById("maxext").innerHTML =
map.getMaxExtent();
    document.getElementById("maxresol").innerHTML =
map.getMaxResolution();
    document.getElementById("size").innerHTML =
map.getSize();
    document.getElementById("numzoom").innerHTML =
map.getNumZoomLevels();
    document.getElementById("zoom").innerHTML =
map.getZoom();
}

function UseSLD(param) {
    mySelection = param;
    SLDurl =
'http://plurel.jrc.ec.europa.eu/ArcGIS/Wms/SLDs/dynsld.aspx?
field=' + param;
    wms4.mergeNewParams({styles: 'Style1', SLD: SLDurl})
};

function readWMC(merge) {
    var text = document.getElementById("wmc").value;

    if(merge) {
        try {
            map = format.read(text, {map: map});
        } catch(err) {
            document.getElementById("wmc").value =
err;
        }
    } else {
        map.destroy();
        try {
            map = new OpenLayers.Map("center");
            myMapInit(map);
            map = format.read(text, {map:
"center"});
        } catch(err) {
```

```
        document.getElementById("wmc").value =
err;
    }
}

function writeWMC(merge) {
    try {
        var text = format.write(map);
        document.getElementById("wmc").value = text;
    } catch(err) {
        document.getElementById("wmc").value = err;
    }
}

// function to get the legends
function getImage(pExistingImageID, pImageURL){
    var img = document.createElement('img');
    img.onload = function (evt) {

document.getElementById(pExistingImageID).src=this.src;

document.getElementById(pExistingImageID).width=this.width;

document.getElementById(pExistingImageID).height=this.height
;
    }
    img.src = pImageURL;
    return false;
}

function doGetFeatureInfo(evt)
{
    if(evt)
    {
        var wmsStat = new OpenLayers.Layer.WMS( "Waste
test service",
"http://plurel.jrc.ec.europa.eu/ArcGIS/services/SEIS_waste_t
est/MapServer/WMSServer?", {layers: '0'});
        map.addLayer(wmsStat);

        if(wmsStat)
        {
            var url = wmsStat.getFullRequestString({
                REQUEST: "GetFeatureInfo",
                EXCEPTIONS:
"application/vnd.ogc.se_xml",
```

```

        BBOX:
wmsStat.map.getExtent().toBBOX(),
        X: evt.xy.x,
        Y: evt.xy.y,
        INFO_FORMAT: 'text/xml',
        QUERY_LAYERS:
wmsStat.params.LAYERS,
        WIDTH:
wmsStat.map.size.w,
        HEIGHT:
wmsStat.map.size.h});

        OpenLayers.ProxyHost = "http://localhost/cgi-
bin/proxy.cgi?url=";

        OpenLayers.loadURL(url, '', this, setHTML);

        OpenLayers.Event.stop(evt);
    }
}

function setHTML(response) {
    //alert(response.responseText);

    if (!mySelection) {
        mySelection = "TOTOTOT06";
    }

    myHTMLOutput = '';
    myHTMLOutput += '<table width="98%" border="1"
cellpadding="0" cellspacing="0">';
    myHTMLOutput += '<th>Country</th><th>Stat</th>';

    $('FIELDS', response.responseXML).each(function(i)
    {
        countryCode = $(this).attr("COUNTRYCOD");
        //stat = $(this).attr("TOTOTOT06");
        stat = $(this).attr(mySelection);
        mydata = BuildTdHTML(countryCode, stat);
        myHTMLOutput = myHTMLOutput + mydata;
    });
    myHTMLOutput += '</table>';
    $("#FeatureTab").append(myHTMLOutput);

    //create the window on the first click and reuse
    subsequent clicks

```

```
if (!win) {
    win = new Ext.Window({
        applyTo      : 'ContentArea',
        autoScroll   : true,
        layout       : 'fit',
        width        : 500,
        Height       : 300,
        closeAction  : 'hide',
        plain        : true,
        items        : new Ext.TabPanel ({
            applyTo   : 'ContentTab',
            autoTabs  : true,
            activeTab : 0,
            deferredRender : false,
            border    : false
        }),
        buttons: [{
            text      : 'close',
            handler   : function() {
                win.hide();
            }
        }]
    });
}
else {
    Ext.get('FeatureTab').update(myHTMLOutput);
}
win.show();
}

function BuildTdHTML(countryCode, stat){
    // Build HTML string and return
    output = '';
    output += '<tr>';
    output += '<td>'+ countryCode + '</td>';
    output += '<td>'+ stat + '</td>';
    output += '</tr>';
    return output;
}
```

### 8.3 Appendix 3 - Map Client 2 SLD File

Highlighted in yellow is the code that demonstrates the use of the user selected variable in the SLD.

```
<?xml version="1.0" encoding="utf-8"?>
<%@LANGUAGE="VBSCRIPT" CODEPAGE="1252"%>
<%
'-----
-----
Dim wastetypecode, hazardcode, treatcode, year, fieldname
fieldname = Request.QueryString("field")

'BDL : we have to concatenate parameters on client side,
because as the SLD URL is passed as parameter, the &
character poses problems (even encoded as %26)
' so, for the moment: only 1 get parameter is possible on
SLD URL :-(

'wastetypecode = Request.QueryString("wastetypecode")
'hazardcode = Request.QueryString("hazardcode")
'treatcode = Request.QueryString("treatcode")
'year = Request.QueryString("year")

'fieldname = wastetypecode & hazardcode & treatcode & year

Dim colors() as String =
{"#DDDDDD", "#EFB2CE", "#DE8EAD", "#C66D8C", "#B5516B", "#A53052",
, "#8C1039"}

dim thresholds() as Double = {0, 10000, 25000, 60000, 225000}
'-----
-----
%>
<sld:StyledLayerDescriptor version="1.0.0"
xmlns:sld="http://www.opengis.net/sld"
xmlns:ogc="http://www.opengis.net/ogc">
  <sld:NamedLayer>
    <sld:Name>0</sld:Name>
    <sld:UserStyle>
      <sld:Name>Style1</sld:Name>
      <sld:FeatureTypeStyle>
        <sld:FeatureTypeName>0</sld:FeatureTypeName>
        <sld:Rule>
          <sld:Name>class1</sld:Name>
          <sld:Title>class1</sld:Title>
```

```
<ogc:Filter>
  <ogc:And>
    <ogc:PropertyIsGreaterThanOrEqualTo>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
  <ogc:Literal><%=tresholds(0)%></ogc:Literal>
  </ogc:PropertyIsGreaterThanOrEqualTo>
  <ogc:PropertyIsLessThanOrEqualTo>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
  <ogc:Literal><%=tresholds(1)%></ogc:Literal>
  </ogc:PropertyIsLessThanOrEqualTo>
</ogc:And>
</ogc:Filter>
<sld:PolygonSymbolizer>
  <sld:Fill>
    <sld:CssParameter
name="fill"><%=colors(1)%></sld:CssParameter>
    <sld:CssParameter name="fill-
opacity">1</sld:CssParameter>
  </sld:Fill>
  <sld:Stroke>
    <sld:CssParameter
name="stroke">#6E6E6E</sld:CssParameter>
    <sld:CssParameter name="stroke-
width">0.4</sld:CssParameter>
    <sld:CssParameter name="stroke-
opacity">1</sld:CssParameter>
  </sld:Stroke>
</sld:PolygonSymbolizer>
</sld:Rule>
<sld:Rule>
  <sld:Name>class2</sld:Name>
  <sld:Title>class2</sld:Title>
  <ogc:Filter>
    <ogc:And>
      <ogc:PropertyIsGreaterThanOrEqualTo>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
      <ogc:Literal><%=tresholds(1)%></ogc:Literal>
      </ogc:PropertyIsGreaterThanOrEqualTo>
      <ogc:PropertyIsLessThanOrEqualTo>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
      <ogc:Literal><%=tresholds(2)%></ogc:Literal>
      </ogc:PropertyIsLessThanOrEqualTo>
    </ogc:And>
```

```
        </ogc:Filter>
        <sld:PolygonSymbolizer>
          <sld:Fill>
            <sld:CssParameter
name="fill"><%=colors (2) %></sld:CssParameter>
            <sld:CssParameter name="fill-
opacity">1</sld:CssParameter>
          </sld:Fill>
          <sld:Stroke>
            <sld:CssParameter
name="stroke">#6E6E6E</sld:CssParameter>
            <sld:CssParameter name="stroke-
width">0.4</sld:CssParameter>
            <sld:CssParameter name="stroke-
opacity">1</sld:CssParameter>
          </sld:Stroke>
        </sld:PolygonSymbolizer>
      </sld:Rule>
      <sld:Rule>
        <sld:Name>class3</sld:Name>
        <sld:Title>class3</sld:Title>
        <ogc:Filter>
          <ogc:And>
            <ogc:PropertyIsGreaterThanOrEqualTo>
              <ogc:PropertyName><%=fieldname%></ogc:PropertyName>
              <ogc:Literal><%=tresholds (2) %></ogc:Literal>
            </ogc:PropertyIsGreaterThanOrEqualTo>
            <ogc:PropertyIsLessThanOrEqualTo>
              <ogc:PropertyName><%=fieldname%></ogc:PropertyName>
              <ogc:Literal><%=tresholds (3) %></ogc:Literal>
            </ogc:PropertyIsLessThanOrEqualTo>
          </ogc:And>
        </ogc:Filter>
        <sld:PolygonSymbolizer>
          <sld:Fill>
            <sld:CssParameter
name="fill"><%=colors (3) %></sld:CssParameter>
            <sld:CssParameter name="fill-
opacity">1</sld:CssParameter>
          </sld:Fill>
          <sld:Stroke>
            <sld:CssParameter
name="stroke">#6E6E6E</sld:CssParameter>
            <sld:CssParameter name="stroke-
width">0.4</sld:CssParameter>
```

```
        <sld:CssParameter name="stroke-
opacity">1</sld:CssParameter>
      </sld:Stroke>
    </sld:PolygonSymbolizer>
  </sld:Rule>
<sld:Rule>
  <sld:Name>class4</sld:Name>
  <sld:Title>class4</sld:Title>
  <ogc:Filter>
    <ogc:And>
      <ogc:PropertyIsGreaterThanOrEqualTo>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
      <ogc:Literal><%=tresholds(3)%></ogc:Literal>
      </ogc:PropertyIsGreaterThanOrEqualTo>
      <ogc:PropertyIsLessThanOrEqualTo>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
      <ogc:Literal><%=tresholds(4)%></ogc:Literal>
      </ogc:PropertyIsLessThanOrEqualTo>
    </ogc:And>
  </ogc:Filter>
  <sld:PolygonSymbolizer>
    <sld:Fill>
      <sld:CssParameter
name="fill"><%=colors(4)%></sld:CssParameter>
      <sld:CssParameter name="fill-
opacity">1</sld:CssParameter>
    </sld:Fill>
    <sld:Stroke>
      <sld:CssParameter
name="stroke">#6E6E6E</sld:CssParameter>
      <sld:CssParameter name="stroke-
width">0.4</sld:CssParameter>
      <sld:CssParameter name="stroke-
opacity">1</sld:CssParameter>
    </sld:Stroke>
  </sld:PolygonSymbolizer>
</sld:Rule>
<sld:Rule>
  <sld:Name>class5</sld:Name>
  <sld:Title>class5</sld:Title>
  <ogc:Filter>
    <ogc:PropertyIsGreaterThan>

<ogc:PropertyName><%=fieldname%></ogc:PropertyName>
      <ogc:Literal><%=tresholds(4)%></ogc:Literal>
```

```
        </ogc:PropertyIsGreaterThan>
      </ogc:Filter>
    <sld:PolygonSymbolizer>
      <sld:Fill>
        <sld:CssParameter
name="fill"><%=colors(5)%></sld:CssParameter>
        <sld:CssParameter name="fill-
opacity">1</sld:CssParameter>
      </sld:Fill>
      <sld:Stroke>
        <sld:CssParameter
name="stroke">#6E6E6E</sld:CssParameter>
        <sld:CssParameter name="stroke-
width">0.4</sld:CssParameter>
        <sld:CssParameter name="stroke-
opacity">1</sld:CssParameter>
      </sld:Stroke>
    </sld:PolygonSymbolizer>
  </sld:Rule>
</sld:FeatureTypeStyle>
</sld:UserStyle>
</sld:NamedLayer>
</sld:StyledLayerDescriptor>
```

## 8.4 Appendix 4 – Get Feature Information XML

An example of an XML response to a Get Feature Information request:

```
<?xml version="1.0" encoding="UTF-8" ?>
<FeatureInfoResponse>
  <FIELDS OBJECTID="34" GISCO_countries.NUCNCD="FR"
  Shape="NULL" SHAPE_Length="121.348907375675"
  SHAPE_Area="71.7575904201783" OID="9"
  COUNTRYCOD="FR" TOTOREC06="264777.97"
  TOTOREC04="253929" TOTOENR06="10386.36"
  TOTOENR04="15469" TOTOINC06="7319.27"
  TOTOINC04="889" TOTODIS06="144121.95"
  TOTODIS04="137569" TOTODEP06="143083.04"
  TOTODEP04="137038" TOTOLTR06="1038.91"
  TOTOLTR04="531" TOHZREC06="2069.75"
  TOHZREC04="2695" TOHZENR06="1630.26"
  TOHZENR04="2601" TOHZINC06="1221.22" TOHZINC04="37"
  TOHZDIS06="1768.79" TOHZDIS04="1707"
  TOHZDEP06="1768.48" TOHZDEP04="1707"
  TOHZLTR06="0.31" TOHZLTR04="0"
  TONHREC06="262708.22" TONHREC04="251234"
  TONHENR06="8756.1" TONHENR04="12868"
  TONHINC06="6098.05" TONHINC04="852"
  TONHDIS06="142353.16" TONHDIS04="135862"
  TONHDEP06="141314.56" TONHDEP04="135331"
  TONHLTR06="1038.6" TONHLTR04="531"
  CSHZENR06="58.64" CSHZENR04="0" CSHZINC06="155.36"
  CSHZINC04="178" CSHZDIS06="1300.19" CSHZDIS04="692"
  CSHZDEP06="516.69" CSHZDEP04="226"
  CSHZLTR06="783.5" CSHZLTR04="466" CWNHENR06="39.71"
  CWNHENR04="14" CWNHINC06="209.16" CWNHINC04="0"
  CWNHDIS06="291.15" CWNHDIS04="42"
  CWNHDEP06="110.65" CWNHDEP04="42"
  CWNHLTR06="180.5" CWNHLTR04="0"
  CWXHZENR06="561.57" CWXHZENR04="1859"
  CWXHZINC06="1031.95" CWXHZINC04="0"
  CWXHZDIS06="100.54" CWXHZDIS04="268"
  CWXHZDEP06="100.23" CWXHZDEP04="268"
  CWXHZLTR06="0.31" CWXHZLTR04="0"
  UOHZREC06="122.54" UOHZREC04="121"
  UOHZENR06="123.16" UOHZENR04="473"
  UOHZINC06="47.09" UOHZINC04="0" UOHZDIS06="1.81"
  UOHZDIS04="4" UOHZDEP06="1.81" UOHZDEP04="4"
```

UOHZLTR06="0" UOHZLTR04="0" HCTOENR06="54.99"  
HCTOENR04="118" HCTOINC06="71.8" HCTOINC04="37"  
HCHZENR06="46.93" HCHZENR04="118" HCHZINC06="59.37"  
HCHZINC04="37" HCNHENR06="8.06" HCNHENR04="0"  
HCNHINC06="12.43" HCNHINC04="0"  
MWTOREC06="10136.01" MWTOREC04="17371"  
MWHZREC06="0.01" MWHZREC04="161"  
MWNHREC06="10136" MWNHREC04="17210"  
GWTOREC06="2174" GWTOREC04="2007" GWHZREC06="0"  
GWHZREC04="7" GWNHREC06="2174" GWNHREC04="2000"  
PCNHREC06="6050" PCNHREC04="7550" RWNHREC06="230"  
RWNHREC04="268" PWNHREC06="435" PWNHREC04="380"  
WWNHREC06="3727.12" WWNHREC04="4261"  
TWNHREC06="388" TWNHREC04="302" PCBHZENR06="0"  
PCBHZENR04="3" PCBHZINC06="18.78" PCBHZINC04="0"  
AVNHREC06="3154.59" AVNHREC04="2773"  
AVNHDIS06="102.16" AVNHDIS04="660"  
AVNHDEP06="87.08" AVNHDEP04="608" AVNHLTR06="15.08"  
AVNHLTR04="52" AFPNHREC06="19.25" AFPNHREC04="32"  
AFPNHDIS06="18.5" AFPNHDIS04="5" AFPNHDEP06="0.9"  
AFPNHDEP04="5" AFPNHLTR06="17.6" AFPNHLTR04="0"  
AFUNHREC06="132.61" AFUNHREC04="60"  
AFUNHDIS06="16.43" AFUNHDIS04="0"  
AFUNHDEP06="16.43" AFUNHDEP04="0" AFUNHLTR06="0"  
AFUNHLTR04="0" HSNHENR06="5030.56"  
HSNHENR04="11098" HSNHINC06="5242.5"  
HSNHINC04="641" HSNHDIS06="11552.88"  
HSNHDIS04="10304" HSNHDEP06="11549.28"  
HSNHDEP04="10291" HSNHLTR06="3.6" HSNHLTR04="13"  
MUTOENR06="418.43" MUTOENR04="1084"  
MUTOINC06="414.42" MUTOINC04="30"  
MUTODIS06="7770.59" MUTODIS04="8104"  
MUTODEP06="7770.59" MUTODEP04="8104" MUTOLTR06="0"  
MUTOLTR04="0" MUHZENR06="1.41" MUHZENR04="13"  
MUHZINC06="26.62" MUHZINC04="0" MUHZDIS06="2.85"  
MUHZDIS04="5" MUHZDEP06="2.85" MUHZDEP04="5"  
MUHZLTR06="0" MUHZLTR04="0" MUNHENR06="417.02"  
MUNHENR04="1071" MUNHINC06="387.8" MUNHINC04="30"  
MUNHDIS06="7767.74" MUNHDIS04="8099"  
MUNHDEP06="7767.74" MUNHDEP04="8099" MUNHLTR06="0"  
MUNHLTR04="0" SRTOENR06="84.08" SRTOENR04="186"  
SRTOINC06="63.85" SRTOINC04="0" SRTODIS06="2790.11"  
SRTODIS04="1419" SRTODEP06="2789.76"  
SRTODEP04="1419" SRTOLTR06="0.35" SRTOLTR04="0"

```
SRHZENR06="39.79" SRHZENR04="2" SRHZINC06="14.83"  
SRHZINC04="0" SRHZDIS06="5.32" SRHZDIS04="8"  
SRHZDEP06="5.32" SRHZDEP04="8" SRHZLTR06="0"  
SRHZLTR04="0" SRNHENR06="44.29" SRNHENR04="184"  
SRNHINC06="49.02" SRNHINC04="0" SRNHDIS06="2784.79"  
SRNHDIS04="1411" SRNHDEP06="2784.44"  
SRNHDEP04="1411" SRNHLTR06="0.35" SRNHLTR04="0"  
TOTOTOT06="426605.55" TOTOTOT04="407856" />  
</FeatureInfoResponse>
```

## 8.5 Appendix 5 – Download Client Code

Highlighted yellow is the Get Feature command to download the country features.

Highlighted blue is the Put command to update a dataset.

Highlighted red is the Get command to download a dataset.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01
Transitional//EN" >
<html>
<head>
<title>Data Download</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-
8859-1" >

<link rel="stylesheet" type="text/css"
href="mapfishWC/lib/ext/resources/css/ext-all.css" />

<script type="text/javascript" >
var xmlhttp;

function loadXMLDoc(url)
{
xmlhttp=null;
if (window.XMLHttpRequest)
  { // code for IE7, Firefox, Mozilla, etc.
  xmlhttp=new XMLHttpRequest();
  }
else if (window.ActiveXObject)
  { // code for IE5, IE6
  xmlhttp=new ActiveXObject("Microsoft.XMLHTTP");
  }
if (xmlhttp!=null)
  {
  xmlhttp.onreadystatechange=onResponse;
  xmlhttp.open("GET",url,true);
  xmlhttp.send(null);
  }
else
  {
  alert("Your browser does not support XMLHttpRequest.");
  }
}
```

```
function onResponse()
{
if(xmlhttp.readyState!=4) return;
if(xmlhttp.status!=200)
{
alert("Problem retrieving XML data");
return;
}

txt=" <table border='1'>";
x=xmlhttp.responseXML.documentElement.getElementsByTagName("d
atas1:WasteTreatmentStat");
for (i=0; i<x.length; i++)
{
txt=txt + "<tr>";
xx=x[i].getElementsByTagName("datas1:Country");
{
try
{
txt=txt + "<td>" + xx[0].firstChild.nodeValue + "</td>";
}
catch (er)
{
txt=txt + "<td> </td>";
}
}
xx=x[i].getElementsByTagName("datas1:ThousandsOfTonnes");
{
try
{
txt=txt + "<td>" + xx[0].firstChild.nodeValue + "</td>";
}
catch (er)
{
txt=txt + "<td> </td>";
}
}
txt=txt + "</tr>";
}
txt=txt + "</table>";
document.getElementById('Table').innerHTML=txt;
}
```

```
function go()
```

```
{
var
httpBase="http://139.191.16.244:9762/services/WasteTreatmentRES
T/getWasteTreatment?"
var wasteType=document.getElementById("wasteTypeMenu").value;
var hazardous=document.getElementById("hazardousMenu").value;
var
treatmentType=document.getElementById("treatmentTypeMenu").val
ue;
var year=document.getElementById("yearMenu").value;
var httpTotal=(httpBase + "wasteType=" + wasteType +
"&hazardous=" + hazardous + "&treatmentType=" + treatmentType +
"&year=" + year +
"&wasteTreatmentSelection=Get+Waste+Treatment+Stats+in+XML");
//document.write(httpTotal);
//window.location=httpTotal;
loadXMLDoc(httpTotal);
}
```

```
function goXML()
{
var
httpBase="http://139.191.16.244:9762/services/WasteTreatmentRES
T/getWasteTreatment?"
var wasteType=document.getElementById("wasteTypeMenu").value;
var hazardous=document.getElementById("hazardousMenu").value;
var
treatmentType=document.getElementById("treatmentTypeMenu").val
ue;
var year=document.getElementById("yearMenu").value;
var httpTotal=(httpBase + "wasteType=" + wasteType +
"&hazardous=" + hazardous + "&treatmentType=" + treatmentType +
"&year=" + year +
"&wasteTreatmentSelection=Get+Waste+Treatment+Stats+in+XML");
//document.write(httpTotal);
window.location=httpTotal;
//loadXMLDoc(httpTotal);
}
```

```
function goUpdate()
{
var
httpBase="http://139.191.16.244:9762/services/WasteTreatmentRES
T/putUpdateValue?"
```

```
var wType=document.getElementById("wasteTypeMenu").value;
var haz=document.getElementById("hazardousMenu").value;
var
tType=document.getElementById("treatmentTypeMenu").value;
var year=document.getElementById("yearMenu").value;
var
cCode=document.getElementById("countryCodeMenu").value;
var newVal=document.getElementById("newValue").value;
var httpTotal=(httpBase + "newVal=" + newVal + "&wType=" +
wType + "&haz=" + haz + "&tType=" + tType + "&year=" + year +
"&cCode=" + cCode);
//document.write(httpTotal);
//window.location=httpTotal;
goUpdateStat(httpTotal);
//loadXMLDoc(httpTotal);
//window.location=httpOrig;
}
```

```
function goUpdateStat(url)
{
xmlhttp=null;
if (window.XMLHttpRequest)
  {// code for IE7, Firefox, Mozilla, etc.
  xmlhttp=new XMLHttpRequest();
  }
else if (window.ActiveXObject)
  {// code for IE5, IE6
  xmlhttp=new ActiveXObject("Microsoft.XMLHTTP");
  }
if (xmlhttp!=null)
  {
  xmlhttp.onreadystatechange=onUpdateResponse;
  xmlhttp.open("GET",url,true);
  xmlhttp.send(null);
  }
else
  {
  alert("Your browser does not support XMLHttpRequest.");
  }
}
```

```
function onUpdateResponse()
{
if(xmlhttp.readyState!=4) return;
```

```
if(xmlhttp.status!=200)
{
  alert("Problem retrieving XML data");
  return;
}

alert("Updated");
return;
}

function goGML()
{
  var
  httpGML="http://plurel.jrc.ec.europa.eu/ArcGIS/services/SEIS_waste_
  test/MapServer/WFSServer?request=GetFeature&TypeName=SEIS_wa
  ste_test:GISCO_countries&MAXFEATURES=5";
  //document.write(httpTotal);
  window.location=httpGML;
  //newWindow.document.open("C:\Documents and
  Settings\hardyma\Desktop\wso2wsas-2.3\wso2wsas-
  2.3\lib\tomcat\webapps\ROOT\WFSServer.xml");
  //loadXMLDoc(httpTotal);
}

function goDisplayFeatureURL()
{
  var
  FeatureURL="http://plurel.jrc.ec.europa.eu/ArcGIS/services/SEIS_was
  te_test/MapServer/WFSServer?request=GetFeature&TypeName=SEIS
  _waste_test:GISCO_countries";
  alert(FeatureURL);
}

function goDisplayStatURL()
{
  var
  httpBase="http://139.191.16.244:9762/services/WasteTreatmentRES
  T/getWasteTreatment?"
  var
  wasteType=document.getElementById("wasteTypeMenu").value;
  var
  hazardous=document.getElementById("hazardousMenu").value;
```

```
    var
treatmentType=document.getElementById("treatmentTypeMenu").value;
    var year=document.getElementById("yearMenu").value;
    var httpTotal=(httpBase + "wasteType=" + wasteType +
"&hazardous=" + hazardous + "&treatmentType=" + treatmentType +
"&year=" + year +
"&wasteTreatmentSelection=Get+Waste+Treatment+Stats+in+XML");
    alert(httpTotal);
}
```

```
</script>
```

```
</head>
```

```
<body bgcolor="#d0d0d0" >
```

```
<h1 align='center'>Waste Data Service</h1 >
```

```
<br >
```

```
<h2>Download Chosen Statistics</h2 >
```

```
<br >
```

```
<p>Make a selection from each of the Drop Down boxes.</p >
```

```
<p>The Get Table button will display the results from the selection in
a table showing the volume of waste in thousand of tonnes for each
country</p >
```

```
<p>The Get XML File button will open a new window displaying the
XML file</p >
```

```
<br >
```

```
<form >
```

```
<select id="wasteTypeMenu" >
```

```
  <option>--Waste Type--</option >
```

```
  <option value="WT" >Total Waste</option >
```

```
  <option value="MW" >Metalic Waste</option >
```

```
  <option value="GW" >Glass Waste</option >
```

```
</select >
```

```
<br >
```

```
<br >
```

```
<select id="hazardousMenu" >
```

```
  <option>--Hazardous--</option >
```

```
  <option value="TT" >Total</option >
```

```
  <option value="HZ" >Hazardous</option >
```

```
  <option value="NH" >Non Hazardous</option >
```

```
</select >
```

```
<br >
```

```
<br>
<select id="treatmentTypeMenu" >
  <option>--Treatment Type--</option>
  <option value="RECOV" >Recovery</option>
  <option value="INCIN" >Incinerated</option>
</select>
<br>
<br>
<select id="yearMenu" >
  <option>--Year--</option>
  <option value="2006" >2006</option>
  <option value="2004" >2004</option>
</select>
</form>

<br>
<div id="Table" >
<button onclick="go()" >Get Table</button>
</div>
<br>
<div id="XML" >
<button onclick="goXML()" >Get XML File</button>
</div>
<br>
<div id="getStatURLButton" >
  <button onclick="goDisplayStatURL()" >Display REST service
URL</button>
</div>
<br>

<h2>Download Country Feature Details</h2>
<br>
<p>The Get GML File button will open a new window displaying the
GML file of the country polygon details. This will take a few
minutes.</p>
<br>
<div id="GML" >
<button onclick="goGML()" >Get GML File</button>
</div>
<br>
<div id="getFeatureURLButton" >
  <button onclick="goDisplayFeatureURL()" >Display Get Feature
URL</button>
</div>
```

```
<br>

<h2>Update Waste Statistics</h2>
<br>
<p>Select a Country Code and enter a value to update that particular
statistic</p>
<p>The Update Stat button will perform this update. You will only be
able to view this update once the Data Service has been
restarted</p>
<br>

<form>
<select id="countryCodeMenu" >
  <option>--Country Code--</option>
  <option value="BE">Belgium</option>
  <option value="BG">Bulgaria</option>
  <option value="CZ">Czech Republic</option>
  <option value="DK">Denmark</option>
  <option value="DE">Germany</option>
</select>
<br>
<br>
<textarea name="NewValue" cols="10" rows="1">
Value
</textarea>
</form>
<br>

<div id="update">
<button onclick="goUpdate()">Update Stat</button>
</div>

</body>
</html>
```

## 8.6 Appendix 6 – Metadata Mapping

### SDDS Base Page

Geographical Area		European Union, Candidate Countries, EFTA countries
Data Category		Key Indicators on EU policy - Structural indicators - Environment - Municipal Waste (generated, landfilled and incinerated)
Last Update		16 January 2008
Contact		Eurostat, Statistical Office of the European Community, W. KLOEK, Unit E3 - Environment statistics, L-2920 Luxembourg
The Data: Coverage, Periodicity and Timeliness	Short Description	<p>The structural indicator on municipal waste consists of a set of three indicators: municipal waste generated, municipal waste land filled and municipal waste incinerated. The amounts are expressed in kilograms per person.</p> <p>The amount of municipal waste generated consists of waste collected by or on behalf of municipal authorities and disposed of through the waste management system.</p> <p>The bulk of this waste stream is from households, though similar wastes from sources such as commerce, offices and public institutions are included. For areas not covered by a municipal waste collection scheme the amount of waste generated is estimated.</p> <p>Wastes from agriculture and from industries are not included.</p>
	Geographical Coverage	<p>Data are published for the European Union (in various aggregations) as well as for each Member State separately. The aggregates include the current composition of the Union EU-27 and the historic compositions EU-25 and EU-15; for the Euro area only the composition with 15 countries is presented.</p> <p>In addition data for EU-Candidate Countries (Croatia, Turkey) and for EFTA countries (Norway, Iceland, Switzerland) are included.</p>
	Time Coverage	Data on municipal waste generation, collection and treatment are published for the 1995 to 2006 period.
	Periodicity	Annual
	Timeliness	The delay between reference period and the publication of the indicator is about a year.
Access by the Public	Advance dissemination of release calendar	No
	Simultaneous release to all interested parties	Data are disseminated simultaneously to all interested parties through a database update and on Eurostat's website

Integrity (transparency of practices and procedures)	Rules on statistical compilation	Data on municipal waste are collected via the Eurostat / OECD Joint Questionnaire. Data are currently provided under a so-called gentlemen's agreement, from 2006 onwards data on waste is available through the Waste Statistics Regulation: Reg. (EC) No. 2150/2002 of the European Parliament and of the Council of November 2002 on waste statistics, Official Journal of the European Communities, L332, 9 December 2002. See website: <a href="http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_332/l_33220021209en00010036.pdf">http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_332/l_33220021209en00010036.pdf</a>
	Regulation on statistical confidentiality	Council Regulation (CE) No 322/97 of 17 February 1997 (OJ No L 52/1) and Council Regulation (EURATOM, EEC) no 1588/90 of 11 June 1990 on the transmission of the data subject to statistical confidentiality to the Statistical Office of the European Communities (OJ No L 151/ 1) stipulates the detailed rules used for receiving, processing and disseminating the confidential data.
	Internal access to data before release	None
	Commentary on the occasion of statistical releases	None
	Provision of info on revisions and notice of changes in methodology	None
Quality	Dissemination of documentation on methodology and types of data sources used in preparing statistics	For a detailed description of the methodology please refer to the Eurostat/OECD Joint Questionnaire. This document can be obtained upon request from Eurostat, Unit E-3 Environment statistics
	Dissemination of component detail, reconciliations with related data, and statistical frameworks that support cross-checks and provide assurance of reasonableness	<p>Municipal waste is only a part of total waste generation; other sources of waste generation are for instance agriculture and industry. Part of the waste generated by the service sector of the economy (e.g. trade, services, restaurants, schools, hospitals) is included in municipal waste. Also waste statistics other than on municipal waste are freely available on the Eurostat website.</p> <p>For predefined tables follow: Tables - Long term indicators - Environment and energy - Environment - Waste:</p> <p><a href="#">Link to predefined tables</a></p> <p>For the Eurostat database follow.....</p> <p>Waste data collected through the Regulation on waste statistics is available in the same database under: Data - Environment and energy - Environment - Waste Statistics Regulation.</p>

	Notes:	<p>The publication uses some standard flags to indicate special situations:</p> <p>: (colon) indicates no data available; this applies only for Croatia;  e indicates a country estimate; no data is available (yet) and the figure is the result of interpolation, extrapolation or modelling;  s indicates an Eurostat estimate; such estimates are explained in the summary methodology, paragraph 6 "Other aspects";  b indicates a break in series; this is a change in the level or structure of the figures due to a change in data collection methods; a change as the result of a change in policy (for instance a ban on landfilling) will not be marked as a break in the series.</p> <p>The EU-aggregates are calculated as the sum of the waste amounts for EU Member States divided by their total population. The EU-aggregates are influenced by all breaks in time-series that appear at Member State level in proportion to their population size, i.e. with a higher impact for the larger countries</p> <p>For further information on the implementation of the Waste Statistics Regulation see: Circa Website of the Waste Statistics Regulation</p>
Dissemination Formats	Hardcopy	New releases on-line Free publications on-line Statistics in Focus on-line Waste generated and treated in Europe, data 1990-2001 (Paper) Municipal Waste Management in Accession Countries, (Paper) 2002 edition
	Electronic	Please consult free data on-line <a href="http://ec.europa.eu/eurostat">http://ec.europa.eu/eurostat</a> No CDROM

**SDDS Summary Methodology**

Concepts, definitions and classifications	Statistical Concept	<p>The base information for the structural indicator is the amounts of municipal waste generated, land filled and incinerated per year. The amount of municipal waste generated consists of waste collected by or on behalf of municipal authorities. For areas not covered by a municipal waste collection scheme the amount of waste generated is estimated.</p> <p>The term 'municipal' is used in different ways in the separate countries reflecting different waste management practices. The bulk of the waste stream is originating from households, though similar wastes from sources such as commerce, offices and public institutions are also included. Differences between countries are mainly the result of differences in the coverage of these similar wastes.</p> <p>According to OECD/Eurostat Joint Questionnaire municipal waste includes the following types of materials: paper, paperboard and paper products, plastics, glass, metals, food and garden waste and textiles.</p> <p>Landfill is defined as deposit of waste into or onto land; it includes specially engineered landfills and temporary storage of over one year on permanent sites. The definition covers both landfill in internal sites (i.e. where a generator of waste is carrying out its own waste disposal at the place of generation) and in external sites.</p> <p>Incineration means thermal treatment of waste in an incineration plant as define in Article 3(4) or a co-incineration plant as defined in Article 3(5) of European Parliament and Council Directive 2000/76/EC of 4 December 2000 on the incineration of waste. OJ L 332, 28.12.2000, p.91.</p>
	Definition of Indicators	<p>This indicator set presents the amounts of municipal waste (generated, land filled and incinerated) expressed in kg per person. The annual amount of waste is divided by the population on 1 January of the relevant year. The population figures were taken from the Eurostat NewCronos database by the end of December 2007.</p>
	Classification System and Conformity with Official Standards	<p>Classification is done according to the definitions for the OECD/Eurostat Joint Questionnaire section Waste. The statistical classification is currently under revision in the frame of the implementation of the Waste Statistics Regulation.</p>
Scope / Coverage of the data	Geographical Coverage	<p>Data are published for the European Union as well as for each Member State separately. The European Union is presented in its current composition (EU-27) and in some historic compositions (EU-25, EU-15); for the Euro Area only the composition with 15 countries is presented. The publication also contains data for EU-Candidate Countries (Croatia and Turkey) and EFTA countries (Norway, Iceland, Switzerland). The series cover the 1995 to 2006 period.</p>

	Statistical Units	The statistical units are households, municipalities and public or private enterprises (all economic activities according to NACE Rev1.1) that generate or treat waste.
	Statistical Population	All municipal waste generated or treated in the country during the year.
Accounting conventions	Reference Period	For the amount of municipal waste generated the data refer to the handover over the waste to the waste collector or to a disposal site. For the amounts of waste treated the data refer to the date of treatment. For landfills the date of arrival is regarded as the date of treatment.
	Base Period	Not applicable
	Recording of Transactions	Not applicable
Nature of the basic data	Data sources used	National Statistical Institutes (or other competent authorities like Ministries of Environment or Environmental Protection Agencies) collect data from various sources. Surveys; Administrative sources such as municipalities or other local authorities (provinces, regions, etc.), waste collectors at municipal/local level, waste treatment facilities; Reporting obligations under other Community Legislation, statistical estimation procedures on the basis of samples or waste related estimators; A combination of these methods.
	Type of survey	Member States select the type of survey according to national waste management practices, either at the source of waste generation, at the place waste treatment or at both sides.
	Techniques of data collection	Data are collected by National Statistical Institutes and Ministries for the Environment for each year. These institutions complete the section on waste in the joint Eurostat/OECD questionnaire. The questionnaire contains data collected in previous years. Member States send updated tables to Eurostat and the OECD.
Compilation practices (data processing)	Compilation of European aggregates	For the calculation of kg per person the national amounts of waste generated, landfilled and incinerated are divided by the population on 1 January of the relevant year. The European aggregates are calculated by adding up the national waste amounts and dividing the result by the total population. The EU-aggregates are influenced by all breaks in time-series that appear at Member State level in proportion to their population size, i.e. with a higher impact for the larger countries. All Member States have supplied either data or estimates. If no data would have been available for a certain country and year Eurostat had to fill the gap in order to calculate the EU-aggregates; such Eurostat estimates will not be presented at national level.
	Adjustments and weights	The data are not adjusted; they are rounded to kilograms per person.
	Validation of statistical data	Data validation is done in close collaboration with the Member States' Competent Authorities.

	Revision policy	<p>The indicators are updated once a year (in December or January): a new year will be added and old data may be revised. During the year only obvious errors will be corrected.</p> <p>On 10 January 2008 some data for Czech Republic, Ireland, Spain, Malta and Romania were revised. The impact on the EU-aggregates was minor.</p>
Other aspect	Other Aspect	<p>The German time series on municipal waste generated has been revised in August 2007. The series as supplied by the German statistical institute contained two major breaks (in 1999 and in 2002) due to revision of the classification of waste. These breaks also had a considerable impact on the EU-aggregates. Eurostat decided to reconstruct the series to the current data collection procedures. The Eurostat estimates for the year 1995 to 2001 are labelled as such with an s-flag.</p>

**INSPIRE Mandatory Fields (Details Adjusted)**

Description	Title		Municipal waste generated - Kg per person per year
	Abstract		<p>The structural indicators on municipal waste include the indicator of municipal waste generated. The amounts are expressed in kilograms per person. The annual amount of waste is divided by the population on 1 January of the relevant year. The population figures were taken from the Eurostat NewCronos database by the end of December 2007.</p> <p>The amount of municipal waste generated consists of waste collected by or on behalf of municipal authorities and disposed of through the waste management system.</p> <p>The term 'municipal' is used in different ways in the separate countries reflecting different waste management practices. The bulk of this waste stream is from households, though similar wastes from sources such as commerce, offices and public institutions are included. Differences between countries are mainly the result of differences in the coverage of these similar wastes. For areas not covered by a municipal waste collection scheme the amount of waste generated is estimated.</p> <p>Wastes from agriculture and from industries are not included.</p> <p>According to OECD/Eurostat Joint Questionnaire municipal waste includes the following types of materials: paper, paperboard and paper products, plastics, glass, metals, food and garden waste and textiles.</p>
	Graphic Overview		
	Date	Creation	Default
		Publication	Default
		Revision	2008-01-16
	Point of Contact		All as per Metadata - Contact below.
	Reference System Info	Codespace	
		Version	
		Code	
	Geographic Bounding Box	North	75
		East	40
		South	35
		West	-15
	Geographic Identifier		
	Time Period	Begin	1995-01-01
		End	2006-12-12
	Spatial Resolution 1		
	Spatial Representation Type		

	Statement		<p>Data on municipal waste are collected via the Eurostat / OECD Joint Questionnaire. Data are currently provided under a so-called gentlemen's agreement, from 2006 onwards data on waste is available through the Waste Statistics Regulation:</p> <p>Reg. (EC) No. 2150/2002 of the European Parliament and of the Council of November 2002 on waste statistics, Official Journal of the European Communities, L332, 9 December 2002.</p> <p>See website: <a href="http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_332/l_33220021209en00010036.pdf">http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_332/l_33220021209en00010036.pdf</a></p> <p>For a detailed description of the methodology please refer to the Eurostat/OECD Joint Questionnaire. This document can be obtained upon request from Eurostat, Unit E-3 Environment statistics</p> <p>Municipal waste is only a part of total waste generation; other sources of waste generation are for instance agriculture and industry. Part of the waste generated by the service sector of the economy (e.g. trade, services, restaurants, schools, hospitals) is included in municipal waste. Also waste statistics other than on municipal waste are freely available on the Eurostat website.</p>
	Language		English
	MD_CharactersetCode		utf8
	Identifier		
Categorisation	Type		dataset
	Hierarchy Level Name		
	Topic Category		geoscientificInformation
	Descriptive Keywords	Theme	Municipal waste generated
		Stratum	
		Place	Europe
		Temporal	
		Discipline	Statistics
		None	
Distribution	Distributor Format		<p>Electronic: On-line or database Please consult free data on-line CD ROM None</p> <p>Hardcopy: New releases on-line Free publications on-line Statistics in Focus on-line Waste generated and treated in Europe, data 1990-2001 (Paper) Municipal Waste Management in Accession Countries, (Paper) 2002 edition</p>
	Version		
	Distributor Contact		
Access	URL		<a href="http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&amp;init=1&amp;plugin=1&amp;language=en&amp;pcode=en051">http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&amp;init=1&amp;plugin=1&amp;language=en&amp;pcode=en051</a>

	Use Limitation		No conditions apply
	Access Constraints		Data are disseminated simultaneously to all interested parties through a database update and on Eurostat's website
	Use Constraints		No conditions apply
Metadata	Contact	Individual Name	W. KLOEK, Unit E3 - Environment statistics,
		Org Name	Eurostat, Statistical Office of the European Communities,
		Position	
		Role	publisher
		Phone	
		Fax	
		Address	
		City	
		Admin Area	
		Post Code	L-2920
		Country	Luxembourg
		E-Mail	-
	Datestamp		2008-09-16
	Metadata Standard Name		ISO19115
	Metadata Standard Version		
	Language		English
	Characterset		utf8
	File Identifier		

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**Abstract**

The purpose of this document is to report on the pilot portal developed for the IT Convergence between Data Centres Pilot Study. It details the data and services that have been included, illustrates how the services were developed, describes any problems that occurred during its development and highlights potential issues.

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