

# EXISTING GEO-INFORMATICS IN THE REPUBLIC OF IRELAND

**A Report and Register of Irish Geoinformatics for  
Monitoring Landcover and Landuse Changes**

*RORY G. SCARROTT  
on behalf of Friends of the Irish Environment  
April 2010*



Cornhshool, Oldhrecht agus Rialtas Áitiúil  
Environment, Heritage and Local Government



IEN   
Irish Environmental Network

## Addenda

This Report was focused on peatlands and water quality monitoring. We now hope to include the marine and other sources identified from feedback received and developments since February 2010. While feedback is still being sought, key new information received so far is given here and the EPA Response with further useful information is appended.

### **ISDE [Irish Spatial Data Exchange ]**

The major development has been the initiation of the Irish Spatial Data Exchange ([www.isde.ie](http://www.isde.ie)) where many government agencies and departments are placing their catalogues of freely accessible data for the public to search and readily find the data viewing and download options. This is of critical importance as the ISDE ties into the INSPIRE directive. ISDE is one of Ireland's main actions to harmonise data standards and make it available through a central portal.

### **GIS Services**

The GIS kindly drew our attention to a number of services they now provide that were not included in the Report, which lists only one GIS viewer, the Public Data Viewer, while if the marine area is included, the GSI has eight online map viewers:

Public Data Viewer,  
Groundwater,  
Geotechnical,  
INFOMAR,  
JIBS (Joint Irish Bathymetric Survey)  
GeoUrban,  
Exploration Company Reports (Open File) – hosted in conjunction with EMD  
Brefine Geotourism Viewer"

The GIS also provide the following online web services which are freely available from the GSI and other government Departments, which many of the free GIS packages listed in the report can readily consume. They currently have six live web services;

<http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/GeoUrban?>  
<http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/Groundwater?>  
[http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/GSI\\_Bedrock\\_Geology?](http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/GSI_Bedrock_Geology?)  
[http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/GSI\\_Simple?](http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/GSI_Simple?)  
<http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/INFOMAR?>  
[http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/JIBS?"](http://spatial.dcenr.gov.ie/wmsconnector/com.esri.wms.Esrimap/JIBS?)

Also note the GSI Interactive Web Data Download System (IWDDS) where Tbs of marine and onshore data may be downloaded freely, including high value, high resolution bathymetry data. We are grateful to the GIS for providing the above information.

### **IRLOGI [Irish Organisation for Geographic Information]**

This is the representative organisation for all members of Ireland's Geographic Information community (public and private sector, system vendors, data providers, end-users, academics, etc), and organises the annual GIS Ireland conference in October each year. IRLOGI is also Ireland's representative on EUROGI, the (the European umbrella group for national GI organisations. The Chair of IRLOGI is on the board of EUROGI and many other bodies and, crucially, is also coordinating development of Ireland's national spatial data infrastructure (ISDI), of which MIDA and the Irish Spatial Data Exchange (ISDE) are key component parts, and which is part of Ireland's response to the INSPIRE Directive.

29.04.10

## **EPA Response to Report “Existing GeoInformatic in the Republic of Ireland”**

Many thanks for forwarding us a copy of your report “Existing Geo-Informatics in the Republic of Ireland”. We have reviewed same and have the following comments which I am forwarding in the interest of making a positive contribution to your efforts to access GeoInformatic data.

Firstly, there are some datasets which should be included in this report in the interest of completeness:

- A Republic of Ireland shapefile can be created from NUTS data which can be downloaded for free as an ArcInfo Export Interchange file from <http://idn.ceos.org/portals/Home.do?Portal=ceos&MetadataType=0>.
- Relating to Soils data there are two recent projects of interest. The first is the Teagasc /EPA Soil and Subsoil mapping project which was completed as a joint venture in 2006. This project had four main mapping outputs available for free from the EPA as ArcView shapefiles: soils, subsoils, landcover and habitat maps. The maps were compiled by Teagasc and can be obtained from the EPA.
- The National Soils Database has created baseline raster maps of soil geochemistry. This project was completed in 2008. More details can be accessed at <http://erc.epa.ie/nsdb/>
- Water Framework Directive (WFD) Groundwater bodies – the groundwater reporting units for the WFD – could be included under Groundwater aquifers section.
- The Office of Public Works has done a volume of work on Predictive Flood Mapping which should be included in the section on Rivers data. Please also note that the OPW have created lake catchment polygons for a large number of Ireland’s lakes. Flood risk data is displayed on the OPW website at [www.floodmaps.ie](http://www.floodmaps.ie). For completeness, this website could be included in Part II of your report.
- Along with rivers, lakes and groundwater bodies GIS polygons of WFD transitional and coastal water bodies are available free of charge from the EPA. Groundwater, transitional water and coastal water spatial data is not under licence to the OSI
- Digital Elevation Models have not been included in this report and are considered core Geo-Informatics datasets. The OSI have a DEM, and the EPA have used OSI vector spot height and contour data to create a hydrologically corrected DTM of 20m grid resolution.
- Under biological data, habitat indicator maps have been created as part of the Teagasc/EPA Soil and Subsoil mapping project referred to above.
- Water Quality Data also includes WFD waterbody status (in the WFD classes i.e. High, Good, Moderate, Poor, Bad). This data can be viewed on the WaterMaps website and is available from the EPA. In the reference to “risk assessments” under the Water Quality data section, it would be more correct to refer to these as WFD Risk Assessments in order to put them in context.

The Irish Spatial Data Exchange (ISDE) project should be included in this report in the interest of completeness. It is a joint initiative between the Marine Institute, DCENR, GSI, DEHLG, EPA and Coastal & Marine Resources Centre (CMRC: who are involved in the MIDA project). The ISDE project has created a common framework for metadata discovery catalogues. The national working group on Irish Spatial Data Infrastructure (ISDI) led by the DEHLG recognise the value of such a national project and are implementing it as a key part of a national ISDI to facilitate metadata publication and spatial data discovery. More information about ISDE can be found at [www.isde.ie](http://www.isde.ie).

The EPA has a policy of open access to spatial data. We make all the data we produce and own available free of charge with no restrictions to any individual, organisation, third level institute, private company or public agency that requests it. This policy is also adopted by the GSI, Marine Institute, DEHLG and DCENR. The EPA’s commitment to this policy is shown in our provision of the Envision GIS site, which has been recently expanded to include a site dedicated to display of Historic Mines data, and our “Splash” site for display of Bathing Water quality data to the public ([www.bathingwater.ie](http://www.bathingwater.ie)). We are always working towards more efficient and open ways of providing data through our participation in the ISDE project and our own internal initiatives.

While we appreciate your frustration with the restrictions that result from high licensing costs for the OSI, we do endeavour to maximise on the value we have added to OSI geometry by proactively making this data available to other public bodies and organisations that have the OSI licence in place. Through a WFD Data Management and GIS group we got agreement from the OSI that national rivers and lakes data could be shared across River Basin District boundaries (rather than limited by the restrictions that could have been imposed by only allowing each Local Authority access to electronic data within its own boundaries, which is the limit of their OSI licence under the CCMA). As a result, River Basin District projects were able to specialise on national projects for River Basin Management Planning activities rather than run a number of fragmented parallel projects on a county by county basis.

Therefore I feel the reference to “disorganisation and repetition, uncoordinated and incompatible initiatives with inevitable wasted resources” in your letter is not wholly accurate. There is a high level of co-ordination and organisation across public sector organisations who work with Geo-Informatics data, which maximises on data resources. The following are some examples:

- The ISDE project creates a single framework for publication and discovery of metadata, so that each of the participating organisations does not have to create its own framework. The ISDE project is open to all organisations who wish to participate and is recognised by the ISDI project
- The ISDI working group lead by the DEHLG has representatives from all the public sector and semi state agencies (including the OSI) who hold data under the INSPIRE themes in order to ensure a co-ordinated approach
- Data sharing and reuse has contributed to the following projects:
  - o The EPA has created a common schema for data that is required under the Water Framework Directive, or inputs to it. This geodatabase has been shared with River Basin Districts and other organisations (OPW, Central Fisheries Board, DEHLG) to ensure compatibility of data
  - o WFD data is shared with the Northern Ireland Environment Agency to ensure cross border compatibility of data
  - o EPA provided rivers and hydrological DTM to the OPW to advance the OPW Flood Mapping project
  - o The EPA reused river and lake catchment boundaries from the OPW Flood Mapping project in a joint venture on predictive flow modelling with the ESB.
  - o Teagasc reuse the EPA Hydrological DTM in their current Irish Soil Information project, which is co-funded by the EPA.
  - o Teagasc/EPA soils and subsoils maps are reused by Local Authorities and their planning agents in site suitability assessments
  - o Corine data produced under the direction of the EPA is a national de facto standard base dataset for Landcover

10 May 2010

## **TABLE OF CONTENTS**

<b>Introduction</b>	<b>4</b>
<b>Executive Summary</b>	<b>6</b>
<b>PART I</b>	
<b>Datasets, their sources, and potential sources</b>	<b>8</b>
<b>Further information on some key holders of spatial data</b>	<b>27</b>
- Third level institutions	
- Ordnance Survey Ireland	
- Local Authorities	
<b>PART II</b>	
<b>Useful and free Geo-informatics data-access sites</b>	<b>32</b>
<b>PART III</b>	
<b>Useful and free satellite imagery access sites</b>	<b>37</b>
<b>PART IV</b>	
<b>Useful and free GIS softwares</b>	<b>40</b>
<b>PART V</b>	
<b>INSPIRE, a key spatial data infrastructure development</b>	<b>46</b>
<b>REFERENCES</b>	<b>49</b>
<b>ANNEX: Register of sources [attached Excel spreadsheet]</b>	

## INTRODUCTION

Geoinformatics – acquiring, analyzing and visualizing spatial electronic data – is one of the most rapidly evolving scientific fields, driven in particular by the development of global navigation satellite systems.

The last 5 to 10 years have also brought geoinformatics into everyday applications in almost every sector of consumer society. Global Positioning Systems [GPS] devices direct drivers and are now incorporated in mobile phones and cameras. Google Earth is part of our culture.

But what Friends of the Irish Environment found when we went to source this information is that it is held by a wide variety of agencies, Government Departments and Universities, and that much of it requires expensive licenses. Because Geographical Information Systems [GIS] of these spatial data sources rely originally on Ordnance Survey of Ireland [OSI] data, the 'commercial' approach of the OSI has in effect stopped the flow of geographical information.

As the author notes:

"The best quality spatial data on river and stream systems is that held by the Environmental Protection Agency (EPA). It is based on river lines collected by OSI, with some improvements and a large amount of added attribution. Due to this, this data can only be given to holders of a license for the OSI Discovery Series vector water lines data."

It can make no sense for Government organisations like the EPA [Environmental Protection Agency] and the NPWS [National Parks and Wildlife Service] to have to pay the state for the spatial data required to make informed decision on behalf of the state.

The Ordnance Survey Ireland Act, 2001 gives as its general function the provision of 'a national mapping service in the State' that 'shall operate in the public interest'. The legislation also empowers the Minister for Finance to issue Ministerial Directives that would effect these changes.

Media and the tele-communications industries have caused a fundamental re-examination of the charging model for information businesses. In the media age in which we now live, information drives innovation. Releasing data means individuals, communities and entrepreneurs can "mash-up" this information with other data to form brand new products and services, creating economic and social value.

The recent Irish initiative in launching MapGenie has done nothing to address the issue. On March 30, 2010, Minister for Science, Technology, Innovation and Natural Resources Conor Lenihan, announced in Dublin a commercial 'new online service' that he claimed 'will support the development of national

industry and assist public sector organisations improve existing services as well as introducing new services.'

On the following day in London, John Denham, Secretary of State for Communities and Local Government launched data.gov.uk. Almost all of the UK OSI unrefined data will now be available to everyone free for use and re-use, including commercial re-use.

Sir Tim Berners Lee (the founder of the internet) who has assisted the UK Government in making their data available across a range of interests calls information the "essential raw material" of a new digital society.

"Government must play its part by setting a framework for new approaches to using data and 'mashing' data from different sources to provide new services which enhance our lives', he says. 'In particular, we want government information to be accessible and useful for the widest possible spectrum of people.'

Research at Cambridge University and a public consultation period found that making unrefined data available would need a subsidy from central government to make up for the loss in revenue but that the increase in government funding would be outweighed by a gross social welfare gain of around £168m, due in part to greater innovation within the UK economy.

Several international initiatives exist that will bring changes – in time. The United Nations International Committee on Global Navigation Satellite Systems (ICG) is progressing compatibility and interoperability among Earth Observation systems.

And our European INSPIRE Directive seeks to ensure by 2019 that spatial information from across Europe

'should be easy to find what geographical information is available, easy to assess how it can be used to meet a particular need, and easy to enquire under which conditions it can be acquired and used.'

This Report supports these international initiatives to encourage our authorities to release more geoinformatics data, so encouraging enterprise and driving our economic recovery – while ensuring greater protection of the environment at the same time.

Tony Lowes,  
tony@friendsoftheirishenvironment.org  
April 2010

=====

## EXECUTIVE SUMMARY

This report outlines remote observation datasets relevant to research in land cover, land use change, water quality, and their monitoring.

This Report is aimed to act as a guide to aid further researchers and the public with an idea of where to source assessable geo-informatics data in the Republic of Ireland relevant to these areas.

The data sets include:

- Boundary and outline datasets
- Man-made Structures
- Wells and water abstraction Points
- Physical environment
- Biological data
- Landcover and landuse maps and change indicators
- Water quality data
- Conservation status data

The source of the data sources listed here are not exhaustive and it does not list all the datasets available. However the report and accompanying register do list identified dataset locations. They also list contact details of the individuals who can provide information about accessing and assessing the available spatial data.

Satellite data access sites are also outlined, as is a list of GIS freeware. Finally, a brief introduction is given to the European INSPIRE directive, as key development for the future sourcing, and future access to geo-informatics in Europe.

This report is accompanied by a register (in excel file format), containing the contact points details in the various organizations, their website addresses, and the links to the various web access portals.

The information contained in this Report was correct as of 14<sup>th</sup> February, 2010.

Rory Scarrott  
rory.scarrott@gmail.com

# PART I

## IRISH DATASETS: SOURCES AND POTENTIAL SOURCES

Boundary and outline datasets	7
- Republic of Ireland shapefile	
- administrative areas layers	
- boundary data from the land registry	
- Clár Areas.	
Man-made Structures	9
- road networks, rail networks, canal networks etc.	
- urban areas	
Wells and water abstraction Points	11
- ground water wells	
- drinking water abstraction points (public and group)	
Physical environment	12
- bedrock geology data	
- soils data.	
- groundwater aquifers	
- rivers data	
- river catchments and basins data	
- lakes Data	
- climate data	
Biological data	18
- habitats & Species data	
- forestry data	
- current peatlands maps & data	
Landcover and landuse maps and change indicators	22
Water quality data	24
Conservation status data	25
- National Parks layer, and Nature Reserves layer	
- National Heritage Areas layer, proposed National heritage Areas, Special	
- Areas of Conservation, Special Protection Areas	
Further information on some key holders of spatial data	26
- Third level institutions	
- Ordnance Survey Ireland	
- Local Authorities	

## **BOUNDARY AND OUTLINE DATASETS**

**Note:** Bord na Mona are NOT included in the register as even a potential source of data. The data they collect is of a highly commercially sensitive nature, and cannot be released. Due to this, the company should not be viewed as a potential source of data.

### **Republic of Ireland Shapefile**

#### **- CORINE datasets**

A layer showing the spatial extent of the Republic of Ireland is available (or producible) from CORINE 2006. This has a resolution of 25 Ha, and is available from the EPA. To ascertain the datasets availability, use restrictions and to obtain the dataset, use the contact point outlined in the accompanying register.

#### **- Environmental Protection Agency (via the Marine Irish Digital Atlas)**

Another option of a higher resolution, is to obtain a shape file of Irish land borders. This is incorporated into the MIDA website ([mida.ucc.ie](http://mida.ucc.ie)), though is not freely downloadable due to data restrictions. It is advised to contact the EPA as regards obtaining the file using the contact point outlined in the accompanying register.

### **Administrative areas layers**

#### **- Environmental protection Agency (via the Marine Irish Digital Atlas)**

This dataset layer is freely available from the EPA/OSI, and downloadable via the MIDA web portal ([mida.ucc.ie](http://mida.ucc.ie)).

#### **- Local authorities**

Data layers outlining the spatial extent of the area under their administration are available as GIS data layers on local authorities central GIS. Contact the relevant spatial data contact point, detailed in the local authority section of the accompanying register, to discuss accessing the datasets.

#### **-Ordinance Survey Ireland**

Boundaries of the various administrative areas in the republic are also available at a cost from OSI. See the OSI section of this report for a full listing of the available layers, and enquire using the contact point outlined in the accompanying register.

## **Boundary data from the land registry**

### **- the Land Registry**

Currently, 2.4 million or so land parcels are registered in the Land Registry (see [www.landregistry.ie](http://www.landregistry.ie)), together with the extent of various structures such as way-leaves and pipelines. The land registry is now implementing digital mapping technology coupled with an online service, allowing customers to view land registry information online in a mapped format.

An overall shapefile of precisely how the Island is divided into lots which are then owned is currently being compiled from their map records county by county. The finished map dataset will show precisely how the republic land is divided into property lots in a simple boundary file on registered land. Overall approximately 93% of the republics land is registered. These boundary definitions may be useful to potential researchers, though it does come at a fee (an initial fee of 125 euro is required upon registration with the land registry).. Contact the land registry at the contact points indicated in the registry in order to discuss gaining access to the boundary datasets.

## **Clár Areas.**

### **- National Institute for Regional and Spatial Analysis**

These areas are those involved in an investment programme for disadvantaged areas (selected on the basis of population decline between 1926 and 1996). The aim of the programme is the development of social, community and physical infrastructure, and extends over many prime blanket bog areas in particular (e.g. West Cork & Kerry, North Mayo).

The spatial dataset is displayed on the MIDA web atlas ([mida.ucc.ie](http://mida.ucc.ie)), though is not freely available. To discuss obtaining the data contact the National Institute for Regional & Spatial Analysis (NIRSA) at the contact points outlined in the accompanying register.

## **MAN-MADE STRUCTURES**

### **Road networks, rail networks, canal networks etc.**

#### **- Ordnance Survey Ireland (OSI)**

The most reliable surveyed datasets on road/rail/and canal networks are held by OSI. For further information on obtaining these datasets, consult the OSI section of this report.

#### **- Local authorities**

Local councils have their own spatial data, sometimes linked to OSI data (with licensing implications), of county and citywide road and rail networks. These may not be complete, but may be useful. Dataset quality may vary between datasets, and this should be appraised before use. Contact the relevant spatial data contact point detailed in the local authority section of this register, to enquire about data access and availability.

#### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

### **Urban areas**

#### **- Ordnance Survey Ireland**

The most reliable surveyed datasets on urban area delineations are held by OSI. For further information on obtaining these datasets, consult the OSI section of this report.

#### **- local authorities**

These have multiple datasets concerning urban areas, their spread, and classifications. These are often tied into Development plans which are accessible to the public, often with maps (which can be digitised), or are being compiled using GIS data layers. To discuss accessing the GIS data layers, and see what is available, contact the relevant spatial data contact point detailed in the local authority section of this register.

#### **- Free data websites.**

Though quality will vary, global datasets do exist of the locations of urban areas with organisations such as the USGS amongst others. The metadata must be carefully

consulted as quality control for free data may vary. To access the data, go to websites such as those outlined in the free data access sites section of this report.

**- CORINE datasets**

CORINE 1990, 2000, and 2006 do contain various urban classes. It is of a considerably lower spatial resolution than OSI maps, though may be useful as being indicative of urban spread and extent. See the section on CORINE in landcover/ landuse layers for details on how to access CORINE 1990 - 2006.

## **WELLS AND WATER ABSTRACTION POINTS**

### **Ground water wells**

#### **- Geological Survey of Ireland (GSI)**

A spatial and descriptive dataset on groundwater abstraction points in the Republic of Ireland is available for free from GSI via the Department of Communication, Marine and Natural resources (DCMNR) spatial data web portal. Metadata is available in the same portal concerning the dataset. For further information email or phone the contact points outlined in the accompanying register.

#### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

### **Drinking water abstraction points (public and group)**

#### **- local authorities**

Public water mains are administered and maintained by local authorities whilst Group water schemes are also reported to local authorities. Their locations are stored in the local authorities databases. Contact the relevant local authority to ascertain whether the dataset is available at the spatial data contact points of the local authority section in the register.

#### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register..

## **PHYSICAL ENVIRONMENT**

### **Bedrock geology data**

#### **-Geological Survey Ireland (GSI)**

GSI has produced national scale maps of various resolutions covering the topics of bedrock geology at various resolutions, borehole locations and attributes, and mineral locations and quarries. These are freely available in digital format on the department of communications, Energy and Natural resources (DCENR) spatial data page.

Summary metadata is also available on the same webpage. A summary of other sources of GSI data available to the public is to be found at ( [www.gsi.ie/mapping](http://www.gsi.ie/mapping) ), in which links to various web portals can be found.

#### **- Planning survey reports**

Geology data may also be found in fragmented form amongst Survey reports associated with planning applications. Though time consuming, a browsing of planning applications in the study area in question may yield useful data. Contact the planning department of the relevant planning authority via the contact points outlined in the local authority section of the register.

#### **- Local authorities**

Local authorities may also hold their own data on a number of sampling sites throughout their jurisdiction. To enquire further, contact the relevant spatial data contact point detailed in the local authority section of this register.

#### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

### **Soils data.**

#### **- most recent soils map**

The most recent and most comprehensive soils map of Ireland is the General soil map of Ireland based on the work of the National Soil Survey. The soil survey information was

created in order to provide a basis for land use planning and in particular agricultural development, and was published in 1980. Metadata can be viewed on the MIDA website (mida.ucc.ie), though to gain access and use restrictions contact Teagasc at the contact point outlined in the register.

### **- Survey companies**

Survey companies collect data on the soils & subsoil of plots under proposed development as part of the Environmental Impact Assessments. This data may be submitted with the planning application to the relevant local authority, where it can be viewed in paper format at the local authority office upon request (for contact details, see the local authority section of this report). Accompanying data may still be held by the company following submission, the company being identifiable through the planning application.

Upon identifying an survey linked to a particular area of interest, the best course of action is the contact the survey company in question directly, and enquire about accessing the data collected and associated metadata.

Note that the quality of data collection may vary, though in general it should have been collected to a legally defensible scientific standard. This should be kept in mind when approaching any data for use in research.

### **- Local authorities**

Local authorities hold soils data in the form of EIAs. however, in general EIA data is not integrated into the councils central GIS. The information must be located in the county councils databases and made GIS capable by the researcher. Whilst the workload would appear to be overwhelming, it is evident during the process of compiling this report, that the sheer volume of data and information that can be found in EIA records could be highly valuable to any research in the areas in question.

Also known is that all EIA data held by the councils is freely available to the public for reasons of transparency in the planning system. However administrative fees for retrieval, of photocopying of files may apply. See the local authorities section of this report for contact details within the various local authorities.

### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

## **Groundwater aquifers**

### **- Geological survey of Ireland (GSI)**

The best available spatial dataset of the Republic of Irelands aquifers is available for free from the Geological survey of Ireland website, via the DCMR spatial data web portal. Metadata is available in the same portal concerning the dataset. For further queries, email or phone the contact points outlined in the registry suppliment.

## **Third level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

## **Rivers data**

### **- Environmental Protection Agency (EPA)**

The best quality spatial data on river and stream systems is that held by the Environmental Protection Agency (EPA). It is based on river lines collected by OSI, with some improvements and a large amount of added attribution. Due to this, this data can only be given to holders of a license for the OSI Discovery Series vector water lines data. Once the license number can be supplied, the EPA make this data available free of charge. The spatial coverage the EPA can send depends on the coverage of the OSI license.

EPA data can be viewed in the ENVISION web portal. However it is currently sent by CD Rom. The EPA are implementing a GeoPortal, which will see an improved Envision viewer along with links to metadata and a data download section to allow direct access to data, rather than the CD Rom route. It is expected to be fully complete by the end of the year and parts of it will be released in stages.

To discuss accessing EPA data, consult the ENVISION viewer and contact the email address or phone number outlined in the accompanying register.

### **- Local authorities**

Local authorities store rivers data on their central GIS, sometimes linked to OSI data

(with licensing implications). Though quality may vary between datasets and authorities, and the attributes vary with purpose, it is a useful option for obtaining spatial data. Contact the spatial data contact point outlined in the local authority section of the report. Rivers data may also be contained in EIA's associated with shore side developments. Consult the planning departments of the relevant local authority outlined in the local authority section of this report.

#### **- Free data**

Free spatial extent data on river systems is available in the form of global datasets with organisations such as the USGS amongst others. These may be missing the smaller stream systems mapped in EPA data for example, and metadata should be consulted carefully when considering their usefulness. To assess data availability, go to websites such as those outlined in the free data access sites section of this report.

#### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the "third level institutes" section of this report and accompanying register.

### **River catchments and basins data**

#### **- Environmental Protection Agency (EPA)**

The best quality spatial data on river catchments and river basins is that held by the EPA. It is not based on OSI data, and is freely available. The data can be viewed in the ENVISION web portal and is currently sent by CD Rom upon submission of a data request. The EPA are implementing a GeoPortal, which will see an improved Envision viewer along with links to metadata and a data download section to allow direct access to data, rather than the CD Rom route. It is expected to be fully complete by the end of the year and parts of it will be released in stages.

To discuss accessing EPA data, consult the ENVISION viewer and contact the email address or phone number outlined in the accompanying worksheet.

#### **- Local authorities**

Local authorities may have data layers on river basins as a result of a recent push for flood planning and cause assessments. Though quality may vary between datasets and authorities, and the attributes vary with purpose, it is a useful option for obtaining spatial data on basin districts, and overall catchment characteristics. To enquire into the availability of this data, contact the spatial data contact point outlined in the local

authority section of the report.

## **Lakes Data**

### **- Environmental Protection Agency (EPA)**

The best quality spatial data on lakes is that held by the Environmental Protection Agency (EPA). It is based on lake polygon extents collected by OSI, with some improvements and a large quantity of attribution. Due to this, this data can only be given to holders of a license for the OSI Discovery Series vector water lines data. Once a license number can be supplied, the EPA make this data available free of charge. The spatial coverage the EPA can send is also governed by the extent allowed by the OSI license.

EPA data can be viewed in the ENVISION web portal. However it is currently sent by CD Rom. The EPA are implementing a GeoPortal, which will see an improved Envision viewer along with links to metadata and a data download section to allow direct access to data, rather than the CD Rom route. It is expected to be fully complete by the end of the year and parts of it will be released in stages.

To discuss accessing EPA data, consult the ENVISION viewer and contact the email address or phone number outlined in the accompanying worksheet.

### **- Local authorities**

Local authorities store lakes data on their central GIS, sometimes linked to OSI data (with licensing implications). Though quality may vary between datasets and authorities, and the attributes vary with purpose, it is a useful option for obtaining spatial data. Contact the spatial data contact point outlined in the local authority section of the report and accompanying register.

Lakes data may also be contained in EIA's and surveys (associated with shore side developments for example). Consult the planning departments of the relevant local authority outlined in the local authority section of this report and the accompanying register.

### **- Free data**

Free spatial extent data on larger lake systems is available in the form of global datasets with organisations such as the USGS amongst others. These may be missing the smaller lakes mapped in EPA data (for example), and metadata should be consulted carefully when considering their usefulness. To search for and access relevant data, go to the websites outlined in the "useful free data access sites" section of the report and accompanying registry.

### **- Third Level Institutions**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

### **Climate data**

#### **- Met Éireann**

Climate data (e.g. records on precipitation, sunlight intensity etc. from the various observatories in the republic) are available from Met Éireann. These observatory locations are known and can be incorporated into a GIS to produce climate information products. A fee may be applied for data retrieval. Contact Met Éireann climate enquiries at the contact points detailed in the accompanying register.

## **BIOLOGICAL DATA**

### **Habitats & Species data**

**Note:** No single habitats map currently exists covering the entire republic. However habitats data are available, though the spatial extents are scattered and fragmented. A number of sources need to be consulted for a comprehensive collection of the available habitats data to be attained.

#### **- National biodiversity Data Centre (NBDC)**

The NBDC aims to serve as a national repository for biological data. One objective is to make good-quality, reliable data on Ireland's biological diversity freely and universally available via the Internet. Species data is available to view on an online mapping system on the NBDC website ( [www.biodiversityireland.ie](http://www.biodiversityireland.ie) ). However, currently, there is no facility for automated download of data from the system at this stage. It is something that they are looking at providing (in some form) later this year.

In particular the NBDC is hoping to enable users to generate a list of all the species recorded within grid squares over the republic, which may be useful for validating habitat mapping of satellite imagery for example. To discuss accessing the data, contact the NBDC as outlined in the accompanying register.

#### **- Local authorities (heritage sections)**

Some heritage sections have begun habitat surveying of their administrative areas (e.g. Cork & Roscommon county councils). These habitat surveys can also contain species presence/absence data. Though currently being coordinated and networked by the Heritage Council, the extent of habitat surveying that is possible, and the consistency across local authorities varies. It is recommended that you contact the relevant local authority and ask for the heritage section for further information, whilst for an overall view on who might have data, contact the Heritage Councils wildlife officer. Contact details are in the accompanying register.

#### **- Local authorities (planning sections - Environmental Impact Assessments)**

Where habitats and/or species data is required in an EIA, the data collected is stored on paper with the planning application. These are open to viewing by the public through the relevant local authority. See the Environmental Impact Assessment contact point information in the Local Authority section of the report and accompanying register.

#### **- Third Level Institutions.**

Third level institutions collect a vast quantity of data as part of funded research, student theses and ongoing data collection. The data is then stored, though is kept amongst various departmental research groups. An adequate listing of data was not obtainable for

the purposes of this report, though it is advisable to contact the departments, institutes, centres of excellence, and research groups of interest. The contact points are outlined in the “third level institutes” section of this report and accompanying register.

#### **- Irish Peatlands Conservation Council (IPCC)**

The IPCC collects varying data on peatland habitats and species, in areas it recognises as peatlands. This data varies in quality, and extent. It can range from a simple site description (i.e. “peatland“), to site databases of species records (e.g. frog surveys) and site surveys (e.g. Bog of Allen survey). They also hold details of individual studies carried out by consultancies on behalf of the IPCC. Some of the species data has been transferred to the NBDC and is now available to view (see NBDC contact details).

Altogether, the IPCC holds records on 147 sites in the republic (as of 10<sup>th</sup> February, 2010). To discuss accessing these datasets, enquire at the contact points outlined in the accompanying registry.

#### **- National parks & Wildlife Service (NPWS)**

The NPWS holds some habitats and species data as submitted in various reports commissioned by the department. Though varying widely in nature, subject and quality, they may be useful to research. Contact the main desk of the NPWS by email or by phone (see NPWS contact details in the accompanying register), and submit an enquiry outlining the subject areas you are interested in. They will then respond with what they have available and can release to you.

#### **- European Environmental Agency (EEA)**

It contains previously unavailable data and information collected at EU level by various institutions or bodies and centralised at the EEA. Concerning habitats and species information, data is downloadable and viewable on the EUNIS database, available online. Contact the EEA about spatial datasets in the subject areas required (using the contact addresses outlined in the accompanying register), and they will reply with what is available.

### **Forestry data**

#### **-The Forestry Service**

Spatial data on Forestry cover in the republic is partly held by the Forestry Service, as part of the Department of Agriculture, Fisheries, and Food. Spatial datasets related only to forest cover, such as the FIPS2007 dataset (outlining the spatial extents of sampled coniferous, deciduous and native woodlands) are freely available, though as yet are not available to download from the web. It is advised that to obtain forestry related datasets you contact Noel Heffernan of the department of agriculture (contact details are in the

accompanying register) and request a data sharing agreement form. In this you can outline the information required, and the forestry service will send you what is relevant to your enquiry and your signed copy of the form.

The forestry service also has excel spreadsheets available to download summarising the results of the National Forests Inventory completed in 2007. These are available through the webpage at [www.agriculture.gov.ie/nfi/](http://www.agriculture.gov.ie/nfi/)

### **-Coillte Teoranta**

This semi-state forestry company also holds spatial data on forestry under their administration within the republic of Ireland. As a semi-state body, restrictions on access may apply to data for the purposes of customer privacy. To discuss whether data is held, and whether or not it can be accessed, contact them with a data request, and Coillte will reply with the data they have and their accessibility. Contact points in Coillte Teoranta are detailed in the accompanying register.

### **-CORINE datasets**

The 25Ha resolution CORINE maps of landcover contain what can be considered, as a general outline of where forestry lies in the Republic. This is as part of its overall landcover shape file as a land class. Please note the reservations expressed about CORINE landcover mapping (outlined in the CORINE landcover section of this report along with details on how to access the CORINE datasets). Despite these, it is useful, and is freely available.

## **Current peatlands maps**

### **- The Derived Peatlands map of Ireland**

This map outlines the spatial extents of predicted peat (identifiable by a probability of occurrence) of four types of peat habitat - high level montaine, low level atlantic, raised bog, and industrial peatlands. It is available in digital format. For a detailed description on how it was produced, please see Connelly & Holden (1999) and Connelly *et al.* (2007). The map is currently held in UCD. To discuss accessing the map, please contact Dr. J. Connelly (contact details provided in the accompanying register worksheet).

### **- FIE/UCC Landsat peatmap of Ireland**

This map outlines the spatial extents of vegetated and exposed peat soils as identified by a supervised classification of multi-spectral Landsat TM (30m) imagery collected between 2003 & 2006. The map is provided with accuracy assessments for each of the various classes (non peat, possible vegetated peat, and exposed peat) and it is available in

a digital format.

To gain access to the data/map, please contact Friends of the Irish Environment (FIE) at the outlined contact point. For information on map compilation, please contact Dr. F. Cawkwell of UCC Dept. of Geography (contact detailed in the accompanying register).

#### **-CORINE datasets**

CORINE 1990, 2000, 2006 do contain a “peat bog” class. It is of a considerably lower spatial resolution than UCC/FIE peatlands map, though similar to the Derived peatlands map (in which CORINE was used as an input). See the section on CORINE in landcover/landuse layers (of both the report and register) for details on how to access CORINE 1990 - 2006.

#### **- Irish Peatlands Conservation Council (IPCC)**

The IPCC collects varying data on peatland habitats and species, in areas it recognises as peatlands. This data varies in quality, and extent. It can range from a simple site description (i.e. “peatland“), to site databases of species records (e.g. frog surveys) and site surveys (e.g. Bog of Allen survey). They also hold details of individual studies carried out by consultancies on behalf of the IPCC. Some of the species data has been transferred to the NBDC and is now available to view (see NBDC contact details).

Altogether, the IPCC holds records on 147 sites in the republic (as of 10<sup>th</sup> February, 2010). To discuss accessing these datasets, enquire at the contact points outlined in the accompanying registry.

## **LANDCOVER AND LANDUSE MAPS AND CHANGE INDICATORS**

### **Note**

The distinction between land cover and land use is fundamental, and the two are often confused. They are defined as follows:

\* Land cover is the observed physical cover, as seen from the ground or through remote sensing, including natural or planted vegetation and human constructions (buildings, roads, etc.) which cover the earth's surface. Water, ice, bare rock or sand surfaces count as land cover

\* Land use is based upon function, the purpose for which the land is being used. A land use is defined as a series of activities undertaken to produce one or more goods or services. A given land use may take place on one or several pieces of land, and several land uses may occur on the same piece of land.

### **- CORINE datasets**

CORINE Land Cover (CLC) is a map of the European environmental landscape based on interpretation of satellite images. It provides a pan-European dataset of comparable digital maps of land cover for each country for much of Europe. Datasets at three intervals are now available (1990, 2000, & 2006). The mapping units are images of elementary landscape systems that can be interpreted, simultaneously, as land use systems and ecosystems. The dataset files also come with a separate shape file of the changes between successive CLC datasets.

CORINE landcover datasets are deficient in some respects. It is advisable to consult the production literature on the EEA website (European Environment Agency, 2010) , outlines of limitations both on the EPA website (Environmental Protection Agency, 2010) and in the scientific literature.

CLC data are available for both commercial and non-commercial usage under similar licence terms and conditions. All are available from the EPA. To obtain the datasets, contact the EPA contact points as outlined in the accompanying register.

### **- Ordinance survey Ireland (OSI)**

OSI data give a clearer idea of land use (e.g. transport networks, forestry type, information on housing). However OSI data is also only available at a fee. A list of data layers available at the large scale level is included in the OSI section of this report. To enquire about obtaining these layers, please contact OSI sales at the contact points outlined in the accompanying register.

### **- Local authorities**

Planning applications are now viewable online through a map viewer with many local

authorities (using either a web map facility, or a gplan facility). These application contain information on the uses gained from land plots nationwide. Using these, planned changes to the landscape use can be tracked, and approximately dated (e.g. planned & granted forest applications, wind turbine applications, applications to convert field systems into agricultural facilities etc.). Web-mapping facilities are not available in every local authority, though enquiries into applications by location are possible using the almost universally available “eplan” system or similar enquiry facilities. Consult the relevant local authority website & contact points as detailed in the accompanying register, for further information.

## **WATER QUALITY DATA**

### **- Environmental Protection Agency (EPA)**

The EPA is the primary source of water quality and chemistry information in the republic. Furthermore, any data collected by them is quality controlled, and available for free to the public upon request.

A summary of the datasets, held by the EPA, and considered useful to researchers include those on :

- river water quality,
- lake water quality,
- groundwater quality,
- bathing water quality,
- estuarine and coastal water quality
- active IPPC (Integrated Pollution Prevention & Control) and waste licenses
- risk assessments for rivers, lakes, groundwater, transitional water, and coastal water.

These datasets give location information, and the time of sampling/assessment. Use the mapping tool on the EPA website ([www.epa.ie](http://www.epa.ie)) to ascertain the data required. Contacting the EPA to ascertain whether they might have any accompanying datasets is also advisable. To obtain the data, contact the EPA at the contact point indicated in the register with an information request. The EPA will then send you the data on a CD Rom. Note also that the EPA hopes to have their datasets downloadable via the web map in the future.

### **- River Basin Districts**

Created under the Water Frameworks directive, River Basin Districts are in possession of the most up-to-date data on water quality. The records can be viewed in map format on the WaterMap webGIS application (outlined in the “Geo-informatics data access sites” section of this report). River Basin Districts must be contacted directly. Contact points are outlines in the “River Basin Districts” section of the accompanying register.

## **CONSERVATION STATUS DATA**

### **National Parks layer, and Nature Reserves layer**

#### **- National parks and Wildlife Service (NPWS)**

Available for free from the National Parks and Wildlife Service (NPWS), these layers show the boundary extents of the Republic of Ireland's national parks and nature reserves, along with basic attribute information (e.g. Park name). The data sets can be downloaded via the MIDA web portal ([mida.ucc.ie](http://mida.ucc.ie)) for free.

### **National Heritage Areas layer, proposed National heritage Areas, Special Areas of Conservation, Special Protection Areas**

#### **- National Parks and wildlife Service (NPWS)**

Available from the NPWS ([www.npws.ie](http://www.npws.ie)), the layer shows the boundary extents of NHA's, pNHA's, SAC's, and SPA's within the Republic of Ireland. These are attributed with information such as name, date declared an NHA etc.). The data layers are separate (I.e. SPA layer, NHA layer etc.) and are only downloadable county by county. For an all-Ireland view they all have to be joined together in a GIS. Metadata are available including information on when the NHA layers were last updated. For more information go to [www.npws.ie](http://www.npws.ie), and contact the NPWS as outlined in the accompanying registry.

## **FURTHER INFORMATION ON SOME KEY HOLDERS OF GEO-INFORMATION**

### **Third level institutions**

Third level research collectively hold a large quantity of data, often of the highest quality. However, it is fragmented throughout institute and university departments and amongst various research groups. Spatial datasets exist in universities relevant to almost every aspect of this report, and are too numerous to be summarised as a list (for example, soils data may be collected by geology departments, but also civil engineering departments studying surveying techniques; habitats data may be held by both zoology and botany departments, and environmental research institutes within the same university).

With this in mind, the contact points within the universities (departments, research institutes etc.) are listed here to encourage the researcher to contact directly the schools, departments, centres of excellence (and through them their research groups), enquire as to what data they have, and collaborate within these areas. It cannot be emphasized enough how valuable data from third level institutions may be to the researcher, and it is hoped that the contact points provided here will aid in sourcing and accessing it.

### **Ordnance Survey Ireland (OSI)**

Ordnance Survey Ireland is the national mapping agency of the Republic of Ireland (OSI, 2010). The semi-state company's principal responsibilities of Ordnance Survey Ireland include:

- \* creating and maintaining mapping and related geographic databases which have national consistency of content, currency, style and manner.
- \* providing mapping and related geographic data to the public and private sectors in support of social, economic, legislative, security, business and administrative functions and requirements.
- \*protecting Government copyright on OSI databases, products and published material.

OSI's primary product is mapping services. However the base data used to create the map series is also used to produce other products such as aerial photography and digital terrain models. OSI also licence the use of data for a wide range of computer based applications including Geographic Information Systems (GIS).

In tables 1 are listed the available large scale datasets as held by OSI, and the parent layers to which they belong ( in table 2). These require a license for their use to be obtained, with details of costings available from the contact points outlined in the accompanying register. For further information, go to [www.osi.ie](http://www.osi.ie).

**Table 1:** the dataset layers held by Ordnance Survey Ireland

OSI Dataset Name	description	OSI Dataset Name	description
CONTROL_P	legend data	NAT_PRIMAR	national primary routes
LATCHFRAME	frame of map	NAT_SECOND	national secondary routes
CLIPFRAME	map edge lines	THIRD	third class roads
CONTOUR2.0	2 metre contours	FOURTH	fourth class roads
CONTOUR1.0	1 metre contours	STREET	street networks
CONTOUR0.5	0.5 metre contours	AVE_FOFTP	avenue or footpath
SPOT_HT	spot height geometry	OTHER	road centreline of roads
HT_MARKS	height geometry with the z attribute	STAND_TRC	standard track trails
TRIG_LEVL	control point symbol	NON_ST_TRC	non standard track trails
HT_CTRL	bench marks and values	SINGLE_PEK	single line rail pecked
FENCE	fence and wall polygons	RUN_TAXIWY	runways or taxiways
FENCE_PK	type of fence and wall	PIER	data associated with piers
STEPS	lines representing steps	E.S.B.	ESB Utilities
INN_WALLS	internal walls in buildings	B_TELECOM	Bord Telecom Utilities
ROCK_FACE	rockface symbol	B_GAS	Bord Gais Utilities
SLOPEA	slope geometry	WATER	Water Supply network
CROP_ROCK	cropping rock geometry	SOLID	solid buildings
PASTURE_L	rough pasture symbol (large)	PECK	pecked buildings
PASTURE_S	rough pasture symbol (small)	DW_HOUSE	dwelling House
MARSH	marsh symbols	GL_HOUSE	Glasshouses
DECIDUOUS	deciduous forestry	FEATURES	sub-level of "antiquit" (parent level)
CONIFEROUS	coniferous forestry	TUM_SLOPE	slopes related to antiquities
MIXED_FOR	mixed forest	COUNTY	county boundary geometry
ORCHARD	orchards	BARONY	barony boundary geometry
RIVER	polygons and names of rivers	TOWNLAND	townland boundary geometry
STREAM	polygons and names of streams	PARISH	parish boundary geometry
LAKE	names and outlines of lakes	WARD	ward boundary geometry
POND	outlines of ponds	CO_BOR	county borough boundary geometry
WATERFALL	waterfall symbolisation and names	BOROUGH	borough boundary geometry
SLOP_MAS	sloping masonry	URBAN_DIS	urban district boundary geometry
DRAIN	polygons representing drains	TOWN	town boundary geometry
CANAL	polygons representing canals	LANDPC	land parcel geometry
RESERVOIR	reservoir names and polygons	WATERPC	water parcel geometry
IS_INLAND	inland islands	LEFT	geometry to the left-hand side of boundary
IS_COASTAL	coastal islands	RIGHT	geometry to the right-hand side of boundary
HWM	polygons for high water marks	CHAN_SYM	symbol geometry related to area summations
LWM	polygons for low water marks	PLAN_TEXT	general text level
COAST_FEAT	coastal features	TEXT1.5MM	1.5 mm sized text
FLAT_ROCK	flat rock features	TEXT3.0MM	3.0 mm sized text
		TEXT6.0MM	6.0 mm sized text

**Table 2:** Parent layers names, in which are contained combinations of the dataset layers described in table 1 (e.g. parent layer no. 78, ROADS, contains the datasets NAT\_PRIMARY, NAT\_SECONDARY, THIRD and FOURTH )

Layer number	OSI 179 Name	Layer number	OSI 179 Name	Layer number	OSI 179 Name
1	AIRP_MIL	35	GENERAL	69	PORTS
2	AIRPORT	36	GUIDELINES	70	PRIMARY
3	ANCILLARY	37	HARBOURS	71	PROFILE_LN
4	ANTIQUIT	38	HEIGHT_LN	72	PROFILE_LN
5	AREAS	39	HUM_ENVOIR	73	PUBLIC
6	ART_FEAT	40	ISLANDS	74	RAIL
7	ART_WATER	41	JOIN_LINES	75	RECREATION
8	BDR_OBS_AR	42	JUSTICE	76	REGIONAL
9	BEACHES	43	LAND_AREAS	77	RELIGIOUS
10	BLD_ANTIQ	44	LAND_FEAT	78	ROADS
11	BLD_COASTL	45	LINK	79	ROUNABOUT
12	BMLITARY	46	LK_VVTR_LN	80	SECONDARY
13	BOUNDARY	47	LOWER_LINE	81	SECURITY
14	BUILDINGS	48	MAP	82	SERVICES
15	CEMETERY	49	MASTER	83	SEWAGE
16	COASTAL	50	MASTS	84	SINGLE_LIN
17	COMMUNIC	51	MATCHLINE	85	SLOPEB
18	CONECTING	52	MBARRACKS	86	SLOPES
19	CONTROL	53	MBUILDINGS	87	SP_FACILIT
20	DETAILS	54	MEDICAL	88	TERTIARY
21	DOCKS	55	MILITARY	89	TEXT
22	DRN_LN_RIV	56	MINES	90	TIDALPC
23	DTM	57	MOTORWAY	91	TOLL_FEAT
24	EDUCATION	58	NAT_ENVIR	92	TOWN_PER
25	ELEVATION	59	NAT_FEAT	93	TRACE_O_LN
26	ENTERTAIN	60	NAT_SYMB	94	TRUNK
27	EXTR_AIRFT	61	NAT_WATER	95	TUM_CONNE
28	FERRY	62	OPEN_SPAC	96	TUM_LOWER
29	FLAG	63	OTHERS	97	TUM_SLOPE1
30	FLAGAREA	64	PARCEL	98	TUM_UPPER
31	FOR_FEAT	65	PLAN_ELEV	99	TUMULUS
32	FORESTRY	66	PLAT_GAS	100	UPER_LINE
33	FORESTS	67	PLAT_OIL	101	INDUSTRY
34	FRAMES	68	PLATFORM		

## **Local Authorities**

There are 29 County Councils and 5 city councils, in the Republic of Ireland. There are also 5 borough councils and 75 town councils, which exist in county council jurisdictional areas and may carry out functions jointly or separately. However they remain accessible via county council websites. County and city councils have jurisdiction or control throughout their administrative areas. They collect a variety of spatial data in the form of commissioned reports, council surveys, and submitted data associated with planning applications among others. Outlined in the register are the contact details of the councils, their GIS contact points, their heritage contact points, and their planning office contact points.

### **- Spatial Data**

County councils contain a wide variety of spatial datasets, some of them available digitally, others still held in paper map format. Other datasets contain information about a particular site, which could be incorporated into a spatial dataset.

The datasets, held vary both in subject matter (e.g. road networks, waterworks sites, drain networks, habitats maps, hydrological & geological surveys) and quality (e.g. roads networks may be missing the smaller tracks and trails, habitats maps may only cover a portion of the jurisdictional area). The datasets are also often sourced in a variety of departmental sections (e.g. heritage, planning, traffic & transportation).

Most of the authorities however, have those datasets associated with county development plans now in GIS format, and within a central council GIS. Furthermore, the development plans themselves and zoning information are GIS capable and available to public view. Councils may vary over opinions of what data they are willing to release, partly due to privacy and copyright issues (e.g. if datasets are tied in with OSI data), and if they have any concerns with the quality of any datasets they release for research use.

It is advised therefore, that when searching for data, enquire about what datasets are available (or could be available), relevant to the research subject areas. Do this via the appropriate contact point identified in the accompanying register, who is able to source data from the various departments, or can tell you who you need to contact.

### **- Planning applications and environmental Impact Assessments/Statements**

A potentially lucrative source of good quality habitats, species, geological, hydrological and soils data may lie in Environmental impact Assessments and survey reports submitted with some planning applications. The survey contents of any application are specific to that project, varying between applications. However, if a survey is carried out, it produces a presence absence record of a particular species, habitat, soil quality, hydrology feature etc., at a particular point and at a particular time. For example, such information could aid in verification of satellite derived maps for monitoring.

Planning applications are stored in each county council with a unique Planning Application Number (PAN). This PAN networks all the documents associated with the planning application (EIAs, letters of objections, recommendations etc.). These PANs are obtainable from any county council, in most cases from an online *eplan* (or similar) facility. In the absence of an online enquiry system, it is advised to call into the local authority office to browse planning applications on the internal planning enquiry system. Alternatively, many local authorities now have PANs available on a map based enquiry system (normally a *gplan* facility or similar), where the user can see all the planning applications in a map of the county, and get the PANs required for an area of interest.

Though many county councils do have the online facility available to view most recent records as pdf files with an idea of whether there is an associated EIA, older files, or in some cases all files, are still only available in paper format at the local authority office (e.g. Leitrim & Offaly County Councils). It is advisable that you contact the local authority at the contact point outlined in the accompanying register well in advance of your visit, particularly if the file you need is in storage, or you have a number of files to view.

Note that in many cases, whilst viewing a file held in the council office is free, retrieving files from storage can incur a fee (of up to 30 euro per file). Also note that copying the files can also incur fees of up to 40 euro per record. Fees and when they are applied vary between councils and it is best to enquire beforehand.

## **PART II**

### **Useful Free Geo-informatics access sites**

Concerning the Irish Republic, there is as yet no centralised access point for GIS data. The MIDA web atlas (described below) is probably the most comprehensive access point concerning the Republics' data, some of which is freely available. However other datasets come at a fee, or may have restricted access. The progress of the INSPIRE directive, is hoped to network European spatial data, and through this, Irish environmental data. There are department-orientated data access portals are now available (e.g. the NPWS GIS data access portal), and these are described in brief below.

Some free GIS data access sites do exist for global datasets, and in some cases Ireland-specific. Free-gis-data.blogspot.com (2010) is an excellent site where you can find complete information about websites who provide free GIS, Remote Sensing, spatial and hydrology data as a service. You will also find there interesting articles, tutorials and reviews about GIS, Remote Sensing and Spatial Hydrology data. There are also links to data warehouses where you can download spatial data for free with a minimum effort.

Websites found to be particularly for sourcing free data, are detailed in the register under the “data access portals” section. Metadata should be carefully consulted when assessing whether or not to use the datasets obtained from free sources.

#### **The Marine Irish Digital Atlas (MIDA)**

MIDA provides a single source where people interested in coastal and marine information can visualise and identify relevant geospatial datasets and determine where to acquire them. However, it also contains visualisations and links to some layers relevant to peat soils, peatlands, landcover and use change, and water quality.

The atlas itself is built around an interactive map, allowing anyone to visualise, and query those datasets relevant to their interests. It is accessible from a wide range of web browsers, and allows users to visualise and query the geospatial data directly on the MIDA website (mida.ucc.ie, 2010).

Data located here that is pertinent to the scope of this register include:

- administrative boundaries,
- water management boundaries
- freshwater quality
- estuarine water quality
- parks and reserves
- protected areas
- heritage areas
- planning information

- land tenure
- waste
- landscape
- climate
- hydrology
- infrastructure
- topography
- agriculture

The data layers are provided under a variety of data sharing agreements. For example, publicly sourced data layers such as the national parks and reserves can be downloaded for free from a link to the National Parks and Wildlife Service web portal. In contrast, water management areas, and river and lake systems, based on areas mapped by Ordnance Survey Ireland, require the license purchased from OSI, upon production of which, the EPA can release their OSI based datasets. As previously mentioned MIDA is involved in the ISDE project under the INSPIRE directive.

### **Other Data Portals**

#### **- Department of Communications, Energy and Natural Resources (DCENR) spatial data page**

Here, GIS data from GSI, in ESRI shape file format, can be downloaded in pre-zipped folders. A style file is included in the download, as is a digital license agreement, which must be completed and returned by the user. Datasets held and available include bedrock geology maps, borehole details, groundwater aquifer locations, and groundwater well locations, amongst others. Summary metadata can also be found at [www.dcenr.gov.ie](http://www.dcenr.gov.ie) (2010). For further information, see [www.dcenr.gov.ie](http://www.dcenr.gov.ie) (2010), or contact GSI at the contact point outlined in the “Free Data Access Sites” section of the accompanying register.

#### **- GSI Datasets Public Viewer**

Here, more digital spatial data from GSI are available, including the National Draft Bedrock and Gravel Aquifer maps, river basin district boundaries (supplied by the EPA), source protection areas, and bedrock datasets (amongst others). Information on where to download the data is available as being included in the metadata. For further information, see the data viewer at the address outlined in the “Free Data Access Sites” section of the accompanying register, or see the GSI homepage ([www.gsi.ie](http://www.gsi.ie), 2010)

#### **- EPA ENVISION Map Viewer**

Provided by the Environmental Protection Agency ([www.epa.ie](http://www.epa.ie), 2010a), the ENVISION data viewer allows the public to view, though not yet to download, data on water quality (see the data viewer web address in the accompanying register, under the “Free Data Access Sites” section). For obtaining the viewed data, send a date request (to the contact

points outlined in the accompanying register, under the “Free Data Access Sites” section), outlining the datasets of interest and any subject areas required. The EPA will reply with what they have available. These will then be sent by CD-ROM. However, the ENVISION portal is currently been upgraded to allow for downloads in the near future.

Other datasets are also directly downloadable from the web (e.g. a list of 399 drinking water supplies). See [www.epa.ie](http://www.epa.ie) (2010b) for more information. For the ENVISION address, see the accompanying register under the “Free Data Access Sites” section.

### **-WaterMap webGIS**

Visualising the most up-to-date water quality data, the WaterMaps webGIS on the Water Frameworks Directive Ireland website ([www.wfdireland.ie](http://www.wfdireland.ie), 2010). However, the data cannot be downloaded from the site. For further information, see [www.wfdireland.ie](http://www.wfdireland.ie) (2010), whilst to discuss accessing the visualised data, contact the relevant river basins district, at the appropriate point outlined in the “River Basin Districts” section of the accompanying register.

### **- National biodiversity Data Centre (NBDC) Map Viewer**

The data centre has developed an online mapping system “Biodiversity Maps”, which provides access to data on the distribution of Irelands biological diversity. It provides information on not only whether a species has been recorded in an area, but also when the record was made. See [www.biodiversityireland.ie](http://www.biodiversityireland.ie) (2010) for further information, whilst the web map address is outlined in the “Free Data Access Sites” section of the accompanying register.

At present, the datasets are not downloadable from the web. The user must contact the NBDC to discuss accessing the data. Restrictions may apply on what data can be released (e.g. sensitive data on protected species such as freshwater pearl mussels is subject to heavy restrictions).to discuss accessing the data, contact the relevant point as outlined in the accompanying register in the “Free Data Access Sites” section.

### **- National Parks and Wildlife Service (NPWS)**

The NPWS maintains datasets that delineate the boundaries of Natural heritage Areas, proposed Natural Heritage Areas, Special Areas of Conservation, and Special Protection Areas. Furthermore, these datasets are downloadable via the map viewer. Biodiversity and habitats data held by the NPWS is not linked into the map viewer, and must be requested from the NPWS itself at the contact point outlined in the accompanying register. For more information see [www.npws.ie](http://www.npws.ie) (2010a), and [www.npws.ie](http://www.npws.ie) (2010b). For the web-viewer address, see the “Free data Access Sites” section of the accompanying register.

### **- European Environment Agency's (EEA) Maps and Data Webpage**

The EEA is tasked with providing sound, and independent information on the environment, and is a major source for those in Europe, involved in developing, adopting, implementing, and evaluating environmental policies. Their core objective is to produce integrated European, pan-European, and regional environmental data and indicator sets, assessments, and thematic analyses. These are aimed to support decision-making in environmental policy.

To achieve this, the EEA provide datasets on a range of topics, from bathing water quality, to pollutant release, to species and habitats data. This is done via a number of linked web portals (e.g. the EUNIS portal), all accessible via the EEA Maps and Data webpage. For more information on the EEA, see [www.eea.europa.eu](http://www.eea.europa.eu) (2010). For the datasets and interactive maps access page address, see the “Free Data Access Sites” section of the accompanying register.

### **- the GIS Data Depot**

The Depot provides free GIS data downloads, and creates custom GIS data CD-ROMs (at a small fee) for CAD, mapping and location based applications. It is intended for use by users with a good background knowledge in GIS, and may require access to GIS software.

In the “data downloads” section, datasets are organised by country. Data held on Ireland include, for example, Landsat TM mosaics from 1990, administrative and political boundary shapefiles. For further information, see [data.geocomm.com](http://data.geocomm.com) (2010a). For a full list of Irish datasets accessible via the Data Depot, see [data.geocomm.com](http://data.geocomm.com) (2010b). The initial download access page address is detailed in the “Free Data Access Sites” section of the registry, as is an email address for further enquiries.

### **- The Digital Chart of the World data server**

The Digital Chart of the World (DCW) is an ESRI product, originally developed for the US Defence Mapping Agency, using DMA data. Though no longer being updated, datasets from it could nevertheless be useful. It is downloadable in ESRI file formats, compatible with ArcINFO for example. The DCW contains spatial information on a wide range of themes, ranging from roads and railways, to drainage, to landcover. For further information, see [www.maproom.psu.edu](http://www.maproom.psu.edu) (2010). The site also outlines how the DCW was made, and the data sources used in creating it. For the web-portal address, see the “Free Data Access Sites” section of the accompanying registry.

### **- Mapcruzin.com**

Mapcruzin.com provides not only free GIS data, but also satellite, and aerial imagery and maps, topographic maps, open source software, tutorials and resources for students and professional GIS users. The website itself is a little confusing, as they attempt to distribute a wide range of services. For more information, see [www.mapcruzin.com](http://www.mapcruzin.com) (2010a) and [www.mapcruzin.com](http://www.mapcruzin.com) (2010b). To access data, go to the [mapcruzin.com](http://www.mapcruzin.com) homepage ([www.mapcruzin.com](http://www.mapcruzin.com), 2010a), and proceed to browse available datasets.

## **PART III**

### **Useful and Free satellite imagery access sites**

Satellite imagery is derived from a multitude of satellite and sensor systems. The systems most relevant to Ireland are those operated by the National Aeronautics and Space Administration (NASA) (see [www.nasa.gov](http://www.nasa.gov), 2010) and the European space Agency (ESA) ([www.esa.int](http://www.esa.int), 2010). The basic data products, and those of generally low resolution, provided by NASA are generally free to download through the various web portals outlined in the register. Those data products available from ESA missions are generally available, but at a fee. Any product that is of a higher spatial resolution, higher spectral resolution, or has been processed to a high level, will have an appropriate cost.

Websites through which free satellite data is accessible are outlined in the register in the satellite imagery access portals section. Brief descriptions of the most useful, are provided in the report.

#### **Global Landcover Facility**

The Global Land Cover Facility (GLCF) provides earth science data and products with the aim of aiding the study of global environmental systems. In particular, the GLCF develops and distributes remotely sensed satellite data and products that explain land cover from the local to global scales.

The facility makes available satellite imagery from sources such as Landsat, MODIS, and AVHRR, amongst others. Primary data and products available at the GLCF are free to anyone via FTP. Online datasets may be accessed electronically through the Earth Science Data Interface (ESDI). For further information on the GCLF, see [glcf.umiacs.umd.edu](http://glcf.umiacs.umd.edu) (2010a). For product listings see [glcf.umiacs.edu](http://glcf.umiacs.edu) (2010b), whilst for the data interface address, see the “satellite data sites” section in the accompanying registry.

#### **United States Geological Survey (U.S.G.S.) Earth Resources Observation and Science (EROS) Centre**

The U.S.G.S., through the Earth Resources Observation and Science (EROS) Center, operates two very useful, and easy-to-use download portals, for accessing and downloading satellite imagery. These are the EarthExplorer and the Global Visualisation Viewer (GLOVIS). Both allow access to a range of free NASA data products, though some of the products accessible using the Earth Explorer may come with a fee attached (the higher level products for example).

GLOVIS is probably one of the easier web portals allowing access and downloads of a

wide variety of free, NASA satellite imagery. The sensors covered include ASTER, Landsat, and MODIS sensors, all of which have been used in landcover studies in the past. Explorer offers AVHRR data, Global Landcover Survey data, Landsat, and Radar imagery. The GLOVIS viewer allows the user to preview any images taken of the area of interest. A download link is then provided in the viewer for the user to access and download the data. In contrast Earth Explorer immediately provides a statement of whether or not a dataset is available to download, without the user being able to preview it.

For more information on EROS, see [edc.usgs.gov](http://edc.usgs.gov) (2010a), whilst for more information on GLOVIC and Earth Explorer, and the products available see the EROS data products webpage ([edc.usgs.gov](http://edc.usgs.gov), 2010b). For further information on GLOVIS, see [glovis.usgs.gov](http://glovis.usgs.gov) (2010). For the site links to the two download portals, see the “satellite data sites” section in the accompanying registry.

### **National Oceanographic and Atmospheric Administration**

Using this website, the user can get access to meteorological data, landcover data from the Advanced Very High Resolution Radiometer (AVHRR) dataset, and Oceanic satellite imagery ([www.nsof.class.noaa.gov](http://www.nsof.class.noaa.gov) , 2010; [www.nesdis.noaa.gov](http://www.nesdis.noaa.gov), 2010). Product links are provided with descriptions of how to download them, are provided with all products outlined. For further information see [www.nsof.class.noaa.gov](http://www.nsof.class.noaa.gov) (2010) or [www.nesdis.noaa.gov](http://www.nesdis.noaa.gov) (2010).

### **Free VEGETATION distribution site**

This is one of the few sites which allows for the distribution of free satellite landcover imagery from European satellite platforms. The products available are from the SPOT VEGETATION sensors, and are extracts from ten day global syntheses, in full resolution (1km). They are only available on 10 predefined regions of interest. For more information go to [free.vgt.vito.be](http://free.vgt.vito.be) (2010), [www.vgt.vito.be](http://www.vgt.vito.be) (2010), and [www.spot-vegetation.com](http://www.spot-vegetation.com) (2010)

The programmes other products are available at a fee. For a detailed listing of these products, contact [sales@vgt.vito.be](mailto:sales@vgt.vito.be), or phone +32 14 33 68 77.

## **PART IV**

### **Useful and freely available GIS Software**

There are a number of free GIS software available for download. Each has a different range of abilities, and are often designed with particular applications in mind (e.g. hydrology, food security, network analysis etc.). Those outlined here are highlighted in “The Big List of Free GIS Programs” (freegeographytools.com, 2010a, 2010b, 2010c, 2010d), an inventory done in 2008. All programs mentioned here have been checked as to whether or not they are still available, and applicable to the research areas outlined in this report. There are also details on where to find further information about them, and details of where to download the programs (outlined in the accompanying register).

#### **Summary of Useful Free GIS Programs**

##### **AccuGlobe**

Compatible platforms: Windows

Equipped with a useful shapefile editor and layout capabilities, the program supports functions for both vector and raster formats. Attribute editing is also possible using the program. For more information, see [www.accuglobe.net](http://www.accuglobe.net) (2010), whilst the download site address can be seen in the “free GIS software” section in the accompanying registry.

##### **DIVA**

Compatible platforms: Windows

This freeware was designed for mapping purposes and geodata analysis. It can be incorporate both vector and raster formats. The program is focussed on the analysis of biodiversity and species distributions, though it can be used to achieve other outcomes. Meanwhile, the web support also holds free spatial data that can be manipulated and used by both DIVA GIS, and other programs. For further information, see [www.diva-gis.org](http://www.diva-gis.org) (2010), and [freegeographytools.com](http://freegeographytools.com) (2010a), whilst the download site address can be found in the “free GIS software” section of the accompanying registry.

##### **Forestry GIS (fGIS)**

Compatible Platforms: Windows

A useful, compact, and robust program for editing shapefiles, fGIS can also digitize and query spatial data. The program and interface have been designed for natural reserve managers who are not GIS specialists. Raster images can be opened and viewed, whilst

vector shapefiles can be manipulated, edited and compiled into maps. The data produced is Compatible with most commercial GIS programs. For further information, see [www.t4cd.org](http://www.t4cd.org) (2010) and [freegeographytools.com](http://freegeographytools.com) (2010a). The download site address can be found in the “free GIS software” section of the accompanying registry.

### **Geographic Resources Analysis Support System (GRASS)**

Compatible platforms: Windows, Linux, Macintosh

This program was designed as a tool for land management and environmental planning. It allows for geospatial data management, image processing, graphics and map making, as well as spatial visualisation. The program can incorporate both vector and raster data, both of which can be manipulated along with sites data. Spatial data can be created, managed, and stored, whilst multi-spectral imagery can be processed using the GRASS suite of tools. The program supports a number of formats (see [grass.osgeo.org](http://grass.osgeo.org), 2010a), and further information can be found at [grass.osgeo.org](http://grass.osgeo.org) (2010b), or [www.hydrologis.com](http://www.hydrologis.com) (2010). The download site address can be found in the “free GIS software” section of the accompanying registry.

### **GvSIG**

Compatible platforms: Windows, Linux, Macintosh

Based originally on the JUMP platform (see [en.wikipedia.org](http://en.wikipedia.org), 2010a, for further information on the JUMP project), gvSIG is a multi-lingual open-source GIS that can handle both raster and vector data. The program features basic editing tools for raster and vector data in a variety of different formats ([en.wikipedia.org](http://en.wikipedia.org), 2010b). It features impressive vector editing capabilities ([freegeographytools.com](http://freegeographytools.com), 2010). For further information, see [www.gvsig.gva.es](http://www.gvsig.gva.es) (2010). For the download site address, see the “free GIS software” section of the accompanying registry.

### **HidroSIG**

Compatible platforms: Windows, Linux

This GIS freeware is focussed on allowing the user to make estimations and analysis of hydrological, climatic, and geo-morphological variables. It allows for the compiling of maps incorporating both vector and raster formats, features models for rainfall runoff, land stability and water quality, whilst also being able to import files from commercial GIS programmes such as the ESRI suite. The program also hosts a number of other useful features such as hydrological balance estimation, erosion etc., further listings and information on which can be found at [freegeographytools.com](http://freegeographytools.com) (2010a), and [cancerbero.unalmed.edu.co](http://cancerbero.unalmed.edu.co) (2010). The download site address can be found in the “free GIS software” section of the accompanying registry.

### **Integrated Land and Water Information System (ILWIS)**

Compatible platforms: Windows

ILWIS comprises a complete package of image processing, spatial analysis, and digital mapping. It also has the ability to run models such as those for soil erosion and runoff models. For further information, see [www.ilwis.org](http://www.ilwis.org) (2010), and [www.itc.nl](http://www.itc.nl) (2010). For the download link address, see the “free GIS software” section of the accompanying register.

### **Java Geographic Resources Analysis Support System (JGrass)**

Compatible platforms: Windows, Linux, Macintosh

JGrass is a free, multi-platform, Java-based version of GRASS, orientated towards hydrological and geomorphologic analyses. The program is currently being developed to incorporate some of the vector capabilities of software such as uDIG. For further information, see [jgrass.wikisoftware.bz.it](http://jgrass.wikisoftware.bz.it) (2010), [www.hydrologis.org](http://www.hydrologis.org) (2010), or [bedu.ing.unit.it](http://bedu.ing.unit.it) (2010). The download link address can be found in the “free GIS software” section of the accompanying register.

JGrass also hosts the BeeGIS project (an add-on). This set of plug-ins are dedicated to digital field mapping, intended for use by geologists on outdoor surveys. For more information on BeeGIS, see [www.beegis.org](http://www.beegis.org) (2010), or [www.hydrologis.org](http://www.hydrologis.org) (2010). For the download link address, see the “free GIS software” section of the accompanying register.

### **Key Indicator Data System (KIDS)**

Compatible platforms: Windows

KIDS is a software framework that provides the ability to implement thematic information systems that collect, reference, visualise, exchange, and disseminate statistical, survey, and indicator data. The program allows for visualisation through tables, maps, raster images, and graphs. Basic GIS overlay and legend editing functions are available for non GIS users.

Developed originally to collect map and disseminate food insecurity and vulnerability indicators, the program has now been applied to many other disciplines. These include interpreting agricultural land-use, early warning, fisheries statistics, terrestrial ecosystem monitoring, field projects, nutrient responses, and studying meteorological systems using satellite imagery. For further information, see [kids.fao.org](http://kids.fao.org) (2010). For the download link address, see the “free GIS software” section of the accompanying register.

### **Kosmo**

Compatible platforms: Windows

This tool, developed from the JUMP GIS platform (see [en.wikipedia.org](http://en.wikipedia.org), 2010a, for further information on the JUMP project), is useful for visualising and processing spatial data. It is characterised by its' user-friendly interface, and compatibility with multiple data formats, including commercial formats such as ESRI shapefiles and TIFF (raster) files. The program also possesses the ability to edit these files. Kosmo is currently still open-source software, however note that it is being developed further and expanded by a commercial company. For more information on Kosmo, see [www.opengis.es](http://www.opengis.es) (2010), or [en.wikipedia.org](http://en.wikipedia.org) (2010c). For the download link address, see the “free GIS software” section of the accompanying registry.

### **LandSerf**

Compatible platforms: Windows, Linux, Macintosh

Designed to visualise, and analyse land surfaces, LandSerfs' applications include landscape visualisation, geomorphologic analysis, GIS file conversion, mapping outputs, surface modelling, archaeological mapping and archaeological analysis amongst many others. It can incorporate commonly used raster and vector data formats, and can integrate with Garmin GPS receivers. Image rectification and map projection work, for both vector and raster datasets, can be achieved using this program. Concerning surface modelling, LandSerf can handle multiple types of land surface model, including Digital Elevation Models (DEMs), Triangulated Irregular Networks (TINs), and contours. For further information, see [www.soi.city.ac.uk](http://www.soi.city.ac.uk) (2010), whilst for the download link address, see the “free GIS software” section of the accompanying register.

### **MapMaker**

Compatible platforms: Windows (XP, Vista, 7)

The MapMaker program consists of two separate programs in one package. MapMaker Gratis (free) and MapMaker Pro (free for a 30-day demo, upon which time a license is required to keep using it). Note that licenses for MapMaker Pro are available for free to not-for-profit organisations, and educational establishments. Exporting data in standard vector formats requires the Pro version of the software./

The MapMaker Gratis component was designed to give students and novices the opportunity to learn the basics of map-making and GIS. It can also be used to distribute map projects, and to add maps to Google earth. MapMaker Pro was designed for more professional map production and GIS use. It includes features such as 3D functions for contours, Digital Terrain Models (DTMs), sections, volumns , and views. For more information, see [www.mapmaker.com](http://www.mapmaker.com) (2010), whilst for the download link address, see the “free GIS software” section of the accompanying register.

### **MapWindow**

Compatible platforms: Windows

A free, extensible GIS, MapWindow can be seen as an alternative desktop GIS. It can also be used to develop and distribute custom spatial data analyses. The program includes standard GIS data visualisation features, whilst attribute editing is possible via the database (.dbf) files. The ability to edit shapefiles is also a notable feature of the software, as is the ability to import and convert grid (or raster) data. Freegeographytools.com (2010b) notes the software's "excellent vector editing capabilities, plus a host of useful utilities". for more information, see [www.mapwindow.org](http://www.mapwindow.org) (2010), whilst for the download link address, see the "free GIS software" section of the accompanying register.

### **MicroDEM**

Compatible platforms: Windows

"A terrific program for terrain visualisation and analysis" (freegeographytools.com, 2010b). This freeware enables the user to merge and display Digital Elevation Models (DEMs), satellite imagery, scanned maps, vector map data, and GIS databases. The program also features vector editing, analysis, and display functions, though these are not as impressive as its' raster capabilities New features are being added continuously, and the vector capabilities are currently being improved. For more information, see [www.usna.edu](http://www.usna.edu) (2010), whilst for the download link address, see the "free GIS software" section of the accompanying register.

### **OpenJUMP**

Compatible platforms: Windows

Another of the JUMP family of software programs (see [en.wikipedia.org](http://en.wikipedia.org), 2010a, for further information on the JUMP project), OpenJUMP incorporates a number of vector analysis tools for topological analysis and overlay operations. The program can read and write shapefiles and simple GML files, and enables the user to edit geometry and attribute data. Raster data analysis can also be incorporated into the software with the Sextante GIS extension. There is also added functionality for users capable of using python programming language (see [www.python.org](http://www.python.org), 2010 for more information on python). For more information on OpenJUMP, see [www.openjump.org](http://www.openjump.org) (2010) and [sourceforge.net](http://sourceforge.net) (2010a) For the download link address, see the "free GIS software" section of the accompanying register.

### **Natural Resources Database (NRDB)**

### Compatible platforms: Windows

NRDB was designed to be a powerful, yet simple, tool to assist in managing resources. It is a free GIS software for developing and distribution environmental databases. The system forms a spatial database, with the added value of being a time series database, with all data requiring an associated date. Furthermore, the database structure is hierarchical in nature, with the hierarchy defined to meet the needs of a particular project. The software enables the user to create thematic maps, with an automatic layout available if required. The database supports UTM and other transverse Mercator projections, whilst map layers can be exported to shapefiles.

NRDB can import data from shapefiles or text files. Image files can be geo-referenced from paper maps, with the user also able to digitize directly using the software. For further information, see [www.nrdb.co.uk](http://www.nrdb.co.uk) (2010). For the download link address. See the “free GIS software” section of the accompanying register.

### **OrbisGIS**

#### Compatible platforms: Windows, Linux

This useful GIS is dedicated to scientific modelling and simulation. The program is geared towards data acquisition techniques (e.g. remote sensing, modelled inputs, site enquiries etc.), spatial data processing and representation (e.g. storage, modelling etc.), and geographic data sharing. The program is based on robust and well know libraries in the public domain (such as JTS or ImageJ), and enables the user to join or visualise 2D vector and/or raster data. OrbisGIS’ modelling component is useful for hydrological modelling, but also other forms of spatial and temporal modelling. For further information go to [brehat.ec-nantes.fr](http://brehat.ec-nantes.fr) (2010) and [freegeographytools.com](http://freegeographytools.com) (2010c). For the download link address, see the “free GIS software” section of the accompanying register.

### **QuantumGIS**

#### Compatible platforms: Windows, Linux, Macintosh

QuantumGIS supports both raster and database formats. It allows for overlaying, and viewing raster and vector data, in different formats, and projections. Using this software, spatial data can be explored, created, edited, exported, and compiled into maps. The program also contains components which allow for terrain analysis, map algebra, hydrological modelling, and network analysis. An extensive plug-in archive can be used to selectively enhance the program for the user. For example, a geo-referencing tool can be added if the user requires it. For further information, see [www.qgis.org](http://www.qgis.org) (2010a, and [www.qgis.org](http://www.qgis.org) (2010b). For the download link address, see the “free GIS software” section of the accompanying register.

### **System for Automated Geoscientific Analysis (SAGA)**

Compatible platforms: Windows, Linux

Designed for an easy and effective implementation of spatial algorithms, SAGA is useful for analysing raster datasets (visualising in 3D for example). Freegeographytools.com (2010d) mentions that though the interface is not very user-friendly, the program has an impressive range and quantity of functionality. For further information, see [www.saga-gis.org](http://www.saga-gis.org) (2010), and [sourceforge.net](http://sourceforge.net) (2010b). For the download link address, see the “free GIS software” section of the accompanying register.

### **Terrain Analysis System (TAS)**

Compatible platforms: Windows

TAS was designed for environmental science modelling and environmental management. The system can display and utilise both raster and vector data, possessing many of the standard spatial analysis functions that an environmental modeller requires. The system was designed with simplicity and ease-of-use in mind. It is simple enough to be used in classroom exercises, despite still being useful to advanced level GIS users. TAS has been applicable (so far) to the areas of geomorphology, physical geography, hydrology, and watershed management (amongst others). For further information, see [www.intute.ac.uk](http://www.intute.ac.uk) (2010) and [www.uogelph.ca](http://www.uogelph.ca) (2010). For the download link address, see the “free GIS software” section of the accompanying register.

## **PART V**

### **INSPIRE, a key spatial data infrastructure development**

Established by European directive 2007/2/EC of the European parliament and Council of 14<sup>th</sup> March, 2007, Infrastructure for Spatial Information in the European Community (INSPIRE), lays down general rules to establish an infrastructure for spatial information in Europe. This is aimed to aid community environmental policies, and policies/activities that may have an impact on the environment. The goal is to have the directive completely implemented by 2019, having created an E.U wide spatial data infrastructure capable of sharing environmental spatial information amongst public sector organisations, and better facilitating public access to spatial information from across Europe.

INSPIRE is based on a number of principals:

- data should be collected only once, and be kept where it can be maintained most effectively
- it should be possible to combine seamless spatial information from different sources across Europe, and share it with many users and applications
- it should be possible for information collected at one level/scale, to be shared with all levels/scales (i.e. the information should be detailed for thorough investigations, and general for strategic purposes.
- Geo-information, needed for good governance at all levels, should be readily and transparently available
- it should be easy to find what geographical information is available, easy to assess how it can be used to meet a particular need, and easy to enquire under which conditions it can be acquired and used.

INSPIRE involves a number of different types of spatial data, which have been divided into three annexes (details in appendix). The project is currently amalgamating metadata in the republic via projects such as the Irish Spatial Data Exchange (ISDE) ([www.marine.ie](http://www.marine.ie), , 2010). The Marine Digital Atlas (MIDA) project ( [mida.ucc.ie](http://mida.ucc.ie), 2010) via which many of the datasets in this report are referred to or accessible, is also involved with the ISDE and therefore INSPIRE. Further information on the INSPIRE directive, and its progress to date is available at [inspire.jrc.ec.europa.eu](http://inspire.jrc.ec.europa.eu) (2010) .

Details of INSPIRE directive

INSPIRE involves a number of different types of spatial data, which have been divided into three annexes

#### **Annex 1**

- Coordinate reference systems (height, latitude, and longitude etc.)

- Geographical grid systems (compatible with a standardised grid system laid across Europe)
- Geographical names (e.g. areas, regions, localities, cities, suburbs, towns & settlements, and geographical or topographical features)
- Administrative units (areas for local, regional, and national boundaries & administrative areas)
- Addresses (road name, house number, postcode)
- Cadastral parcels (i.e. registered land properties)
- Transport networks (road, rail, air, and water networks, and related infrastructure; links between these networks)
- Hydrography (marine areas, river basins & sub-basins, rivers, coastlines, lakes etc.)
- Protected sites (areas designated by international, European community, and national legislation aimed at achieving conservation objectives - e.g. national monuments, SAC's etc.)

## **Annex 2**

- Elevation (land, ice, ocean surfaces, shorelines etc.)
- Land cover (physical & biological surfaces incl. built-up areas, agriculture, forests, wetlands, water bodies etc.)
- Orthoimagery (images of the earth's surface from satellites and airborne sensors)
- Geology (characterised according to composition and structure incl. bedrock, aquifers & geomorphology)

## **Annex 3**

- Statistical units (e.g. enumeration districts used by the CSO)
- Buildings
- Soil (soils and sub-soils characterised according to depth, texture, structure, and content of particles & organic matter, stoniness, erosion, and where appropriate average slope & water storage capacity)
- Land use (current and future zoned use e.g. residential, industrial etc.)
- Human health & safety (distribution of pathologies, e.g. cancers; info indicating the effects on health, e.g. fertility decline & epidemics, or well being of people, e.g. fatigue & stress; linked directly or indirectly to environmental quality.
- Utility & government services (sewage, waste management, energy supply, water supply, administrative & social government services e.g. public administrations, civil protection sites, schools, hospitals etc.)
- Environmental monitoring facilities (location & operation of facilities monitoring, for example, emissions, biodiversity, ecological conditions of vegetation etc.)
- Production & industrial facilities (factories, installations covered by pollution prevention & control legislation, abstraction facilities, mining, storage sites)
- Agriculture & aquaculture facilities (farming equipment & production facilities incl. irrigations systems, greenhouses, stables etc.)
- Population distribution (demography)
- Area management/restriction/regulation zones & reporting units

- Natural risk zones (vulnerable areas such as flooding & landslide areas, areas of subsidence, forest fires etc.)
- Atmospheric conditions (physical conditions in the atmosphere based on measurement or models)
- Meteorological geographical features (weather conditions & their measurements)
- Sea regions (physical conditions of seas and saline water bodies divided up into regions & sub-regions with common characteristics)
- Bio-geographical regions (areas of relatively homogenous ecological conditions and common characteristics)
- Habitats & biotopes (areas characterised by specific ecological conditions and common characteristics)
- Species distribution (areas of occurrence of animal & plant species)
- Energy resources (hydrocarbons, hydropower, bio-energy, solar, wind etc., incl. where relevant depth/height information on the extent of the resources is to be found)
- Mineral resources (incl. metal ores, industrial materials etc., incl. where relevant depth/height information on the extent of the resource is to be found).

## **REFERENCES**

Connelly, J., and Holden, N.M. (2009) Mapping peat soils in Ireland; updating the Derived Irish Peat Map. *Irish Geography*, **3**, 343-352.

Connelly, J., Holden, N.M., Ward, S.M. (2007) Mapping peatlands in Ireland using a rule-based methodology and digital data. *Soil Science Society of America Journal*, **71**, 492-499.

European Environment Agency (2010)  
www.eea.europa.eu/publications/COR0-landcover  
[accessed 28<sup>th</sup> January, 2010]

Environmental Protection Agency (2010) www.epa.ie/whatwedo/assessment/land/corine/uses/  
[accessed 16<sup>th</sup> January, 2010]

OSI, 2010  
www.osi.ie  
[last accessed 12<sup>th</sup> January, 2010]

### **Internet References**

bedu.ing.unitn.it (2010)  
bedu.ing.unitn.it/~daniel/fantastico/public/index.php?projectID=3#intro  
[last accessed 26<sup>th</sup> January, 2010]

brehat.ec-nantes.fr (2010)  
brehat.ec-nantes.fr/orbisgis/doku.php  
[last accessed 2<sup>nd</sup> February, 2010]

cancerbero.unalmed.edu.co (2010)  
cancerbero.unalmed.edu.co/~hidrosig/ingles/index.php  
[last accessed 26<sup>th</sup> January, 2010]

data.geocomm.com (2010a)  
data.geocomm.com  
[last accessed 12<sup>th</sup> January, 2010]

data.geocomm.com (2010b)  
data.geocomm.com/catalog/EI/index.html  
[last accessed 12<sup>th</sup> January, 2010]

edc.usgs.gov (2010a)  
edc.usgs.gov  
[last accessed 29<sup>th</sup> January, 2010]

edc.usgs.gov (2010b)  
edc.usgs.gov/#/Find\_Data  
[last accessed 29<sup>th</sup> January, 2010]

en.wikipedia.org (2010a)

en.wikipedia.org/wiki/JUMP\_GIS/  
**[last accessed 10<sup>th</sup> February, 2010]**

en.wikipedia.org (2010b)  
en.wikipedia.org/wiki/gvSIG/  
**[last accessed 26<sup>th</sup> January, 2010]**

en.wikipedia.org (2010c)  
En.wikipedia.org/wiki/kosmo/  
**[last accessed 27<sup>th</sup> January, 2010]**

freegeographytools.com (2010a)  
freegeographytools.com/2008/the-big-list-of-free-basic-gis-programs-a-through-h  
**[last accessed 10<sup>th</sup> February, 2010]**

freegeographytools.com (2010b)  
freegeographytools.com/2008/the-big-list-of-free-basic-gis-programs-i-through-m  
**[last accessed 10<sup>th</sup> February, 2010]**

freegeographytools.com (2010c)  
freegeographytools.com/2008/the-big-list-of-free-basic-gis-programs-n-through-r  
**[last accessed 10<sup>th</sup> February, 2010]**

freegeographytools.com (2010d)  
freegeographytools.com/2008/the-big-list-of-free-basic-gis-programs-s-through-z  
**[last accessed 10<sup>th</sup> February, 2010]**

free-gis-data.blogspot.com (2010)  
free-gis-data.blogspot.com  
**[last accessed 15<sup>th</sup> January, 2010]**

free.vgt.vito.be (2010)  
free.vgt.vito.be  
**[last accessed 28<sup>th</sup> February, 2010]**

glcf.umiacs.umd.edu (2010a)  
glcf.umiacs.umd.edu  
**[last accessed 28<sup>th</sup> January, 2010]**

glcf.umiacs.umd.edu (2010b)  
http://glcf.umiacs.umd.edu/data/  
**[last accessed 28<sup>th</sup> January, 2010]**

glovis.usgs.gov (2010)  
glovis.usgs.gov/AboutBrowse.shtml  
**[last accessed 29<sup>th</sup> January, 2010]**

grass.osgeo.org (2010a)  
grass.osgeo.org/intro/general.php  
**[last accessed 26<sup>th</sup> January, 2010]**

grass.osgeo.org (2010b)  
grass.osgeo.org  
**[last accessed 26<sup>th</sup> January, 2010]**

inspire.jrc.ec.europa.eu (2010)  
inspire.jrc.ec.europa.eu  
**[last accessed 19<sup>th</sup> January, 2010]**

jgrass.wikisoftware.bz.it (2010)  
jgrass.wikisoftware.bz.it  
**[last accessed 26<sup>th</sup> January, 2010]**

mida.ucc.ie, 2010  
mida.ucc.ie  
**[last accessed 6<sup>th</sup> February, 2010]**

sourceforge.net (2010a)  
sourceforge.net/apps/mediawiki/jump-pilot/index.php?title=Main\_Page  
**[last accessed 29<sup>th</sup> January, 2010]**

sourceforge.net (2010b)  
sourceforge.net/projects/saga-gis/  
**[last accessed 4<sup>th</sup> February, 2010]**

www.accuglobe.net (2010)  
www.accuglobe.net  
**[last accessed 26<sup>th</sup> January, 2010]**

www.beegis.org (2010)  
www.beegis.org  
**[last accessed 26<sup>th</sup> January, 2010]**

www.biodiversityireland.ie (2010)  
www.biodiversityireland.ie  
**[last accessed 15<sup>th</sup> January, 2010]**

www.dcenr.gov.ie (2010),  
www.dcenr.gov.ie/Spatial+Data/Geological+Survey+of+Ireland/GSI+spatial+data+downloads.htm  
**[last accessed 1<sup>st</sup> February, 2010]**

www.diva-gis.org (2010)  
www.diva-gis.org  
**[last accessed 26<sup>th</sup> January, 2010]**

www.eea.europa.eu (2010)  
www.eea.europa.eu/about-us/who  
**[last accessed 23<sup>rd</sup> January, 2010]**

www.epa.ie (2010a)  
www.epa.ie  
**[last accessed 5<sup>th</sup> February, 2010]**

www.epa.ie (2010b)  
www.epa.ie/downloads/  
**[last accessed 5<sup>th</sup> February, 2010]**

www.esa.int (2010)  
www.esa.int/esaEO/index.html

**[last accessed 28<sup>th</sup> January, 2010]**

www.gsi.ie (2010)

www.gsi.ie

**[last accessed 2<sup>nd</sup> February, 2010]**

www.gvgis.gva.es (2010)

www.gvgis.gva.es/eng/que-es-gvsig/

**[last accessed 26<sup>th</sup> January, 2010]**

www.hydrologis.org (2010)

www.hydrologis.org

**[last accessed 26<sup>th</sup> January, 2010]**

www.ilwis.org (2010)

www.ilwis.org

**[last accessed 27<sup>th</sup> January, 2010]**

www.intute.ac.uk (2010)

www.intute.ac.uk/cgi-bin/fullrecord.pl?handle=20090519-10583267

**[last accessed 4<sup>th</sup> February, 2010]**

www.itc.nl (2010)

www.itc.nl/Pub/Research/research\_output/ILWIS\_-\_Remote\_Sensing\_and\_GIS\_software.html

**[Last accessed 27<sup>th</sup> January, 2010]**

www.mapcruzin.com (2010a)

www.mapcruzin.com/index.html

**[last accessed 19<sup>th</sup> February, 2010]**

www.mapcruzin.com (2010b)

www.mapcruzin.com/index.html#aboutus

**[last accessed 19<sup>th</sup> February, 2010]**

www.mapmaker.com (2010)

www.mapmaker.com

**[last accessed 29<sup>th</sup> January, 2010]**

www.maproom.psu.edu (2010)

www.maproom.psu.edu

**[last accessed 19<sup>th</sup> January, 2010]**

www.mapwindow.org (2010)

www.mapwindow.org

**[last accessed 29<sup>th</sup> January, 2010]**

www.marine.ie (2010)

www.marine.ie/isde/default.htm

**[last accessed 17<sup>th</sup> January, 2010]**

mida.ucc.ie (2010)

mida.ucc.ie

**[last accessed 27<sup>th</sup> January, 2010]**

www.nasa.gov (2010)

[www.nasa.gov/missions/index.html](http://www.nasa.gov/missions/index.html)  
**[last accessed 28<sup>th</sup> January, 2010]**

[www.nesdis.noaa.gov](http://www.nesdis.noaa.gov) (2010)  
[www.nesdis.noaa.gov/SatProducts.html](http://www.nesdis.noaa.gov/SatProducts.html)  
**[last accessed 29<sup>th</sup> January, 2010]**

[www.npws.ie](http://www.npws.ie) (2010a)  
[www.npws.ie/MapsData/?agreecheck=on&submit=I+Accept](http://www.npws.ie/MapsData/?agreecheck=on&submit=I+Accept)  
**[last accessed 14<sup>th</sup> January, 2010]**

[www.npws.ie](http://www.npws.ie) (2010b)  
[www.npws.ie/en/MapsData/downloadingandMetadata/](http://www.npws.ie/en/MapsData/downloadingandMetadata/)  
**[last accessed 14<sup>th</sup> January, 2010]**

[www.nrdb.co.uk](http://www.nrdb.co.uk) (2010)  
[www.nrdb.co.uk](http://www.nrdb.co.uk)  
**[last accessed 2<sup>nd</sup> February, 2010]**

[www.nsof.class.noaa.gov](http://www.nsof.class.noaa.gov) (2010)  
[www.nsof.class.noaa.gov/saa/products/welcome/](http://www.nsof.class.noaa.gov/saa/products/welcome/)  
**[last accessed 19<sup>th</sup> January, 2010]**

[www.opengis.es](http://www.opengis.es) (2010)  
[www.opengis.es](http://www.opengis.es)  
**[last accessed 27<sup>th</sup> January, 2010]**

[www.openjump.org](http://www.openjump.org) (2010)  
[www.openjump.org](http://www.openjump.org)  
**[last accessed 29<sup>th</sup> January, 2010]**

[www.python.org](http://www.python.org) (2010)  
[www.python.org](http://www.python.org)  
**[last accessed 29<sup>th</sup> January, 2010]**

[www.qgis.org](http://www.qgis.org) (2010a)  
[www.qgis.org](http://www.qgis.org)  
**[accessed 2<sup>nd</sup> February, 2010]**

[www.qgis.org](http://www.qgis.org) (2010b)  
[www.qgis.org/en/about/qgis/features.html](http://www.qgis.org/en/about/qgis/features.html)  
**[last accessed 2<sup>nd</sup> February, 2010]**

[www.saga-gis.org](http://www.saga-gis.org) (2010)  
[www.saga-gis.org](http://www.saga-gis.org)  
**[last accessed 4<sup>th</sup> February, 2010]**

[www.soi.city.ac.uk](http://www.soi.city.ac.uk) (2010)  
[www.soi.city.ac.uk/~jwo/landserf/](http://www.soi.city.ac.uk/~jwo/landserf/)  
**[last accessed 29<sup>th</sup> January, 2010]**

[www.spot-vegetation.com](http://www.spot-vegetation.com) (2010)  
[www.spot-vegetation.com](http://www.spot-vegetation.com)  
**[last accessed 28<sup>th</sup> January, 2010]**

www.t4cd.org (2010)  
www.t4cd.org/resources/ICT\_resources/technologies/pages/ICTtechnology\_81.aspx  
**[last accessed 26<sup>th</sup> January, 2010]**

www.uogelph.ca (2010)  
www.uogelph.ca/~hydrogeo/TAS/index.html  
**[last accessed 4<sup>th</sup> February, 2010]**

www.usna.edu (2010)  
www.usna.edu/users/oceano/pguth/website/microdem/microdem.htm  
**[last accessed 29<sup>th</sup> January, 2010]**

www.vgt.vito.be (2010)  
www.vgt.vito.be  
**[last accessed 29<sup>th</sup> January, 2010]**

www.wfdireland.ie (2010)  
www.wfdireland.ie  
**[last accessed 5<sup>th</sup> February, 2010]**