

# MapElre - User manual

User manual for the MapElre model system

Academic report from the Department of Environmental Science

2019

Marlene S. Plejdrup, Henrik G. Bruun & Ole-Kenneth Nielsen





# MapElre - User manual

#### User manual for the MapElre model system

Academic report from the Department of Environmental Science

2019

# Data

Series title and number Title Subtitle	Academic report from the Department of Environmental Science MapElre – User manual User manual for the MapElre model system
Authors	Marlene S. Plejdrup, Henrik G. Bruun & Ole-Kenneth Nielsen
Department	Environmental Science
Year of publication	February 2019
Editing completed	February 2019
Financial support	Irish Environmental Protection Agency
Please quote	Plejdrup, M.S., Bruun, H.G. & Nielsen, OK., 2019: MapElre – User Manual. User manual for the MapElre model system. Department of Environmental Science, Aarhus University. Available at: www.MapElre.dk
Version	Final
Summary	This report describes the MapElre model, which is a prepared by Department of Envi- ronmental Science (ENVS) at Aarhus University (AU), Denmark as part of the project National mapping of GHG and non-GHG emissions sources (MapElre), which is funded by the Irish EPA and is part of the Environmental Protection Agency Research Call 2015 on Climate - Air Science under the EPA Research Programme 2014-2020. The report documents the methods behind the model and the specifications for the model, and serves as a guide for users of the model
Keywords	Emissions, spatial distribution, Ireland, EMEP, UNECE
Number of pages	96
Internet version	[Text and Website]a

# Contents

mu	oduct	tion	6
1	Syst	em requirements	7
	1.1	Setup of the MapElre system	7
2	Wor	kflow for the spatial model	9
	2.1	Importing emission data	9
	2.2	GeoKeys management	15
	2.3	Running the model	17
	2.4	Quality check	18
	2.5	Generating outputs	19
	2.6	Creating maps	20
3	Geo	Key development	21
	3.1	Projection	24
	3.2	Borders	24
	3.3	EEZ	24
	3.4	Coastline	24
	3.5	National border	24
	3.6	Border files	25
	3.7	Grids	25
4	Tem	poral model	28
	4.1	Temporal profiles and TKey development	
	4.2	Calculation of temporal emissions for use in maps and videos	
	4.3	Set up a project in ArcMap	30
	4.4	Export images for making a video	
	4.5	Assemble Video	32
Anr	nex 1.		34

MAPEIRE - USER MANUAL

Installing MS SQL Server 2016 SP1 and SSMS 17 on a laptop	
Network enabling of MS SQL Server	
Creating the MapElre database	
Make a connection from MS Access to the MapElre database	
Changing the ODBC time out for queries in MS Access	42
Annex 2 – List of GeoKeys	44
Annex 3 - Correspondence between GNFR, NFR and GeoKey	45
Annex 4 - Correspondence list of IPCC categories and assigned land-use category	<i>/</i> ,0
Annex 5 - Irish projections	
Annex 6 - List of TKeys	53
Annex 7 - Guide to create maps	56
Annex 8 – Preparing a GeoKey for a point source	67
Annex 9 – Preparing a GeoKey for a line source	76
Annex 10 - Working with coordinates and projections	88
Part 1: Coordinate transformation using Franson CoordTrans	
Part 2: Working with projection – Project	
Part 3: Working with projection - Define projection	
Annex 11- Importing a set of CRF variables	94

5

## Introduction

This report describes the MapElre model, which is a prepared by Department of Environmental Science (ENVS) at Aarhus University (AU), Denmark as part of the project National mapping of GHG and non-GHG emissions sources (MapElre), which is funded by the Irish EPA and is part of the Environmental Protection Agency Research Call 2015 on Climate - Air Science under the EPA Research Programme 2014-2020. The report documents the methods behind the model and the specifications for the model, and serves as a guide for users of the model.

The MapElre model provides a high spatial resolution of Irish emissions, including all sectors and pollutants in the national inventories of GHG and non-GHG emissions due to Ireland's legal agreements under the CAFÉ Directive, the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the UN Framework Convention on Climate Change (UNFCCC). Reporting of spatial emissions is a requirement under CLRTAP, and the output of the MapElre model is consistency with the national emission inventory and meets the requirements for reporting of to CLRTAP. But the MapElre model takes the emission mapping at step further through a higher spatial resolution (1 km x 1 km vs. 0.1 degree x 0.1 degree) and a more disaggregated sectoral level (nomenclature for reporting, NRF vs. gridded nomenclature for reporting, GNFR), than the CLRTAP requirements. Further, the MapElre model include a module for temporal distribution of emissions. The temporal model follow the methodology in the EMEP model, and the temporal profiles follow the format corresponds to EMEP's temporal profiles.

The MapElre model is an integrated database system, and the different modules and their specifications and interrelationships are described in this report. The spatial distribution of emissions is based on a number of geographical distribution keys (GeoKeys), which are sector specific tables that holds information on the share of the total sectoral emission to be allocated to the individual grid cells. Most GeoKeys are prepared in a Geographical Information System (GIS) using overlay analysis and data management functionality, while GeoKeys for sectors only covering point sources are created from emission inventory data in spreadsheets or databases. The temporal distribution of emissions is based on temporal profiles (TKeys), which are sectoral tables that holds information on the share of the sectoral emission to be allocated by time intervals. The model include three temporal resolutions, i.e. monthly, daily and hourly, and following, three separate TKeys are prepared for each sector. TKeys are based on temporal production and consumption statistics, and on assumptions for sectors where temporal data are not available.

This report guides the user through the model system in four parts;

- Chapter one describes the system requirements for hosting, setting up, and running the MapElre model
- Chapter two describes the workflow for mapping of emissions; import of emissions from the inventory, managing GeoKeys, running calculations, and generating outputs
- Chapter three describes spatial definitions and development of GeoKeys
- Chapter four describes the temporal model and the TKeys

# **1** System requirements

To be able to install and use the MapElre model, the following requirements needs to be fulfilled;

- MS Excel and MS Access must be installed on the PC
- The user needs basic understanding of MS Access 2013, MS Excel 2013
- The user must have access to a file share with the MapElre files
- The user must have access to the database *MapElre* on an MS SQL server version 2016 or newer

The individual parts of the setup of the MapElre system is described in detail in the following chapters.

## 1.1 Setup of the MapElre system

The system can be setup in different ways; for demo or for production, and for one user or for more than one user. The choice of setup depends on the environment that is going to use the model. This user guide describes a system as setup for one person on one PC. See the Annex 1 for further information on other installation and setup options.

#### 1.1.1 Database system

The *MapEire* database is installed on a MS SQL Server 2016 or newer.

#### 1.1.2 Files

All files of the MapElre model is stored in the folder *MapElre*, covering documentation files, data files, and program files.

The user access the model from programs made in MS Access and the programs updates the database backend on MS SQL Server.

The MapElre system include the following program files with the listed functions:

- NFR\_Importer; a MS Access database used for import of data from the NFR reporting tables
- CRF\_Importer, a MS Access database used for import of data from the CRF reporting tables
- GeoKeys\_Final\_To\_model, a MS database that stores all GeoKeys used for calculation of spatial emissions
- GKey\_Manager; a MS Access database used to manage GeoKeys and for calculation of spatial emissions

- *QC*; a MS Access database for data quality control
- *MapElre\_Reporting;* a MS Access database used for calculation of emissions for reporting to the UNECE LRTAP convention
- MapDatebasesMake; a MS Access database for making map data to be used in GIS like ESRI ArcMap
- **TempMapElre**, a MS Access database for calculation temporal emission for a user defined subset of the spatial emissions
- Ireland\_Dimensions\_dw; a MS Access database containing definitions of Sectors, Pollutants, Grid cells and Years
- GeoKeys\_Final\_To\_model, a MS Access database containing GeoKeys

The table below shows the interactions between programs and the databases.

Access frontends/ SQL Server backend tables	MapElre.Dbo FactEmission	MapElre.Dbo FactGEmission
CRF_Importer.accdb	link, delete, insert into	
NFR_Importer.accdb	link, delete, insert into	
Gey_Key_manager.accdb	Link, select	link, delete, insert into
QC.accdb	Link, select	Link, select
MapElre_Reporting.accdb		Link, select
MapDatabasesMake.accdb		Link, select
TempMapElre.accdb		Link, select
GeoKeys_Final_To_model.mdb	no	No
Ireland_Dimensions_dw.accdb	no	no

#### 2 Workflow for the spatial model

The spatial model in the MapElre system covers the following steps;

- Import of emissions data from the CRF reporting tables and from the NFR reporting tables have to be done every year
- Update of the GeoKeys if new data become available that allow for improvement of the spatial distribution
- Calculation of spatial emissions
- Export of the resulting spatial emissions as different reports and datasets

The workflow in the spatial model is described in detail in the following chapters, covering the individual steps in the model run.

## 2.1 Importing emission data

The spatial model uses emissions data from the official Irish national emissions inventories for air pollution and for greenhouse gases, in agreement with the reporting's to the LRTAP convention in the NFR format and to the UNFCCC in the CRF format. The emission inventories are updated annually for the time series, and following the emissions data used in the MapElre model should be imported every year to ensure consistency between the national total emissions and the spatial emissions.

#### 2.1.1 Importing the CRF data

MapElre uses emission data from the CRF tables. The import is done in the Access database *CRF\_Importer*. If there have been changes to the CRF reporting variables, e.g. new variables, since the last import, refer to Chapter New CRF Variables2.1.1.2 for further information before running the import procedure described below.

It is possible to add only a new year, or to delete the old data and import all years in the time series. The latter is relevant if there have been changes in emissions time series in CRF tables.

#### 2.1.1.1 Import of data

For each year that shall be imported to the model, the following procedures must be carried out:

- 1. Copy the CRF reporting table Excel spreadsheets to the folder ...MapEIre/ModelSystem/Inputdata/CRF with the filename format *IRL\_xxxx\_yyyy*, where xxxx is the submission year and yyyy is the emission year
- 2. Open the file CRF macro.xlsm in the folder ... MapElre/ModelSystem/Inputdata/CRF

- 3. Open the CRF reporting table in Excel
- 4. Select the Developer tab in the Excel Menu
- 5. To display the Developer tab, click on the File menu and select Options from the drop down menu. When the Excel Options window appears, click on the Customize Ribbon option on the left. Click on the Developer checkbox under the list of Main Tabs on the right. Then click on the OK button
- 6. Select Macros and run the macro named *Traverse\_GetValues*
- 7. Click OK to save a .csv file in the same folder as the CRF Reporting table.
- 8. Repeat from Step 3 for every year you want to import.

#### Start MS Access

Open *CRF\_Importer.mdb* from the folder ... \ \*MapElre* \ *ModelSystem* \ *Program-Files* 

Before an import of CRF data for all years in the time series, the old data in table *dbo\_FactEmissions* in the database have to be deleted. The procedure to delete all data from CRF in the table *dbo\_FactEmissions* is as follows;

• Run the query *qdbo\_FactEmission\_DeleteDataFromCRF* 

Adding the data from Excel

- 1. For every year to import
  - a. If the table Cel\_values exist, then delete it
  - b. Select External data, select Text file, browse to the folder
     ...MapElre/ModelSystem/Inputdata/CRF, and import the file
     IRL\_xxxx\_yyyy.xlsx.cel\_values.csv. Make sure that the settings are correct for the field separator (,) and the decimal separator (.) in the file.
     A primary key is not needed in the import wizard. *Field2* holds both text and numeric values
  - c. Rename the imported table to Cel\_values
  - d. Run the query *dbo\_FactEmission\_AppendCRF*. Enter the submission year of the import when inquired
- 2. Repeat the procedure above for all years in the time series

Note: Some text strings from CRF category names exceed the 255 character limitation of the shot text datatype, but as only the numeric values are used in the system, this does not cause any problems.

2.1.1.2 New CRF Variables

If new CRF variables has been added into the CRF Reporter since the last MapElre model run, these have to be added to MapElre.

If a new CRF variable, e.g. "Goats", or a new f-gas has been included in the CRF reporting tables, some changes have to be made in the MapElre model before importing of the CRF data.

The following information is needed for each CRF variable in the excel spreadsheet, which should be imported to MapElre:

- Sheet name
- Cell reference
- Pollutant name

**Important**: The user has to select all the emissions sources in table *Table2(II)B-Hs2* ("From manufacturing", "From stocks", and "From disposal") in the *CRF\_Variable* table. The import function sum up the three sources to one emission value. It is the user's responsibility not to mix aggregated emissions in *Table2(II)* with disaggregated emissions in *Table2(II)*, and thereby import the emissions more than one time, leading to double counting.

For each new CRF variable, the following procedure must be performed;

- Enter sheet name, cell reference and pollutant name to the table CRF\_Variables in the CRF\_Importer database
- Select a sector in the SectorID Field

Detailed description on how to find sheet name and cell reference in the CRF tables, and how to import new CRF variables are included in the following chapters.

2.1.1.3 Finding sheet name and cell references

The procedure for finding sheet name and cell reference is described as an example, where a new CRF category named "Goats" has been included in the CRF reporting tables in "Table 3.1 A. Enteric fermentation". Adding this new category will cause creation of (a lot of) variables in CRF reporting tables, even though only the CH<sub>4</sub> and the N<sub>2</sub>O variables are relevant to include in MapElre. You need access to the CRF Reporter for doing this. The workflow below should be followed;

- Download the CRF reporting tables with new variables in CRF Reporter
- On the CRF Reporter website, click on Import/Export, click on Export Reporting tables, and select the variable
- Open the exported excel file, go to the sheet "Table3s1", and find the row "Goats"
- Mark the CH<sub>4</sub> cell and copy the value, e.g.: [Enteric Fermentation][Goats][Emissions][CH4][kt][no source][no method][no target][no option][no type]: 7565BBD7-9C8B-4240-AB37-E8974D0FFAE1

- The name of the variable is: [Enteric Fermentation][Goats][Emissions]
- The pollutant is: [CH4]
- The cell reference is: C26
- The Sheet ref is: Table3s1
- Copy the variable name to the field CRF\_Name
- Copy the pollutant name to the field Pollutant
- Copy the cell reference to the field CelRef
- Copy the sheet reference to the field *Sheetname*
- Remove all brackets
- Select a sector in the field SectorID, see Figure 1

Repeat the workflow for the  $N_2O$  variable.

For importing many CRF variables in one process, see Appendix 11

```
Figure 1 Example of the table CRF_Variable
```

iler Hjem Opret Eksterne data Databaseværktøjer		🛛 Fortæl mig, hvi							undor
	kering - 📄 🖮 N		Segoe UI - 11	11 H H H H +					
Te Cast Bin Kopiér	Opdater		trol → Gåtil-						
<ul> <li>ind v d<sup>a</sup> Formatpensel</li> <li>If jern sortering ▼ TRT</li> </ul>	ha-filter alle XS	ict 🔹 🔝 Flere *	12 Vooig *						
inger Udklipsholder 15 Sottér og filtrer	1.000	Poster	Søig Tekstformater	ing 5					
lle Access-objekter 🛛 🔍 «	CRF_Variables	a . 10 .	6.12	<ul> <li>Folt3 - Folt4</li> </ul>	- Pollutant -	CollRof - Folt		• Felt8 •	
م ا	SheetName •	SectoriD ~		Felt3      Felt4     Horses     Fmissions		Conner Ten		Tento	
abeller A	Table3s1		N2O and NMVOC Emissions				no source		nc
Cel_marked	Table3s1 Table3s1	3A4d 9	Enteric Fermentation	Goats Emissions Goats Emissions		C\$24 kt	no source		
cel_values	Table3s1	3A4e	tation	Swine Emissions		C\$21 kt	no source	no method no method	DX DX
CRF_Variables	Table3s1	3A4f	tation	Sheep Emissions		520 kt	no source		D
IRL_2018_2015_05112018_181606_xtsx_cell_values	Table3s1	3A4a	tation	Non-Dairy Ca Emissions		C\$13 kt			
IRL_2010_2016_05112010_181728_xlsx_cell_values	Table3s1	3A4h	tation			_\$13 kt	no source		D.
dbo_FactEmission	Table2(l)s2	3B1a	I Process and Product Use	Dairy Cattle Emissions no classificati Emissions		3\$29 kt	no source	no method no method	D
dbo FactGEmission	Table2(I)s2	381b	rom Other Product Use	no classificati Emissions		4\$29 Kt H\$26 t	no source	no method	D
DimPollutant	Table2(I)s2	382	om Other Product use	no classificati Emissions		4\$25 t	no source	no method	D
DimSector	Table2(I)s2 Table2(I)A-Hs2	383	m product use	no classificati Emissions		(\$33 kt	no source	no method	n
Dimitear	Table2(I):A-Hs2 Table2(I):s2	3B4a	ed product manufacture and use	no classificati Emissions		3\$28 kt	no source	no method	n
respangsler *	Table2(I)A-Hs2	384d	cations	no classificati Emissions		(\$32 kt	no source	no method	n
odbo, FactEmission, DeleteDataFromCRF	Table2(I)s2	384e	ions	no classificati Emissions		\$23 t	no source	no method	D
	Table2(I)s2	3B4f	ions	no classificati Emissions	Unspecified n \$4		equival no source	no method	n
	Table2(I)s2	3B4gi	ions	no classificati Emissions		4\$23 t	no source	no method	1
qdbo_FactEmission_AppendCRF2	Table2(l)s2	3B4gii	ions	no classificati Emissions			equival no source	no method	n
dbo_FactEmission_AppendCRF	Table2(l)s2	384giii 2F6	Other Applications	no classificati Emissions			equival no source	no method	1
	Table2(l)s2	2F0 2F4	Aerosols	no classificati Emissions		4\$21 t	no source	no method	0
	Table2(I)s2	2F4	Solvents	no classificati Emissions		\$22 t	no source		n
	Table2(l)s2	254	Solvents	no classificati Emissions		4\$22 t	no source	no method	0
	Table2(I)s2	2F4	Solvents	no classificati Emissions	Unspecified n \$6		equival no source	no method	n
	Table2(l)s2	2F4 2F4	Aerosols	no classificati Emissions		\$21 t	no source	no method	n
	Table2(I)s2	2F4	Aerosols	no classificati Emissions			equival no source	no method	n
	Table2(l)s2	2F4 2F4	Aerosols	no classificati Emissions			equival no source	no method	
	Table2(I)s2	2F4	Solvents	no classificati Emissions			equival no source	no method	n
	Table2(I)s2	2F4 2F4	Solvents	no classificati Emissions			equival no source	no method	n
	Table2(I)s2	2F4	Aerosols	no classificati Emissions	Unspecified n \$4		equival no source	no method	n
	Table2(l)s2	2F4 2F3	Fire Protection	no classificati Emissions	Unspecified n St		equival no source	no method	0
	Table2(I)s2	2F3 2F3	Fire Protection	no classificati Emissions			equival no source	no method	0
	Table2(I)s2	2F3 2F3	Fire Protection	no classificati Emissions			equival no source	no method	n
	Table2(I)s2	2F3 2F3	Fire Protection	no classificati Emissions		4\$20 t	no source	no method	0
	Table2(I)s2	2F3 2F3	Fire Protection	no classificati Emissions		\$20 t	no source	no method	n
	Table2(I)s2	2F3 2F2	Foam Blowing Agents	no classificati Emissions		\$19 t	no source	no method	0
	Table2(I)s2	2F2	Foam Blowing Agents	no classificati Emissions			equival no source	no method	D
	Table2(l)s2	2F2 2F2	Foam Blowing Agents	no classificati Emissions	Unspecified n St		equival no source	no method	D
	Table2(I)s2	2F2 2F2	Foam Blowing Agents	no classificati Emissions		4\$19 t	no source	no method	n
	Table2(l)s2	2F2 2F2	Foam Blowing Agents	no classificati Emissions			equival no source	no method	D
	Table2(II)8-Hs2		Stationary Air-Conditioning	no classificati Emissions		(\$194 t	From disposal	no method	DX DX
	Table2(II)B-Hs2		Stationary Air-Conditioning Stationary Air-Conditioning	no classificati Emissions		\$194 t	From stocks	no method	D
	Table2(II)B-Hs2		Stationary Air-Conditioning Stationary Air-Conditioning	no classificati Emissions		(\$191 t	From disposal	no method	D
	Table2(II)B-Hs2		Stationary Air-Conditioning Stationary Air-Conditioning	no classificati Emissions		(\$192 t	From disposal		DX DX

#### 2.1.2 Importing the NFR data

MapElre uses emission data from the NFR reporting tables, which can be imported performing the following steps;

- Copy the NFR table Excel sheet to the folder ... MapElre \Modelsystem \Input \NFR
- Open the NFR excel worksheet
- Open the excel sheet NFR2XML
- Select the NFR Excel sheet

- Select the developer Panel (if not present; select Files>Options>Customize Ribbon, click on Developer in the list to the right. Click OK)
- Select Macros
- Run the NFR2XML.xlsm!NFR2XML macro, see Figure 2. It will save the file NFR.XML in the same folder as the excel sheet. (It can take some time; > 10 min.)

Figure 2 How to run the macro *NFR2XML.xlsm!NFR2XML* 

Macro	?	$\times$
<u>M</u> acro name:		
NFR2XML.xIsm!NFR2XML	<u>R</u>	un
addNewYear Macro3 NFR2XML.xlsm!NFR2XML	<u>S</u> tep	Into
xmlExport	E	dit
	Cre	eate
	<u>D</u> e	lete
· · · · · · · · · · · · · · · · · · ·	<u>O</u> pti	ons
M <u>a</u> cros in: All Open Workbooks		
	Ca	ncel

- Open MapElre/Inputdata/NFR/NFR\_Importer.accdb
- Run the macro mcrDelete Old NFR in dbo\_FactEmission
- Import the xml file NFR.xml
- Select the panel External Data, select the button XML File, browse to the *NFR.xml* file, click OK, select Structure and Data, and click OK
- Open the form *frmCCT*, which is a wizard to make a Converted Crosstab table
- Select the imported table. Select all the pollutants in the list. Click Next, Type "impNFR" as Table, "Pollutant" as New Field name, "Value" as New Value field name, and click OK
- The Normalize Crosstab table wizard normalizes a crosstab table, i.e. convert selected field names to values in a new table, see Figure 3

In the example below, the field names 1990, 1991, 1992 are converted to values in a new field. "Year" is entered as fieldname of the original fieldnames, and "Value" is entered as field name of the values.

	Normalize Crostab table wizard	ł					$\times$
	fWith this wizard you can normalizes a cross tab	Table Sale					
	table.	Product	Region	1990	1991	1992	
	E.g. You want to changes the field names (1990,	Α	1	200	300	400	
	1991, 1992) to values in a	A	11	10	15	20	
	new table.	В	1	1	2	3	
a)	Select table. ROW2 Version 1 2018 Car		Select Fiel Back	d names:	Indeno PAH HCB PCB LiquidFu SolidFue		* *
							~
	The result           New Table Sale 2						1
	Mear is entered as fieldname of the	Product		Region	Year	Value	
	original fieldnames Value is entered as field name of	A			1990	200	
	value is entered as rield name or the values.	A	1		1991	300	
		Α	1		1992	400	1
		A	1	I	1990	10	
					1000		
		B			1990	1	
	New Table name: impNFR Version 1 2018	N	lew field na value field Back	1		Ok	
b)							

Figure 3 Example of using the Normalize Crosstab table wizard; a) input and b) output

- Double-click on the query *qFactNFR\_Apppend* to run the query and append the records to the table *FactNFR*
- Double-click on the query *qdbo\_FactEmission\_Append* to run the query, which loads the data into *dbo\_FactEmission* in the backend sql database MapElre.

15

Now the NFR data is imported to the MS SQL Server database MapElre into the table *dbo\_FactEmission*.

## 2.2 GeoKeys management

This part is of the system is managed with a GIS tools and the MS Access database file *GKey\_Manage* in *...MapElre\ModelSystem\ProgramFiles* 

A GeoKey is a normalized table holding shares of a national total emission, e.g. NO<sub>x</sub> from road transport in 2016, which should be allocated to the individual cells in a predefined grid. The sum of all share values of all cells in a grid is 1. The GeoKeys have to be assigned to one or more NFR/CRF sector(s) and pollutant(s).

Beside the 1 km x 1 km grid, the model also use a grid with a spatial resolution of 0.1 degree x 0.1 degree for reporting of gridded emissions to the LRTAP convention. Aggregation to the  $0.1 \times 0.1$  degree grid are made from the 1 km x 1 km emissions.

#### 2.2.1 Creating GeoKeys

GeoKeys are prepared in a GIS or in Excel from various data sources including a spatial component, and the requisite information is exported and stored in GeoKey tables in the *GeoKeys\_Final\_to\_model* database. The GeoKey tables include reference to the grid cells, year(s), and the emission shares. The methodology for preparing GeoKeys depends on the characteristics of the emission source; if it is a point source with a known geographical location, or if is an area source where emissions occur from an area or from small point sources that cannot be treated individually. Further information on GeoKey development is included in Annex 8 – Preparing a GeoKey for a point source and Annex 9 – Preparing a GeoKey for a line source, and in "MapElre – Technical documentation report".

The working step for creating a GeoKey are;

- Create a table for the GeoKey
- Add data to the table or import the table from a GIS
- Register the GeoKey table and assign it to one or more CRF/NFR sectors and pollutants

#### 2.2.2 Create table

All final GeoKey tables must be stored in the database *GeoKeys\_Final\_to\_model*. To ensure that the tables follow the parameter and format definitions, data can with advantage be appended to an empty GeoKey table instead of being imported. If GeoKeys are prepared in a GIS it is most suitable to save the data as a shape file or in a personal geodatabase. If data are stored in a file geodatabases, it is necessary to export data to another format compatible with MS Access.

The GeoKey tables based on the 1 km x 1 km grid must have these fields:

- ID1kmIE (long int) (pk). The value has to exist in the DimGrid1km table.
- Grid1kmlE (Text)

- **Year** (Text) (pk). If the GeoKey is valid for all year, then year = "9999". The value has to exist in the *DimYear* table
- Share (Decimal) Setting: Precision=19, Scale=18
- The combination of the *ID1kmIE* and *Year* value has to be unique in the table. To ensure this, *ID1kmIE* and *Year* should be defined as primary key.

## 2.2.3 Register

All GeoKeys must be registered in the *GeoKeys\_Final\_to\_model* table to be able to be assigned to a NFR/CRF sector.

- Name the GeoKey table, e.g. "1A1a\_NOx" or "HeatDemand\_Industrial" (case does not matter)
- Register new GeoKeys in the *GKey* table
- Open the table and create a new record with the name of the GeoKey table, like "1A1a\_NOx". Note that it is crucial to use the same name in this table as the table name of the GeoKey

## 2.2.4 Assigning the GeoKey to Sectors and pollutants

All NFR/CRF sectors must be assigned a GeoKey in the MapElre model. If the GeoKey is applicable for all pollutants:

- Open the form *frmGKey\_Sector\_AllPol\_Add*
- Select the GeoKey
- Select the sector
- Press the Create button.
- The system tells you how many assignment you are doing

If the GeoKey is applicable for only selected pollutants:

- Open the form *frmGKey\_Sector\_Pol\_Add*
- Select the GeoKey
- Select the sector
- Select the pollutants in the list box. You can use Shift and Ctrl for selection of multiple pollutants
- Press the Create button.
- The system tells you how many assignment you are doing

If anything goes wrong in the assigning process, e.g. a segment have been added more than once, open the table *GKey\_Sector\_Pollutant*, delete the lines for the specific sector and pollutant(s) (see Chapter 2.2.6), and repeat the process if necessary.

## 2.2.5 Checking for missing GeoKey assignments

It is important that all sector-pollutant combinations have been assigned one and only one GeoKey. This can be checked by evaluating the results of the following queries;

- Sectors without GeoKey: *qSectorNoGKey*
- Sector-Pollutant combinations without GeoKey: qSector\_PolNoGKey

## 2.2.6 Change GeoKey assignment

Before changing a GeoKey assignment, the previous assignment must be deleted in the table *GKey\_Sector\_Pollutant*.

- Select the lines for the sector(s) and pollutant(s) in the table *GKey\_Sec*tor\_Pollutant that should be changed
- Delete the selected lines
- Assign the new GeoKey by running the steps described in Chapter 2.2.4

## 2.2.7 Update GeoKeys

When a GeoKey has been updated, the previous values in the GeoKey table must be deleted and the new values must be appended. Using append instead of import ensures that the GeoKey table definitions are maintained.

- Delete all data in the GeoKey
- Append the new updated data to the empty GeoKey table

To update a year-dependent GeoKey by adding a new year and without changing the existing values, the data for the new year can be appended to the existing GeoKey. If data for the previous years should be updated as well, the steps described above for updating a GeoKey must be followed.

## 2.3 Running the model

#### 2.3.1 Introduction

When the GeoKeys, the NFR data and the CRF data is imported/updated, the model is ready to be run. The result of the model is stored in the MS SQL database *MapElre* in the table *dbo.FactGEmission*. After calculation, MS SQL database holds more than 49 billion records for each year. The calculation process can take from hours to days, depending on the PC, network and size of the data set. The table *dbo.FactGEmission* has to be emptied before a new model run is started.

## 2.3.2 Emptying the table

**Important**: This process will empty the table dbo\_FactGEmission. All existing model results in the table will be deleted without any warning and without any possibility to cancel or undo the process.

- The following step will delete all existing model results in the table *dbo\_FactGEmission*
- Double-click *qdbo\_FactGEmission\_Truncate* to delete all data from *dbo\_FactGEmission*

### 2.3.3 Calculation of spatial emissions

The calculation process can take from hours to days, depending on the PC, network and size of the data set.

Open the form *frmLoadMapElre* in the database *GeoKey\_Manager*. Select year, click update, and wait, see Figure 4. When the calculation is finished, MS Access shows a messages.

You can change the path to the log file and you can open the log file to control the progress of calculation.

Repeat for every year that should be imported

Figure 4 Example of calculation of spatial emissions

😑 Update Dataset		×
Calculates GEmissi selected year.	on and loads the MapEire data	base for the
Select Year	2015 ~	
Path to logfil:	0:\ST_ENVS-Luft-Emi\Irela	nd - National mapping of GHG ar
	Up	Date

## 2.4 Quality check

Use the MS Access database *...MapElre\ModelSystem\ProgramFiles\QC.accdb* for quality control of the data import and distribution.

The query *qQC* is used to test the sums of emissions against the NRF totals and CRF totals. The run time is some minutes and the result of the query include the following field:

- YearName;; year
- GNFR\_Code; the GNFR sector
- NFR\_Code; the NFR/CRF sector
- Pollutant
- SumOfGEmission; sum of spatial emissions in the table *dbo\_FactGEmission*
- **SumOfEmission**, sum of national total emission imported from the NFR tables and the CRF tables in the table *dbo\_FactEmission*
- *Pct\_Diff*, difference between the sum of national total emission and the sum of spatial emissions in percentages

## 2.5 Generating outputs

The MapElre model is set up to generate different output formats. It is possible to aggregate the results on the 0.1 degree x 0.1 degree grid and by GNFR categories for reporting to the LRTAP convention. Further it is possible to generate output databases for easy use in a GIS. The various output formats are generated in the MS Access database *MapElre\_Reporting* and *MapDatabasesMake* in the folder *...MapElre/ModelSystem/Programfiles*.

## 2.5.1 UNECE reporting (0.1x0.1 & GNFR)

The database *MapEire\_Reporting* include the following steps to generate output for reporting to the LRTAP convention;

- Run the query *qGNFR\_Report\_Crosstab*
- Export the result to Excel

### 2.5.2 Ad hoc User queries

It is possible to add user defined queries. The easiest procedure is as follows;

- Make a copy of e.g. *qMap\_1km\_Rail\_1A3c\_2015* and change it to reflect the new user defined output
- Save the adapted version of the query using a new name, e.g. *qMap\_1km\_Rail\_1A3c\_2016*
- To generate a crosstab result, also copy the query *qMap\_1km\_Rail\_1A3c\_2015\_Crosstab* and change the data source table to the adapted version of the query from the previous step, e.g. *qMap\_1km\_Rail\_1A3c\_2016*

#### 2.5.3 Generate output for maps and modelling

Output data for making maps are generated in the database *MapData-basesMake.accdb*. Output including emissions aggregated by GNFR sector, for CRF totals and for NFR totals can be generated using this procedure;

- Run the form *frmMakeMapDatabasesGNFR*
- Run the form *frmMakeMapDatabasesTotals*

The results are stored as tables in separate databases, e.g.:

- 2015\_A\_PublicPower.mdb/2015\_A
- 2015\_B\_Industry.mdb/2015\_B
- ..

The result have columns for all pollutants. Some columns may be empty if emissions does not occur. You can delete unwanted columns in table design mode.

## 2.6 Creating maps

Maps are very useful to present spatial emissions both for validation of emission pattern and for providing information to stakeholders and the public. The MapElre model returns calculated spatial emissions as data tables, which are easily joined to the 1 km x 1 km grid for Ireland in a GIS, using the grid cell ID field *ID\_1kmIE* as join field. The joined data can be exported and stored for future use e.g. in a geodatabase or as a shape file. Visualization of the spatial emission data can be modified in a GIS to make it informative and easy to understand e.g. by changing colours and ranges of quantities, and by adding background layers, legends and scale bars. The resulting maps can be exported as e.g. jpeg or tiff files.

The workflow for creating a map from the spatial emissions calculated with the MapElre model is described in details in Annex 7 - Guide to create maps. The data referred to in the description is examples of output from MapElre and the GIS workflow shown is based on use of ArcMAP. Similar functionality can be found in other geographical information systems, e.g. QGIS (open source).

# 3 GeoKey development

A GeoKey is a table holding shares of a national total emission, e.g. NO<sub>x</sub> from road transport in 2016, which should be allocated to the individual cells in a grid. The GeoKeys are normalised tables where the sum of shares for each table is one. Pollutant and/or year specific GeoKeys can be prepared for a sector if detailed emissions or activity data is available. If detailed data are not available, sectoral GeoKeys are used for all pollutants and for all years, causing similar spatial emission patterns for the sector for all pollutants and years included in the model. This is most likely not the case, but a necessary assumption in the spatial emission model.

The overall methodology for the GIS processing of digital spatial data is to intersect a feature data set (e.g. grassland area or road network) with a grid (e.g. the 1 km x 1 km grid used in MapElre, WL\_1km/E), and calculate the share of the total feature layer located in each grid cell (e.g. share of total grassland area or share or total road length). In some cases the GeoKey is based on both spatial data and statistics (e.g. agricultural areas and number of agricultural machinery by county). In such cases, the spatial data are intersected with the arid, and shares are calculated by arid cell and by spatial aggregation level in the statistics (e.g. county level), and the GeoKey is calculated by grid cell as the sum of the share of the spatial feature multiplied by the share of the total statistics (e.g. share of agricultural area by grid cell and by county multiplied by share of total agricultural machinery by county). In this example the emissions are spatially distributed between the counties by the share of the total number of agricultural machinery, and inside the counties by the share of the agricultural area in the county by arid cell. A detailed guidance to generating GeoKeys using the geographical information system ArcGIS and the database program MS Access is included in Annex 8 - Preparing a GeoKey for a point source and in Annex 9 -Preparing a GeoKey for a line source.

Table 1 to Table 4 give examples on GeoKeys for industrial waste incineration (5C1bi), lime production (2A2), other metal production (2C7c), and public electricity and heat production (1A1a). These GeoKeys are all based on point source data with different level of details, and the resulting GeoKeys exemplifies the different types of GeoKeys;

- The GeoKey for 5C1bi is based on activity data for the latest reporting year to PRTR, and the same GeoKey is used for all years and all pollutants
- The GeoKey for 2A2 is based on annual plant specific activity data, and enabling the creation of year specific GeoKeys
- The GeoKey for 2C7c is based on PRTR data from the latest reporting year, which are available for selected pollutants. For this sector pollutant specific

GeoKeys are prepared for Cd, Pb, and Zn, plus a GeoKey for all remaining pollutants

• The GeoKey for 1A1a is based on emissions and fuel consumption data from ETS reportings. Year and pollutant specific GeoKeys are prepared for SO<sub>2</sub> and NO<sub>x</sub>, plus a year dependent GeoKey for all remaining pollutants

	5CTbi		
ID_1kmIE	Grid1kmIE	Year	Share
312044	*	9999	0.4133
319400	*	9999	0.2686
320143	*	9999	0.0220
444769	*	9999	0.0388
444772	*	9999	0.2571

9999 0.0002

7

Table 1 Example of GeoKey for Industrial waste incineration (NFR sector 5C1bi)

\*Removed due to confidentiality

\*

449545

SUM

Table 2 Example of year specific GeoKey for lime production (NFR sector 2A2)
--

2A2						
ID_1kmIE	Grid1kmIE	Year	Share			
479066	*	2014	0.5177			
405895	*	2014	0.2582			
401438	*	2014	0.2242			
479066	*	2015	0.4375			
405895	*	2015	0.3020			
401438	*	2015	0.2605			
SUM			2			

\*Removed due to confidentiality

Table 3 Example of pollutant specific GeoKey for lead (Pb) for other metal production (NFR sector 2C7c)

2C7c_Pb						
ID_1kmIE	Grid1kmIE	Year	Share			
324905	*	9999	0.2439			
324906	*	9999	0.2683			
353337	*	9999	0.2439			
430786	*	9999	0.2439			
SUM			7			

\*Removed due to confidentiality

Table 4 Example of year and pollutant specific GeoKey for pollutants other than  $SO_2$  and  $NO_x$  for public electricity and heat production (NFR sector 1A1a)

	1A1a_rest	,	L.
ID_1kmIE	Grid1kmIE	Year	Share
441859	*	2014	0.1115
320849	*	2014	0.0531
327315	*	2014	0.0001
357859	*	2014	0.0051
383901	*	2014	0.0011
385914	*	2014	0.3582
430786	*	2014	0.0423
320150	*	2014	0.0618
433804	*	2014	0.0663
444775	*	2014	0.0457
446896	*	2014	0.1037
447964	*	2014	0.0008
446897	*	2014	0.0752
516580	*	2014	0.0001
447897	*	2014	0.0001
473103	*	2014	0.0747
320150	*	2015	0.0677
320849	*	2015	0.0324
473103	*	2015	0.0767
327315	*	2015	0.00001
357859	*	2015	0.0492
447964	*	2015	0.0003
433804	*	2015	0.0615
385914	*	2015	0.4075
446896	*	2015	0.1023
447897	*	2015	0.0003
430786	*	2015	0.0196
446897	*	2015	0.0094
516580	*	2015	0.0002
441859	*	2015	0.0995
444775	*	2015	0.0716
383901	*	2015	0.0016
SUM			2
		ļ	

\*Removed due to confidentiality

Other GeoKeys are based on area data (lines or polygons), e.g. emissions from road transport, which are allocated to the road network, and emissions from cultivated crops, which are allocated to the cropland areas.

A number of GeoKeys are a combination of two or more sub-sector keys. This is the case when a sector has both point sources and area sources, as for non-ferrous metals (NFR category 1A2b) where 85 % of the emissions are allocated to point sources and the remaining 15 % are allocated in accordance with the heat demand in the industrial sector.

## 3.1 Projection

The Irish grid TM65 (EPSG 29902) is used in the emission mapping model. Some geodata used to prepare the GeoKeys are provided in other projections, e.g. TM75 (EPSG 29903) and IRENET95 (EPSG 2157). In these cases the built-in projection transformations in ArcMAP are used to reproject the geodata, e.g. "TM65\_To\_WGS\_1984\_2" and "TM75\_To\_WGS\_1984\_2". An overview table of the Irish projections is included in Annex 10 – Working with coordinates and projections. Reprojection of coordinates for point sources is made in the program Franson CoordTrans.

## 3.2 Borders

The geographical scope of the spatial emission model is the Irish territory, and the exclusive economic zone (EEZ) is used as line of demarcation of the sea area. The coastline provided by EPA is used as line of demarcation of the land area.

## 3.3 EEZ

The shape of the Irish EEZ is based on data from MarineRegions.org. The data has been manually edited to complete the geometry and extent the EEZ line to the meet the coastline. The resulting layer is a polygon covering the Irish land and sea area.

## 3.4 Coastline

The coastline shapefile provided by the Irish EPA (ADMIN\_Coast.shp) is used.

## 3.5 National border

Different spatial data are available that include the national border between the Republic of Ireland and Northern Ireland (*Census2011\_Small\_Areas\_generalised20m* (data source: CSO), *Census2011\_Garda\_Districts\_Nov2013* (data source: CSO), *Census2011\_Constituencies\_2013* (data source: CSO), *Agri* (data source: latest gridded emission inventory), and *northern\_ireland\_counties* (data source: ShareGeo Open, http://www.sharegeo.ac.uk/).

Analysis of the spatial data shows only smaller differences between the country border between the Republic of Ireland and Northern Ireland. In most cases the difference is below 25 meters, and of minor importance for gridding of emissions on a grid with a resolution of 1 km x 1 km.

Based on the analysis, the data set *Census2011\_Garda\_Districts\_Nov2013* provided by the CSO is used as line of demarcation for the Republic of Ireland, as this layer

corresponds well with maps including regions in Northern Ireland, and as this layer follows the coastline rather than the administrative boundaries along water bodies.

## 3.6 Border files

The files defining the borders in the MapElre model are listed in Table 5.

File	File location
EEZ	MapElre\DataLibrary\Borders\Borders.mdb\EEZ
Coastline	MapElre\DataLibrary\Borders\Borders.mdb\Coastline
National border	MapElre\DataLibrary\Borders\Borders.mdb\NationalBorder

Table 5 Files defining the land and sea area borders

## 3.7 Grids

#### 3.7.1 Grid 1km x 1km

A grid with a resolution of 1 km x 1 km is developed for the spatial emission model, using the standard tool Create Fishnet in ArcMap. The fishnet is created so that the corners of the grid cells follow the 1 000 meter x-axis and y-axis in the TM65 projection (EPSG 29902). The grid covers a square around the Exclusive Economic Zone (EEZ). The extent and resolution are defined by the parameters listed in Table 6.

Table 6 Parameters used to prepare the MapElre 1 km x 1 km grid
---

Extent	Bottom	-365 000
	Тор	630 000
	Left:	-360 000
	Right	385 000
Resolution	Width, m	1 000
	Height, m	1 000
Size	Number of rows	995
	Number of columns	745

Using the Calculate geometry tool in ArcMAP, each grid cell is applied X and Y coordinates for the centroid (Xc and Yc). The grid cells are named according to the location of the lower left corner and the grid resolution;

#### $IE_1km_\pm Y_\pm X$

where  $\pm$ Y and  $\pm$ X are the Y and X coordinates for the lower left corner rounded down to nearest full kilometre (e.g. the point *(-296 713.384, 158 922.683)* will be given the grid ID 1km\_158\_-297).

By using a name convention based on the X and Y coordinates, it is easy to apply grid cell name to point sources, which are defined by their exact location (X,Y), and following to summarise emissions from point sources and area sources per grid cell, without using a GIS. Grid cell names are applied using the standard tool Calculate Field in ArcMAP with the following script;

Correspondingly Grid ID can be applied in Access using the query:

Grid1kmlE: CStr("1km\_" & (IIf([Northing]<0 And [Northing]>-1000;-1;(IIf([Northing]<1000 And [Northing]>=0;0;Left((IIf([Northing]<0;([Northing]-1000);[Northing]));(IIf((Len((CStr((Round((IIf([Northing]<0;([Northing]-1000);[Northing]));0)))))>2;(Len((CStr((Round((IIf([Easting]<0 And [Easting]>-1000);[Northing]));0)))))>3;0))))) & "\_" & (IIf([Easting]<0 And [Easting]>-1000;-1;(IIf([Easting]<1000 And [Easting]>=0;0;Left((IIf([Easting]<0;([Easting]-1000);[Easting]));(IIf((Len((CStr((Round((IIf([Easting]<0;([Easting]-1000);[Easting]));0)))))>2;(Len((CStr((Round((IIf([Easting]<0;([Easting]-1000);[Easting]));0)))))-3;0))))))

Four separate grids are prepared;

- G\_1kmlE, covering the area (square) defined by the parameters in Table 6
- WL\_1kmlE, covering the area defined by the Irish EEZ including both land and sea area
- W\_1kmlE, covering the sea area defined by the EEZ and the coastline
- L\_1kmlE, covering the land area defined by the coastline

#### 3.7.2 Grid 0.1° x 0.1°

A grid with a spatial resolution of 0.1 degree x 0.1 degree in the projection WGS84 (EPSG 4326), following the definitions for the EMEP grid, is developed for reporting of spatial emission to LRTAP convention, using the standard tool Create Fishnet in ArcMap. The fishnet is created so that the corners of the grid cells follow the 0.1 degree x-axis and y-axis. The grid covers a square around the Exclusive Economic Zone (EEZ). The extent and resolution are defined by the parameters listed in Table 7

Extent	Bottom	47.0
	Тор	57.0
	Left:	-17.0
	Right	-4.0
Resolution	Width, m	0.1

Table 7	Parameters used to	propare the Ma	nElro () 1 degra	a x 0 1 degree grid
ruble /	Fulumeters used to	prepare the Ma	pelle 0.1 degle	e x u. i degree grid

	Height, m	0.1
Size	Number of rows	100
	Number of columns	130

Using the Calculate geometry tool in ArcMAP, each grid cell is applied X and Y coordinates for the centroid (Xc and Yc). The grid cells are named according to the location of the centroid and the grid resolution;

where  $\pm Y$  and  $\pm X$  are Yc and Xc coordinates rounded to two decimals.

By using a name convention based on the X and Y coordinates, it is easy to apply grid cell name to point sources, which are defined by their exact location (X,Y), and following to summarise emissions from point sources and area sources per grid cell, without using GIS. Grid cell names are applied using the standard tool "Calculate Field" in ArcMAP with the script:

Grid01glE: CStr("01g\_" & Round([Yc\_WGS84],2) & "\_" & Round([Xc\_WGS84],2))

Two separate grids are prepared;

- **G\_01gIE**, covering the area corresponding to *G\_1kmIE*
- WL\_01gIE, covering the area corresponding to WL\_1kmlE

## 3.7.3 Conversion from the 1 km x1 km grid to the 0.1 degree x0.1 degree grid

A conversion table is created for reallocation of emissions from the 1 km x 1 km grid to the 0.1 degree x 0.1 degree grid, including the share of each 1 km x 1 km grid cell to be allocated to the intersecting 0.1 degree x 0.1 degree grid cells. The list is based on an intersection of the 1 km x 1 km grid and the 0.1 degree x 0.1 degree grids covering the lrish territory (land and sea area).

#### 3.7.4 Grid files

The files defining the grids in the MapElre model are listed in Table 8.

File	File location
G_1kmlE	MapElre\DataLibrary\Grids.mdb\G_1kmlE
WL_1kmlE	MapElre\DataLibrary\Grids.mdb\WL_1kmlE
W_1kmlE	MapElre\DataLibrary\Grids.mdb\W_1kmlE
L_1kmlE	MapElre\DataLibrary\Grids.mdb\L_1kmlE
G_01glE	MapElre\DataLibrary\Grids.mdb\G_01glE
WL_01gIE	MapElre\DataLibrary\Grids.mdb\WL_01gIE
Conversion from the 1 km x 1 km grid	MapElre\DataLibrary\Grids.mdb\-
to 0the .1 degree x 0.1 degree grid	Share_of_1km_to_01g

Table 8 Files defining the land and sea area borders

# 4 Temporal model

## 4.1 Temporal profiles and TKey development

A temporal key (TKey) is a table holding shares of an emission e.g. NO<sub>x</sub> from road transport with passenger cars in 2016, which should be allocated to the individual time intervals, i.e. months, days and hours. The TKeys are normalised tables where the sum of shares for each table is one. Three temporal profiles are prepared for each emission source category in the spatial model describing the monthly, the daily and the hourly distributions. For selected emission sources, separate hourly TKeys are prepared for different days of the week. An example is road transport, where separate hourly TKeys are prepared for Monday, Tuesday-Thursday, Friday, Saturday and Sunday, respectively. In other cases, separate TKeys are prepared for different pollutants for a source, as the emissions are related to different activities or processes within the emission category. This is e.g. the case for domestic wastewater handling, where two TKeys are prepared for N<sub>2</sub>O and remaining pollutants, respectively.

TKeys are stored as tables in MS Excel and imported to the temporal model in MS Access database. The TKeys include the parameters;

- Monthly TKeys:
  - GNFR: GNFR category name
  - NFR: NFR category name
  - PollD: pollutant. If a specific pollutant name is applied, the TKey will be used for that pollutant only, e.g. N<sub>2</sub>O. If the value "All" is applied, the TKey will be used for all pollutants that does not have a specific TKey
  - Month: share of emission sum up to 1
- •
- Daily TKeys:
  - GNFR: GNFR category name
  - NFR: NFR category name
  - PolID: pollutant. If a specific pollutant name is applied, the TKey will be used for that pollutant only, e.g. N<sub>2</sub>O. If the value "All" is applied, the TKey will be used for all pollutants that does not have a specific TKey
  - Day: share of emission sum up to 1
- Hourly TKeys:
  - GNFR: GNFR category name
  - NFR: NFR category name
  - Weekday: share of emission sum up to 1

In Access the TKeys are converted into a new table, holding hourly shares for real time years, taking into account the actual weekdays and leap years. These shares are stored in the table *MonthDayHour*, and the hourly shares *TimeFrac* are calculated as;

TimeFrac: [inMonth].[Value]\*[inWeekDay].[Value]\*[inHour].[Value] This is done by the query qMonthDayHour\_Add

#### 4.1.1 Importing temporal profiles (TKeys)

The temporal profiles, which are stored in a spreadsheet, are imported to the temporal model using the following procedure;

- 1. Open TempMapEire in ...MapEire/Modelsystem/Programfiles/
- 2. Create links to the sheets *Month*, *Day*, and *Hour* in the spreadsheet *TemporalProfiles*
- 3. Use the ConvertCrostab wizard to make the tables InMonth, InDay, InHour. The *Month, Day*, and *Hour* fields have to be integer
- 4. Delete posts with empty values in GNFR code and value field
- 5. Carefully control the data
- 6. Run the query *qMonthDayHour\_Add*

# 4.2 Calculation of temporal emissions for use in maps and videos

Temporal emission tables can be generated for use in GIS (ArcMAP) to show hourly emissions maps or for making videos showing a sequence of hourly emissions maps.

The procedure is listed here and further described in the following chapters.

- 1. Decisions
- 2. Prepare the data in the database
- 3. Setup a project in ArcMap
- 4. Exports images for video production
- 5. Assemble a video

#### 4.2.1 Decisions

The user have to decide which emissions should be visualised, defined by sector, year and pollutant (e.g. road transport, 2015,  $NO_x$ ).

Further the user have to decide which time series to visualised; time start, time end, time steps (e.g. "1 Jan 2015 00:00 AM" to "7 Jan 2015 11:00 PM" as 1 hour steps).

Later in process the user has to decide video formats

#### 4.2.2 Prepare data in the database

The MS Access database *TempMapEire.accdb* is used for calculating the temporal emission for the user defined data to be used in ArcMap. The database contain temporal profiles for the NFR sectors and some help/lookup tables. The database is also

linked to the main database *MapEire*, which contain all the spatially distributed emissions.

The output of the database is a table *TimeEmission* with the following structure:

- GridCell\_ID; the ID for the 1 km x 1 km grid cells
- TimeInstant; e.g. 01/01/2015 00:00:00
- NFR\_Code; e.g. 1A1a
- Pollutant; e.g. NO<sub>x</sub>
- **TEmission**; temporal emission value

#### 4.2.3 Making the output

Output of the temporal emissions is made using the following procedure;

- Open the database *TimeEmission*
- Run the query *qTimeEmission\_Add*
- Enter Start Date (format: dd-mm-yyyy), End date, NFR Code, Pollutant, and Year when asked

#### 4.2.4 Export the table TimeEmission

It is possible to use data in the sql server in ArcMap. It is necessary to make the data table accessible from ArcMap.

The table can be exported to an ESRI personal file geodatabase, an ESRI file geodatabase, or to an ESRI Enterprise geodatabase server, e.g. SQL server. The personal file geodatabase is very convenient, but not supported in Arc GIS Pro.

Use the following steps to export data to a personal geodatabase;

- Create a personal geodatabase in ArcMap or in ArcCatalog
- Close the created geodatabase and open it from MS Access
- Import the table *TimeEmission* from the database *TempMapEire.accdb*

## 4.3 Set up a project in ArcMap

The following procedure is used to generate the hourly emissions maps, which can be used to create a video;

- Make a new project in ArcMap
- Add a basemap if desired

Regarding data, the best option is to have the 1kmgrid and the *TimeEmission* in the same personal geodatabase and save it on the local drive. The user defined output is called the sector feature in the following procedure description.

- Add the 1 km grid feature layer from the catalog tree
- Add the sector feature table from the catalog tree
- Join sector feature to the grid using the field *ID\_1kmIE* as join field

TEMPORAL MODEL

- Select keep only matching records
- Setup time properties for the sector feature
  - o Enable time on this layer
  - o Each feature has a single time field
  - Time field = *TheTimeInstant*
  - Time step = e.g. 1 hour
- Setup the symbology for the sector feature
  - Select quantities/graduated colours: value =<Pollutant field>
  - Colour ramp = e.g. "Green2Red" or "Spectrum-full bright"
  - Classification: Classes = e.g. 12 or 20
  - Classification: Method = e.g. Geometrical interval
  - Classification: Data exclusion: Sampling = >1.000.000
    - Important; check that the maximum pollutant value is in the resulting range
- Open the Time Slider Window
  - Select Options (button #2 from left), and select Time Display
    - Time Step = e.g. 1
    - Time window = 0 (normally)
    - Select Show Time on map display
      - Optionally select the button "Appearance"
- Optionally :Setting up the page layout
  - The goal is to set the visual appearance of the ArcMap layout as it should appear in the video
  - Select the map extent for your layer in the data view
  - o Click the layout view, optionally adjust the extent by panning
  - Insert the legend
  - Insert time stamp using Insert/Dynamic text/Data Frame Time, optionally adjust properties
  - Save the project
  - When the appearance is satisfactory, the images for the video can be made

## 4.4 Export images for making a video

It is possibly to make a video from the Time Slide Windows, button #3, but it is difficult to control and to get it right at first. It is also time consuming. It is more convenient to use an arcpy (python) script, which can be run in the background.

Below is an example of an arcpy script. The file locations for input and output should be changed to reflect the path chosen by the user. The file format and the resolution can be changed in the script, and the user can define if the data frame or the page layout should be exported.

import arcpy import os TEMPORAL MODEL

mxd = arcpy.mapping.MapDocument("C:/MapEireTemporal/Temp-MapEire\_3.mxd") df = arcpy.mapping.ListDataFrames(mxd)[0] df.time.currentTime = df.time.startTime counter = 1 while df.time.currentTime <= df.time.endTime: while df.time.currentTime <= df.time.endTime: fileName = "img" + str(counter) + ".png" path = "C:/Gisprojekter/MapEireTemporal/movie/images3/" pathfilename = path + fileName arcpy.mapping.ExportToPNG(mxd, pathfilename) df.time.currentTime = df.time.currentTime + df.time.timeStepInterval counter = counter + 1 del mxd

Further information about the settings can be found here: http://desk-top.arcgis.com/en/arcmap/10.5/analyze/arcpy-mapping/exporttopng.htm

Further information about running arcpy scripts can be found here: http://desktop.arcgis.com/en/arcmap/10.3/analyze/executing-tools/writing-pythonscripts.htm

## 4.5 Assemble Video

Videos can be made in a lot of formats and resolution and with a lot of different programs.

The videos prepared in the MapElre project have been made using the FFmeg program, which is a command line program.

The program is available for download here: https://www.ffmpeg.org/.

The following video show how to install FFmpeg on Windows 10: https://www.youtube.com/watch?v=pHR3ttH5t-w

An example on a command line, including description of the commands, are described here:

Command line:

ffmpeg -y -framerate 3 -i img%d.png -vf scale=1588:1124 -c:v libx264 pix\_fmt yuv420p H.264\_codec.mp4

#### Explanation:

-y = overwrite -framerate 3 = 3 frames per second, i.e. 56 seconds for 168 frames -i tmp%d.png input png files
-vf scale=1588:1124 = "upscale" of the original png file made in arcpy from
1587x1123 pixels (ffmpeg does not like odd pixel values)
-c:v libx264 = H.264 codec
-pix\_fmt yuv420p = maybe not necessary

# Annex 1

## Installing MS SQL Server 2016 SP1 and SSMS 17 on a laptop

MS SQL Server 2016 Developer Edition is free for testing and development when the user have signed up as a member of Visual Studio Dev Essentials. Install the SQL server using the following procedure;

- Download MS SQL Server Developer edition from Visual Studio Developer
- Run setup basic installation
- Select Install SSMS in the setup finished window
- Download SSMS 17
- Restart
- Install SSMS 17

## Network enabling of MS SQL Server

If the database has to be accessible from other devices than the local pc, the database server has to be network enabled. For further information on the relevant settings, see https://docs.microsoft.com/en-us/sql/relational-databases/lesson-2-connecting-from-another-computer

## Creating the MapElre database

Run the scripts in the folder *.../MapElre/Indata/SQL\_scripts* from SSMS to create an empty database:

- Create\_MapElreDatabase
- Create\_FactEmission
- Create\_FactGEmission
- Create\_FactGemission\_ColumnStoreIndex

## Make a connection from MS Access to the MapElre database

In MS Access you have to make a connection to the MS SQL MapElre database and save the information in a file. You can also use this step if you have lost the connection for some reason. Use the following steps to connect to the MapElre database;

- Select External data, and select ODBC
- Select Link and click OK

Get External Data - ODBC Database	?	×
Select the source and destination of the data		
<ul> <li>Specify how and where you want to store the data in the current database.</li> <li>Import the source data into a new table in the current database.</li> <li>If the specified object does not exist, Access will create it. If the specified object already exists, Access will a number to the name of the imported object. Changes made to source objects (including data in tables) will reflected in the current database.</li> <li>Link to the data source by creating a linked table.</li> <li>Access will create a table that will maintain a link to the source data.</li> </ul>		
ОК	Cancel	

Click New

Select Data Source	×			
File Data Source Machine Data Source				
Look in: Documents	~ 🖄			
Altova ArcGIS Custom Office Templates My Data Sources Wy Shapes	SQL Server Management Studio Spra Visual Studio 2015 xmltest dfsMapEire.dsn dfsSpreadonLocal.dsn			
<	>			
DSN Name:	New			
Select the file data source that describes the driver that you wish to connect to. You can use any file data source that refers to an ODBC driver which is installed on your machine.				
	OK Cancel Help			

ANNEX 1

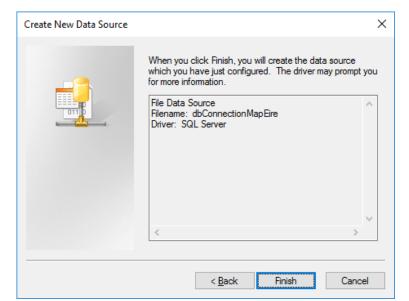
• Select SQL Server and click Next

Create New Data Source	:	×
	Select a driver for which you want to set up a data source.          Name       V         Microsoft Paradox Driver (*.db )       1         Microsoft Paradox-Treiber (*.db )       1         Microsoft Text Driver (*.td; *.csv)       1         Microsoft Text-Treiber (*.td; *.csv)       1         ODBC Driver 13 for SQL Server       2         SQL Server       1         SQL Server       1         Advanced	
	< Back Next > Cancel	

• Type a name for the connection file or browse to save the connection file at an appropriate path. Click Next

Create New Data Source		×
	Type the name of the file data source you this connection to. Or, find the location to clicking Browse.	
	dbConnectionMapEire	B <u>r</u> owse
	< <u>B</u> ack <u>N</u> ext >	Cancel

• Click finish



• Fill in the description and the name of the SQL server. Click Next

Create a New Data Sour	ce to SQL Server		×
	This wizard will help y connect to SQL Serve	ou create an ODBC data source that you can use er.	to
	What name do you w	ant to use to refer to the data source?	
	Na <u>m</u> e:	dbConnectionMapEire	
	How do you want to d	lescribe the data source?	
	Description:	MapEire	
	Which SQL Server do	you want to connect to?	
	<u>S</u> erver:	D16396	$\sim$
Finish         Next >         Cancel         Help			

Click Next

Create a New Data Source to SQL Server			
	How should SQL Server verify the authenticity of the login ID?		
	Client Configuration		
	Connect to SQL Server to obtain default settings for the additional configuration options.		
	Login ID: au223766		
Password:			
< <u>B</u> ack <u>N</u> ext > Cancel Help			

Change the default database to MapElre and click Next

Create a New Data Sour	ce to SQL Server	×
	<ul> <li>Change the default database to:</li> <li>MapErre</li> <li>Attach database filename:</li> <li>Use ANSI quoted identifiers.</li> <li>Use ANSI nulls, paddings and warnings.</li> <li>Use the failover SQL Server if the primary SQL Server is not available.</li> </ul>	
	< Back Next > Cancel Help	

Click Finish

Create a New Data Sour	ce to SQL Server	×
	Change the language of SQL Server system messages to:     English     Use strong encryption for data     Perform translation for character data     Use regional settings when outputting currency, numbers, dates and times.     Save long running queries to the log file:     C:\Users\au223766\AppData\Local\Temp\QUERY     Browse.     Long query time (milliseconds):     30000	
	Log ODBC driver statistics to the log file:     C:\Users\au223766\AppData\Local\Temp\STATS     Browse.	
	< <u>B</u> ack Finish Cancel Help	

• Test the data source or click OK Note: Server name in the test setup at AU is D16396

ODBC Microsoft SQL Server Setup	
A new ODBC data source will be created with the following configuration:	
Microsoft SQL Server ODBC Driver Version 10.00.14393 Data Source Name: dbConnectionMapEire Data Source Description: MapEire Server: D16396 Database: MapEire Language: (Default) Translate Character Data: Yes Log Long Running Queries: No Log Driver Statistics: No Use Regional Settings: No Prepared Statements Option: Drop temporary procedures on disconnect Use Failover Server: No Use ANSI Quoted Identifiers: Yes Use ANSI Null, Paddings and Warnings: Yes Data Encryption: No	~
	~
Test Data Source OK Cance	el

Microsoft SQL Server ODBC Driver Version 10.00.14393	~
Running connectivity tests	
Attempting connection Connection established Verifying option settings Disconnecting from server	
TESTS COMPLETED SUCCESSFULLY!	

Click OK

Select Data Source	×
File Data Source Machine Data S	Source
Look in: Documents	v 🖄
Altova ArcGIS Custom Office Templates My Data Sources Wy Shapes	SQL Server Management Studio dfsS Visual Studio 2015 dff Spre xmltest dbConnectionMapEire.dsn dfsMapEire.dsn
<	>
DSN Name: dbConnectionMa	pEire New
	describes the driver that you wish to connect to. the that refers to an ODBC driver which is installed
	OK Cancel Help

• Select dbo.FactEmission and dbo.FactGEmission and click OK

dbo.FactEmission	~	ОК
dbo.FactGEmission		
INFORMATION_SCHEMA.CHECK_CONSTRAINTS		Cancel
INFORMATION_SCHEMA.COLUMN_DOMAIN_USAGE		Concer
INFORMATION_SCHEMA.COLUMN_PRIVILEGES		
INFORMATION_SCHEMA.COLUMNS		Select <u>A</u> ll
INFORMATION_SCHEMA.CONSTRAINT_COLUMN_USAGE		
INFORMATION_SCHEMA.CONSTRAINT_TABLE_USAGE		Deselect All
INFORMATION_SCHEMA.DOMAIN_CONSTRAINTS		
INFORMATION_SCHEMA.DOMAINS		
INFORMATION_SCHEMA.KEY_COLUMN_USAGE		
INFORMATION_SCHEMA.PARAMETERS		Save passwor
INFORMATION_SCHEMA.REFERENTIAL_CONSTRAINTS		
INFORMATION_SCHEMA.ROUTINE_COLUMNS		
INFORMATION_SCHEMA.ROUTINES		
INFORMATION_SCHEMA.SCHEMATA		
INFORMATION_SCHEMA.SEQUENCES		
INFORMATION_SCHEMA.TABLE_CONSTRAINTS		
INFORMATION_SCHEMA.TABLE_PRIVILEGES		
INFORMATION_SCHEMA.TABLES		
INFORMATION_SCHEMA.VIEW_COLUMN_USAGE		
INFORMATION_SCHEMA.VIEW_TABLE_USAGE		
INFORMATION_SCHEMA.VIEWS		
sys.all_columns		
sys.all_objects		
sys.all_parameters		
sys.all_sql_modules		
sys.all views	$\sim$	

MAPEIRE - USER MANUAL

ANNEX 1

42

When the connection file is created, it can be used to connect to the MapElre database if the connection has been lost or from another database using the following procedure;

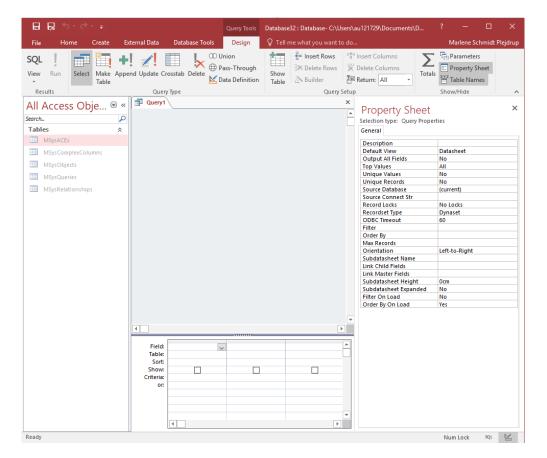
- Select ODBC and select link
- Select the connection file (data source file) generated in the previous chapter and click OK.

Select Data Source	Ś
File Data Source Machine Data Source	
Look in: Documents 🗸 🖄	
Altova       SQL Server Management Studio         ArcGIS       Visual Studio 2015         Custom Office Templates       xmltest         My Data Sources       dbConnection Map Eire.dsn         My Shapes       dfsMap Eire.dsn	
< >>	
DSN Name: dbConnectionMapEire New	
Select the file data source that describes the driver that you wish to connect to. You can use any file data source that refers to an ODBC driver which is installed on your machine.	
OK Cancel Help	

#### Changing the ODBC time out for queries in MS Access

If MS Access return an ODBC timeout error, it is advisory to try to solve the problem by changing the value in the query properties; Set it to 1800 sec

- By default, time is set to 60 sec
- Change it to 1800 sec (30 min)



43

# Annex 2 - List of GeoKeys

GeoKey	GeoKey (continued)	
1A1a NOx	2C2 PM	
1A1a rest	2C3	
1A1a SO2	2C7c Cd	
1A1b	2C7c Pb	
1A1c	2C7c_rest	
1A2b	2C7c_Zn	
1A2c	2D3f	
1A2e	2E1	
1A2f	2G3_NMVOC	
1A2gvi	2G3_rest	
1A2gviii	3B1a	
1A3ai(i)	3B1b	
1A3aii(i)	3B2	
1A3aii(ii)	3B3	
1A3c	3B4d	
1A3d	3B4e	
1A3e	3B4f	
1A4b_CO	3B4gi	
1A4b_CO2	3B4gii	
1A4b_NMVOC	3B4giv	
1A4b_NOx	3B4h	
1A4b_PM25	3D1a6	
1A4b_SO2	3D1b2	
1A4cii	3Da2a	
1A4ciii	5A	
1B1a_Handling	5B1	
1B1a_Mining	5C1bi	
1B2av	5C1biii	
1B2bii	5C1bv	
1B2c	5D_N2O	
2A1	AreaLand	
2A2	AreaLandSea	
2A4b	AreaSea	
2A4d	Buildings_All	
2A5a	Buildings_C_nonUrban	
2B1	Buildings_R	
2B2	Buildings_R_nonSewered	
2C1	Buildings_R_nonUrban	

GeoKey (continued)		
CORINEcropland		
CORINEgrassland		
CORINEotherland		
CORINEsettlement		
CORINEwetland		
HeatDemand_CommercialPublic		
HeatDemand_Industrial		
LPIScropImpGrass		
LPIScropland		
LPISfarmyard		
LPISgrassland		
Population		
Road_HV		
Road_PC		
Road_PCHV		

ANNEX 3 – CORRESPONDENCE BETWEEN GNFR, NFR AND GEOKEY

### Annex 3 – Correspondence between GNFR, NFR and GeoKey

GNFR	NFR	NFR name	GeoKey
А	1A1a	Public electricity and heat production	1A1a_NOx
А	1A1a	Public electricity and heat production	1A1a_rest
А	1A1a	Public electricity and heat production	1A1a_SO2
В	1A1b	Petroleum refining	1A1b
В	1A1c	Manufacture of solid fuels and other energy indus-	1A1c
		tries	
В	1A2a	Stationary combustion in manufacturing industries	HeatDemand_Industrial
		and construction: Iron and steel	
В	1A2b	Stationary combustion in manufacturing industries	1A2b
		and construction: Non-ferrous metals	
В	1A2c	Stationary combustion in manufacturing industries	1A2c
		and construction: Chemicals	
В	1A2d	Stationary combustion in manufacturing industries	HeatDemand_Industrial
		and construction: Pulp, Paper and Print	
В	1A2e	Stationary combustion in manufacturing industries	1A2e
		and construction: Food processing, beverages and	
		tobacco	
В	1A2f	Stationary combustion in manufacturing industries	1A2f
		and construction: Non-metallic minerals	
В	1A2gviii	Stationary combustion in manufacturing industries	1A2gviii
-	244	and construction: Other (please specify in the IIR)	244
B	2A1	Cement production	2A1
В	2A2 2A4a	Lime production	2A2
B	-	Ceramics	HeatDemand_Industrial
В	2A4b	Other uses of soda ash	2A4b
B	2A4d	Other uses of carbonates	2A4d
B	2A5a	Quarrying and mining of minerals other than coal	2A5a
В	2A5b	Construction and demolition	Buildings_All
В	2A6	Other mineral products (please specify in the IIR)	HeatDemand_Industrial
В	2B1	Ammonia production	2B1
В	2B10b	Storage, handling and transport of chemical prod-	LPISfarmyard
	202	ucts (please specify in the IIR)	202
B	2B2	Nitric acid production	2B2
В	2C1	Iron and steel production	2C1
В	2C2	Ferroalloys production	2C2_Cd
B	2C2	Ferroalloys production	2C2_Pb
В	2C2	Ferroalloys production	2C2_PM
B	2C3	Aluminium production	2C3
B	2C7c	Other metal production (please specify in the IIR)	2C7c_Cd
B	2C7c	Other metal production (please specify in the IIR)	2C7c_Pb
В	2C7c	Other metal production (please specify in the IIR)	2C7c_rest

	1
Ш	Ь
	U

D	2076	Other metal production (please specify in the UP)	207c 7n
В	2C7c	Other metal production (please specify in the IIR)	2C7c_Zn
В	2D1	Lubricant use	Road_PCHV
В	2D2	Paraffin wax use	Population
В	2D3b	Road paving with asphalt	Road_PCHV
В	2D3c	Asphalt roofing	Buildings_All
В	2E	Electronics industry	2E1
В	2F1a	Commercial refrigeration	Population
В	2F1e	Mobile air-conditioning	Road_PCHV
В	2F1f	Stationary air-conditioning	Buildings_All
В	2F3	Fire protection	HeatDemand_Industrial
В	2F4	Aerosols	Population
В	2F6	Other applications	Population
В	2H2	Food and beverages industry	1A2e
В	21	Wood processing	Buildings_C_nonUrban
В	2L	Other production, consumption, storage, transpor- tation or handling of bulk products (please specify in the IIR)	AreaLand
С	1A4ai	Commercial/institutional: Stationary	HeatDemand_Commer- cialPublic
С	1A4bi	Residential: Stationary	1A4b_CO
С	1A4bi	Residential: Stationary	1A4b CO2
С	1A4bi	Residential: Stationary	1A4b NMVOC
С	1A4bi	Residential: Stationary	1A4b NOx
С	1A4bi	Residential: Stationary	1A4b PM25
С	1A4bi	Residential: Stationary	1A4b_SO2
С	1A4ci	Agriculture/Forestry/Fishing: Stationary	LPISfarmyard
D	1B1a	Fugitive emission from solid fuels: Coal mining and handling	1B1a_Handling
D	1B1a	Fugitive emission from solid fuels: Coal mining and handling	1B1a_Mining
D	1B2aiv	Fugitive emissions oil: Refining / storage	1A1b
D	1B2av	Distribution of oil products	1B2av
D	1B2b	Fugitive emissions from natural gas (exploration,	1B2bii
-		production, processing, transmission, storage, distri- bution and other)	
D	1B2c	Venting and flaring (oil, gas, combined oil and gas)	1B2c
E	2D3a	Domestic solvent use including fungicides	Population
E	2D3d	Coating applications	Population
E	2D3e	Degreasing	2C7c_rest
E	2D3f	Dry cleaning	2D3f
E	2D3g	Chemical products	HeatDemand_Industrial
E	2D3g 2D3h	Printing	HeatDemand Industrial
E	2D3i	Other solvent use (please specify in the IIR)	Population
E	2031 2G	Other product use (please specify in the IIR)	2G3_NMVOC
E	2G 2G	Other product use (please specify in the IIR)	2G3_NNVOC
F	1A3bi	Road transport: Passenger cars	Road PC
F	1A3bii	Road transport: Light duty vehicles	Road_PC Road_PC
F	1A3biii 1A3biii	Road transport: Heavy duty vehicles and buses	Road_PC
F	1A3biii 1A3biv	Road transport: Mopeds & motorcycles	Road_PC
F			Road_PC Road_PC
Г	1A3bv	Road transport: Gasoline evaporation	NUdu_PC

47		7
----	--	---

F	1A3bvi	Road transport: Automobile tyre and brake wear	Road_PCHV
F	1A3bvii	Road transport: Automobile road abrasion	Road PCHV
G	1A3di(ii )	International inland waterways	AreaSea
G	1A3dii	National navigation (shipping)	1A3d
Н	1A3ai(i)	International aviation LTO (civil)	1A3ai(i)
Η	1A3aii(i )	Domestic aviation LTO (civil)	1A3aii(i)
I	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	1A2gvi
1	1A3c	Railways	1A3c
I	1A3ei	Pipeline transport	1A3e
I	1A4aii	Commercial/institutional: Mobile	HeatDemand_Commer- cialPublic
I	1A4bii	Residential: Household and gardening (mobile)	Buildings_R
I	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	1A4cii
1	1A4ciii	Agriculture/Forestry/Fishing: National fishing	1A4ciii
1	5A	Biological treatment of waste - Solid waste disposal on land	5A
J	5B1	Biological treatment of waste - Composting	5B1
J	5C1bi	Industrial waste incineration	5C1bi
J	5C1biii	Clinical waste incineration	5C1biii
J	5C1bv	Cremation	5C1bv
J	5C2	Open burning of waste	Buildings_R_nonUrban
J	5D1	Domestic wastewater handling	5D_N2O
J	5D1	Domestic wastewater handling	Buildings_R_nonSew- ered
J	5D2	Industrial wastewater handling	5D_N2O
J	5D2	Industrial wastewater handling	Buildings_R_nonSew- ered
J	5D3	Other wastewater handling	5D_N2O
1	5D3	Other wastewater handling	Buildings_R_nonSew- ered
J	5E	Other waste (please specify in IIR)	Population
К	3A1a	Dairy cattle	3B1a
К	3A1b	Non-dairy cattle	3B1b
К	3A2	Sheep	3B2
К	3A3	Swine	3B3
К	3A4d	Goats	3B4d
К	3A4e	Horses	3B4e
К	3A4f	Mules and asses	3B4f
К	3A4g	Poultry	3B4gii
К	3A4h	Other animals	3B4h
К	3B1a	Manure management - Dairy cattle	3B1a
К	3B1b	Manure management - Non-dairy cattle	3B1b
Κ	3B2	Manure management - Sheep	3B2
Κ	3B3	Manure management - Swine	3B3
К	3B4d	Manure management - Goats	3B4d
К	3B4e	Manure management - Horses	3B4e

К	3B4f	Manure management - Mules and asses	3B4f
К	3B4gi	Manure management - Laying hens	3B4gi
к	3B4gii	Manure management - Broilers	3B4gii
К	3B4giii	Manure management - Turkeys	3B4giv
К	3B4giv	Manure management - Other poultry	3B4giv
к	3B461	Manure management - Other animals (please spec-	3B4h
ĸ	50411	ify in IIR)	50411
L	3Da1	Inorganic N-fertilizers (includes also urea applica-	LPIScropland
		tion)	•
L	3Da2a	Animal manure applied to soils	3Da2a
L	3Da2b	Sewage sludge applied to soils	LPIScropland
L	3Da2c	Other organic fertilisers applied to soils	LPIScropland
		(including compost)	
L	3Da3	Urine and dung deposited by grazing animals	LPISgrassland
L	3Da4	Crop residues applied to soils	LPIScropland
L	3Da5	Mineralization	LPIScropland
L	3Da6	Cultivation of organic soils	3D1a6
L	3Db	Indirect emissions from managed soils	LPIScropland
L	3Db1	Atmospheric deposition	AreaLand
L	3Db2	Nitrogen leaching and run-off	3D1b2
L	3Dc	Farm-level agricultural operations including storage,	LPIScropImpGrass
		handling and transport of agricultural products	
L	3Dd	Off-farm storage, handling and transport of bulk ag- ricultural products	HeatDemand_Industrial
L	3De	Cultivated crops	LPIScropland
L	3Df	Use of pesticides	LPIScropland
L	3F	Field burning of agricultural residues	LPIScropland
L	3G	Liming	LPIScropImpGrass
L	3H	Urea application	LPIScropland
0	1A3ai(ii	International aviation cruise (civil)	AreaLandSea
	)		
0	1A3aii(i	Domestic aviation cruise (civil)	1A3aii(ii)
	i)		
Р	1A3di(i)	International maritime navigation	AreaSea
q	4A	LULUCF Forest land	CORINEforestland
q	4B	LULUCF Cropland	CORINEcropland
q	4C	LULUCF Grassland	CORINEgrassland
q	4D	LULUCF Wetlands	CORINEwetland
q	4E	LULUCF Settlements	CORINEsettlement
q	4F	LULUCF Other land	CORINEotherland
q	4G	LULUCF Harvested wood product	Population

MAPEIRE - USER MANUAL

ANNEX 4 - CORRESPONDENCE LIST OF IPCC CATEGORIES AND ASSIGNED LAND-USE CATEGORY

#### 49

### Annex 4 - Correspondence list of IPCC categories and assigned land-use category

IPCC category	Assigned land-use category
Cropland Annual	Cropland Annual
Cropland Annual, Forestry	Complex Landscape
Cropland Annual, Forestry, Grassland Improved	Complex Landscape
Cropland Annual, Forestry, Grassland Temporary	Complex Landscape
Cropland Annual, Grassland Improved	Multiple Agriculture
Cropland Annual, Grassland Improved, Grassland Temporary	Multiple Agriculture
Cropland Annual, Grassland Improved, Grassland Unimproved	Multiple Agriculture
Cropland Annual, Grassland Improved, Settlement	Complex Landscape
Cropland Annual, Grassland Natural	Multiple Agriculture
Cropland Annual, Grassland Temporary	Multiple Agriculture
Cropland Annual, Grassland Temporary, Grassland Improved	Multiple Agriculture
Cropland Annual, Grassland Unimproved	Multiple Agriculture
Cropland Annual, Grassland Unimproved, Grassland Improved	Multiple Agriculture
Cropland Annual, Other	Complex Landscape
Cropland Annual, Settlement	Complex Landscape
Cropland Annual, Wetland	Complex Landscape
Cropland Perennial	Cropland Perennial
Cropland Perennial, Cropland Annual	Multiple Agriculture
Cropland Perennial, Grassland Improved	Multiple Agriculture
Cropland Perennial, Grassland Temporary	Multiple Agriculture
Cropland Perennial, Settlement	Complex Landscape
Forestry	Forestry
Forestry, Cropland Annual	Complex Landscape
Forestry, Grassland Improved	Complex Landscape
Forestry, Grassland Natural	Complex Landscape
Forestry, Grassland Unimproved	Complex Landscape
Forestry, Settlement	Complex Landscape
Forestry, Wetland	Complex Landscape
Grassland Improved	Grassland Improved
Grassland Improved, Cropland Annual	Multiple Agriculture
Grassland Improved, Cropland Annual, Forestry	Complex Landscape
Grassland Improved, Cropland Annual, Grassland Temporary	Multiple Agriculture
Grassland Improved, Cropland Annual, Grassland Unimproved	Multiple Agriculture
Grassland Improved, Cropland Perennial	Multiple Agriculture
Grassland Improved, Forestry	Complex Landscape
Grassland Improved, Grassland Natural	Grassland Improved
Grassland Improved, Grassland Natural, Grassland Unimproved	Grassland Improved
Grassland Improved, Grassland Natural, Other	Grassland Improved
Grassland Improved, Grassland Temporary	Grassland Improved

ANNEX 4 - CORRESPONDENCE LIST OF IPCC CATEGORIES AND ASSIGNED LAND-USE CATEGORY

Grassland Unimproved, Settlement

Grassland Unimproved, Wetland

Grassland Improved, Grassland Temporary, Cropland Annual	Multiple Agriculture
Grassland Improved, Grassland Unimproved	Grassland Improved
Grassland Improved, Grassland Unimproved, Wetland	Grassland Improved
Grassland Improved, Other	Complex Landscape
Grassland Improved, Other, Grassland Unimproved	Grassland Improved
Grassland Improved, Settlement	Complex Landscape
Grassland Improved, Settlement, Cropland Annual	Complex Landscape
Grassland Improved, Settlement, Grassland Natural	Complex Landscape
Grassland Improved, Wetland	Complex Landscape
Grassland Improved, Wetland, Grassland Natural	Grassland Improved
Grassland Improved, Wetland, Grassland Temporary	Complex Landscape
Grassland Natural	Grassland Natural
Grassland Natural, Cropland Annual	Multiple Agriculture
Grassland Natural, Cropland Annual, Grassland Improved	Multiple Agriculture
Grassland Natural, Forestry	Complex Landscape
Grassland Natural, Forestry, Wetland, Grassland Improved	Complex Landscape
Grassland Natural, Grassland Improved	Grassland Improved
Grassland Natural, Grassland Improved, Grassland Unimproved	Grassland Improved
Grassland Natural, Grassland Temporary	Grassland Natural
Grassland Natural, Grassland Unimproved	Grassland Unimproved
Grassland Natural, Other	Other
Grassland Natural, Settlement, Other, Grassland Improved	Complex Landscape
Grassland Natural, Wetland	Complex Landscape
Grassland Temporary	Grassland Temporary
Grassland Temporary, Cropland Annual	Multiple Agriculture
Grassland Temporary, Cropland Annual, Grassland Improved	Multiple Agriculture
Grassland Temporary, Cropland Annual, Grassland Natural	Multiple Agriculture
Grassland Temporary, Cropland Perennial	Multiple Agriculture
Grassland Temporary, Forestry	Complex Landscape
Grassland Temporary, Grassland Improved	Grassland Improved
Grassland Temporary, Grassland Improved Grassland Temporary, Grassland Improved, Cropland Annual	Multiple Agriculture
	Grassland Natural
Grassland Temporary, Grassland Natural	Grassland Unimproved
Grassland Temporary, Grassland Unimproved	
Grassland Temporary, Settlement	Complex Landscape
Grassland Temporary, Settlement, Cropland Annual Grassland Unimproved	Complex Landscape Grassland Unimproved
•	
Grassland Unimproved, Cropland Annual	Multiple Agriculture
Grassland Unimproved, Cropland Annual, Grassland Improved	Multiple Agriculture
Grassland Unimproved, Forestry	Complex Landscape
Grassland Unimproved, Grassland Improved	Grassland Improved
Grassland Unimproved, Grassland Improved, Cropland Annual	Multiple Agriculture
Grassland Unimproved, Grassland Improved, Grassland Temporary	Grassland Improved
Grassland Unimproved, Grassland Improved, Wetland	Grassland Improved
Grassland Unimproved, Grassland Natural	Grassland Unimproved
Grassland Unimproved, Grassland Temporary	Grassland Unimproved
Grassland Unimproved, Other	Other

**Complex Landscape** 

**Complex Landscape** 

Other	Other
Other, Grassland Improved	Grassland Improved
Other, Grassland Natural	Grassland Unimproved
Other, Grassland Unimproved, Grassland Natural, Grassland Improve	Complex Landscape
Other, Settlement, Grassland Improved	Complex Landscape
Other, Wetland, Grassland Improved, Grassland Natural	Complex Landscape
Settlement	Settlement
Settlement, Cropland Annual	Complex Landscape
Settlement, Grassland Improved	Complex Landscape
Settlement, Grassland Improved, Other	Complex Landscape
Settlement, Grassland Natural	Complex Landscape
Settlement, Grassland Temporary	Complex Landscape
Settlement, Wetland	Complex Landscape
Settlement, Wetland, Grassland Improved	Complex Landscape
Wetland	Wetland
Wetland, Forestry	Complex Landscape
Wetland, Grassland Improved	Complex Landscape
Wetland, Grassland Improved, Grassland Natural	Complex Landscape
Wetland, Grassland Improved, Grassland Unimproved	Complex Landscape
Wetland, Grassland Natural	Complex Landscape
Wetland, Grassland Natural, Grassland Improved	Complex Landscape
Wetland, Grassland Temporary	Complex Landscape
Wetland, Grassland Temporary, Grassland Natural	Complex Landscape
Wetland, Grassland Unimproved	Complex Landscape

# Annex 5 - Irish projections

TM65_Irish_Grid WKID: 29902 Authority: EPSG	TM75_Irish_Grid WKID: 29903 Authority: EPSG	IRENET95_Irish_Trans- verse_Mercator WKID: 2157 Authority: EPSG
Projection: Transverse_Merca-	Projection: Transverse_Merca-	Projection: Transverse_Merca-
tor	tor	tor
False_Easting: 200000,0	False_Easting: 200000,0	False_Easting: 600000,0
False_Northing: 250000,0	False_Northing: 250000,0	False_Northing: 750000,0
Central_Meridian: -8,0	Central_Meridian: -8,0	Central_Meridian: -8,0
Scale_Factor: 1,000035	Scale_Factor: 1,000035	Scale_Factor: 0,99982
Latitude_Of_Origin: 53,5	Latitude_Of_Origin: 53,5	Latitude_Of_Origin: 53,5
Linear Unit: Meter (1,0)	Linear Unit: Meter (1,0)	Linear Unit: Meter (1,0)
Coorena dia Coordinata Sua	Coorrect his Coordinate Suc	Coorrect his Coordinate Suc
Geographic Coordinate Sys-	Geographic Coordinate Sys-	Geographic Coordinate Sys-
tem: GCS_TM65	tem: GCS_TM75	tem: GCS_IRENET95
Angular Unit: Degree	Angular Unit: Degree	Angular Unit: Degree
(0,0174532925199433) Prime Meridian: Greenwich	(0,0174532925199433) Prime Meridian: Greenwich	(0,0174532925199433) Prime Meridian: Greenwich
Datum: D_TM65	Datum: D_TM75	Datum: D_IRENET95
Spheroid: Airy_Modified	Spheroid: Airy_Modified	Spheroid: GRS_1980
Semimajor Axis:	Semimajor Axis:	Semimajor Axis: 6378137,0
6377340,189	6377340,189	Semiminor Axis:
Semiminor Axis:	Semiminor Axis:	6356752,314140356
6356034,447938534	6356034,447938534	Inverse Flattening:
Inverse Flattening:	Inverse Flattening:	298,257222101
299,3249646	299,3249646	

# Annex 6 - List of TKeys

Monthly	Daily	Hourly
(GNFR_NFR/CRF_Pollutant)	(GNFR_NFR/CRF_Pollutant)	(GNFR_NFR/CRF_Day)
A_1A1a_All	A_1A1a_All	A_1A1a_1-6
B_1A1b_All	B_1A1b_All	A_1A1a_7
B_1A1c_All	B_1A1c_All	B_1A1b_1-7
B_1A2a_All	B_1A2a_All	B_1A1c_1-7
B_1A2b_All	B_1A2b_All	B_1A2a_1-7
B_1A2c_All	B_1A2c_All	B_1A2b_1-7
B_1A2d_All	B_1A2d_All	B_1A2c_1-7
B_1A2e_All	B_1A2e_All	B_1A2d_1-7
B_1A2f_All	B_1A2f_All	B_1A2e_1-7
B_1A2gviii_All	B_1A2gviii_All	B_1A2f_1-7
B_2A1_All	B_2A1_All	B_1A2gviii_1-7
B_2A2_All	B_2A2_All	B_2A1_1-7
B_2A4a_All	B_2A4a_All	B_2A2_1-7
B_2A4b_All	B_2A4b_All	B_2A4a_1-7
B_2A4d_All	B_2A4d_All	B_2A4b_1-7
B_2A5a_All	B_2A5a_All	B_2A4d_1-7
B_2A5b_All	B_2A5b_All	B_2A5a_1-7
B_2A5c_All	B_2A5c_All	B_2A5b_1-7
B_2A6_All	B_2A6_All	B_2A5c_1-7
B_2B10b_All	B_2B10b_All	B_2A6_1-7
B_2C2_All	B_2C2_All	B_2B10b_1-7
B_2D3b_All	B_2D3b_All	B_2C2_1-7
B_2D3c_All	B_2D3c_All	B_2D3b_1-7
B_2H2_All	B_2H2_All	B_2D3c_1-7
B_2I_All	B_2I_AII	B_2H2_1-7
C 1A4ai All	C 1A4ai All	B 2I 1-7
C 1A4bi All	C 1A4bi All	C 1A4ai 1-5
C 1A4ci All	C 1A4ci All	C 1A4ai 6-7
D 1B1a All	D 1B1a All	C 1A4bi 1-5
D_1B2aiv_All	D 1B2aiv All	C 1A4bi 6-7
D 1B2av All	D_1B2av_All	C 1A4ci 1-7
D_1B2b_All	D 1B2b All	D 1B1a 1-7
D 1B2c All	D 1B2c All	D 1B2aiv 1-7
E 2D3a All	E 2D3a All	D 1B2av 1-7
E 2D3d All	E 2D3d All	D 1B2b 1-6
E 2D3e All	E 2D3e All	D 1B2b 7
E 2D3f All	E 2D3f All	D 1B2c 1-7
E 2D3g All	E 2D3g All	E 2D3a 1-5
E 2D3h All	E 2D3h All	E 2D3a 6-7

E_2D3i_All	E_2
E_2G1_All	E_2
E_2G2_All	E_2
F_1A3bi_All	F_1
F_1A3bii_All	F_1
F_1A3biii_All	F_1
F_1A3biv_All	F_1
F_1A3bv_All	F_1
F_1A3bvi_All	F_1
F_1A3bvii_All	F_1
G_1A3dii_All	G_1
H_1A3ai(i)_All	H 1
H 1A3aii(i) All	H 1
I_1A2gvii_All	I_1/
I_1A3c_All	I_1/
I_1A3ei_All	 I_1/
 I_1A4aii_All	  _1/
I 1A4bii All	1/
I 1A4cii All	  _1/
I 1A4ciii All	1/
J_5A_All	 J 5/
J_5B1_All	J 5
J 5C1bi All	J 50
J 5C1bv All	J 50
J_5C2_All	J 50
J_5D1_All	J_5
J_5D1_N2O	J 5
J_5E_All	J 5
K_3B1a_All	K_3
K_3B1b_All	К 3
K_3B2_All	К 3
K_3B3_All	K_3
K 3B4d All	K 3
K_3B4e_All	K 3
K 3B4f All	K 3
K_3B4gi_All	K_3
K_3B4gii_All	<u>к_</u> з
K_3B4giii_All	K_3
K_3B4giv_All	K_3
K 3B4h All	K 3
K 3B5 All	<u>к_</u> з
L 3Da1 All	L 3
L 3Da2a All	L 3
L 3Da2b All	L 3
L_3Da2c_All	L 3
L 3Da3 All	L 3
L 3Da4 All	L 3
L 3Db All	L 3
L_SDD_AII L_SDC_AII	L 3
	L_3

L\_3Dd\_All

E 2D3i All
E 2G1 All
E 2G2 All
F 1A3bi All
F_1A3bii_All
F_1A3biii_All
F_1A3biv_All
F_1A3bv_All
F_1A3bvi_All F_1A3bvii_All
G_1A3dii_All
H_1A3ai(i)_All
H_1A3aii(i)_All
I_1A2gvii_All
I_1A3c_All
I_1A3ei_All
I_1A4aii_All
I_1A4bii_All
I_1A4cii_All
I_1A4ciii_All
J_5A_All J 5B1 All
J_5C1bi_All
J_5C1bv_All
J_SCIDV_AII
J_5D1_All
J_5D1_N2O J_5E_All
K_3B1a_All
K_3B1b_All
K_3B2_All
K_3B3_All
K_3B4d_All
K_3B4e_All
K_3B4f_All
K_3B4gi_All
K_3B4gii_All
K_3B4giii_All
K_3B4giv_All
K_3B4h_All
K_3B5_All
L_3Da1_All
L_3Da2a_All
L_3Da2b_All
L_3Da2c_All
L_3Da3_All
L_3Da4_All
L_3Db_All
L_3Dc_All
L_3Dd_All

E_2D3d_1-7
E_2D3e_1-7
E_2D3f_1-7
E_2D3g_1-7
E_2D3h_1-7
E_2D3i_1-7
E_2G1_1-7
E_2G2_1-7
F 1A3bi 1
F_1A3bi_2-4
F 1A3bi 5
F 1A3bi 6
 F 1A3bi 7
F 1A3bii 1
F 1A3bii 2-4
F_1A3bii_5
 F_1A3bii_6
F 1A3bii 7
F_1A3biii_1
F 1A3biii 2-4
F 1A3biii 5
F 1A3biii 6
F_1A3biii_7
F 1A3biv 1
F 1A3biv 2-4
F 1A3biv 5
F 1A3biv 6
F_1A3biv_7
F_1A3bv_1-7
F 1A3bvi 1
F 1A3bvi 2-4
F 1A3bvi 5
F_1A3bvi_6
F_1A3bvi_7
F_1A3bvii_1
F 1A3bvii 2-4
F_1A3bvii_5
F_1A3bvii_6
F_1A3bvii_7
G_1A3dii_1-7
H_1A3ai(i)_1-7
H_1A3aii(i)_1-7
1A2gvii 1-7
1A3c 1-5
1A3c 6
1A3c 7
I_1A3ei_1-7
I 1A4aii 1-5
I 1A4aii 6-7
I_1A4bii_1-5

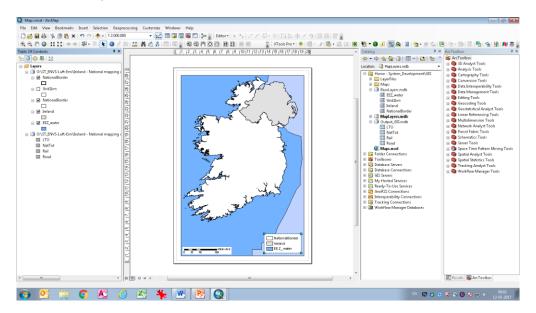
L_3Dd_PM2_5
L_3Dd_PM10
L_3Dd_TSP
L_3De_PM2_5
L_3De_PM10
L_3De_All
L_3Df_All
L_3F_All
O_1A3ai(ii)_All
O_1A3aii(ii)_All
P_1A3di(i)_All
q_4A_All
q_4B_All
q_4C_All
q_4D_All
q_4E_All
q_4F_All
q_4G_All

L_3Dd_PM2_5
L_3Dd_PM10
L_3Dd_TSP
L_3De_PM2_5
L_3De_PM10
L_3De_All
L_3Df_All
L_3F_All
O_1A3ai(ii)_All
O_1A3aii(ii)_All
P_1A3di(i)_All
q_4A_All
q_4B_All
q_4C_All
q_4D_All
q_4E_All
q_4F_All
q_4G_All

I_1A4bii_6-7
I_1A4cii_1-6
I_1A4cii_7
I_1A4ciii_1-7
J_5A_1-7
J_5B1_1-7
J_5C1bi_1-7
J_5C1bv_1-7
J_5C2_1-7
J_5D1_1-7
J_5E_1-7
K_3B1a_1-7
K_3B1b_1-7
K_3B2_1-7 K_3B3_1-7
K_3B3_1-7
K_3B4d_1-7
K_3B4e_1-7
K_3B4f_1-7
K_3B4gi_1-7
K_3B4gii_1-7
K_3B4giii_1-7
K_3B4giv_1-7
K_3B4h_1-7
K_3B5_1-7
L_3Da1_1-7
L_3Da2a_1-7 L_3Da2b_1-7
L_3Da2b_1-7
L_3Da2c_1-7
L_3Da3_1-7
L_3Da4_1-7
L_3Db_1-7
L_3Dc_1-7
L_3Dd_1-7
L_3De_1-7
L_3Df_1-6
L_3Df_7
L_3F_1-7
O_1A3ai(ii)_1-7
O_1A3aii(ii)_1-7
P_1A3di(i)_1-7
q_4A_1-7
q_4B_1-7
q_4C_1-7
q_4D_1-7
q_4E_1-7
q_4F_1-7
q_4G_1-7

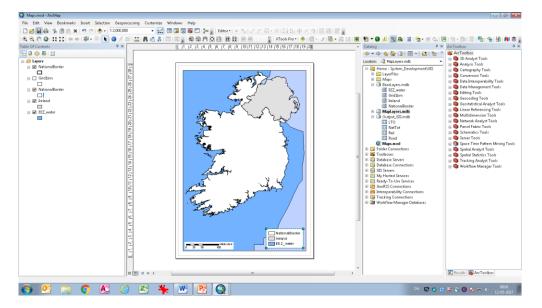
### Annex 7 - Guide to create maps

- Open ...\\MapEIre\ModelSystem\GIS\Maps.mxd
- The mxd document contains the following base layers stored in the geodatabase ...\\MapEIre\ModelSystem\GIS\BaseLayers.mdb:
  - o EEZ\_water: The exclusive economic zone for the Republic of Ireland
  - Grid1km: grid with a resolution of 1 km x 1 km in the TM65 projection covering the national territory (land and water areas)
  - Ireland: coastline for Ireland (Republic of Ireland and Northern Ireland)
  - NationalBorder: national border for the Republic of Ireland
- Generate the output tables that should be included in the maps in ...\\MapEIre\ModelSystem\Output\MapEIre\_Reporting.accdb
- Import the output tables to ...\\MapEIre\ModelSystem\GIS\Output\_GIS.mdb. Use short table names (max 8 characters), avoid using reserved symbols and words (e.g. In), and use letters as first character. All to avoid problems later in the workflow



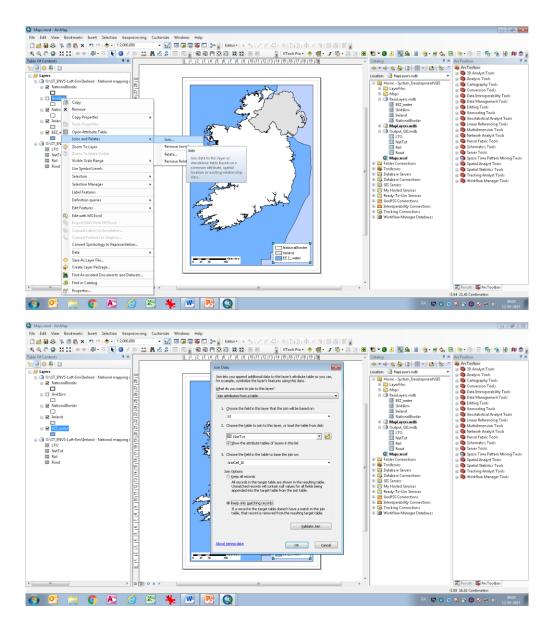
Add the tables from Output\_GIS.mdb to Maps.mxd

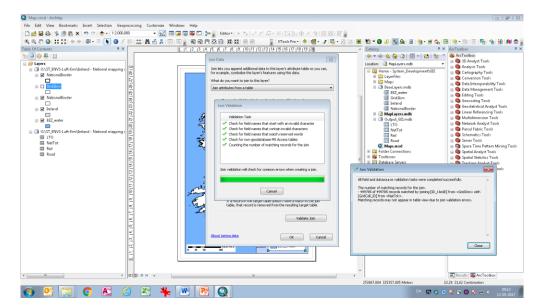
- The mxd document contains the following output tables:
  - LTO: emissions from national LTO (1A3aii\_i) (...\\MapElre\_Reporting.accdb\qMap\_1km\_LTO\_1A3aii\_i\_2015\_Crosstab\_MakeTable)
  - NatTot: National total emissions (...\\MapElre\_Reporting.accdb\qMap\_1km\_Nat\_Tot\_2015\_Crosstab\_MakeTable)
  - Rail: emissions from rail transport (1A3c) (...\\MapElre\_Reporting.accdb\qMap\_1km\_Rail\_1A3c\_2015\_Crosstab\_MakeTable)
  - Road: emissions from road transport (1A3b) (...\\MapElre\_Reporting.accdb\qMap\_1km\_Road\_1A3b\_2015\_Crosstab\_MakeTable)



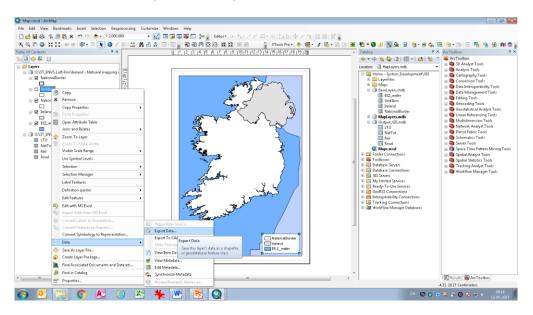
• Use Join by attribute to join an output table to the grid. Use ID\_1kmIE as join field and select Keep only matching records

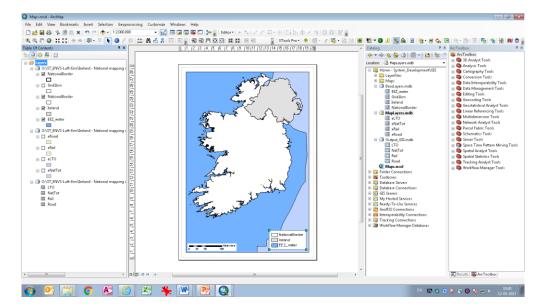
**Hint**: Use Validate join to check for common join errors, e.g. use of reserved words as field headings, and the number of joined records





- Export the joined layer as feature layer to the personal geodatabase ...\\MapEIre\ModelSystem\GIS\MapLayers.mdb
- Add the new layer to the map





#### Remove joins from the grid

<ul> <li>Gendard Construction</li> <li>Render Render Render Construction</li> <li>Render Render Render Construction</li> <li>Render Render Render</li></ul>	
Control	
Tail of Control:       9 x         Image: Control:       1 x         Image: Contr	
Control Contro Control Control Control Control Control Control Control Control Co	। 🖫 🐁 🕌 🍂 🕏
Control Table Convertion     Control Table	÷
Control of the constant o	
Industry	rst Tools
<ul> <li>Badd</li> <li>Corport</li> <li>Ready</li> <li></li></ul>	aphy Tools
<ul> <li>Barder, B. Copy</li> <li>Barder, B. C</li></ul>	
Image: Sector State States       Non-         Image: Sector State States       Non-         Image: Sector States       Non- <td>inagement Tools</td>	inagement Tools
<ul> <li>Ledi Atarov</li> <li>Ledi Ata</li></ul>	
<ul> <li>Parts 1 = Parts 2 = Parts 1 = Par</li></ul>	
<ul> <li>Construction</li> <li>Const</li></ul>	eferencing Tools
<ul> <li>Dest, O</li> <li>Dest, O</li></ul>	mension Tools
<ul> <li>and and a second section</li> <li>and a second section</li> <li>balance</li> <li>control</li> <li>contro</li> <li>control<!--</td--><td></td></li></ul>	
2 Journ 1: Antale Values       Refrest-       Refrest	
<ul> <li>Costelin</li> <li>Visible Scale Range</li> <li>Remove Robert(c)</li> <l< td=""><td></td></l<></ul>	
C Tracka       C Tracka     Us § model condition       C Tracka     C Tracka       C T Tracka     C T Tracka       C T Tracka     C T Tracka       C T Tracka     C T Tracka       C T T Tracka     C T Tracka       C T T T Tracka     C T T Tracka       C T T T T T T Tracka     C T T T T T T T T T T T T T T T T T T T	
Selection Amager  Selection Marger  Selection Ma	Analyst Tools
Statem Statem Label Fedure: Label Fedure: Control Con	
Charles Latel return  Charles	
Definition quries         •	
Contractions Contr	
Concision (a) Concentration (a) Concentratio (a) Concentration (a) Concentration (a) Concentratio	
Winniew Compart Edits from MS Social	
KOV to Control Learn to Annual Annual Control	
411 - Convert Symbology to Representation	
411 Data •	
02- 62- ♦ Save As Layer File	
😑 🔁 Funen 🖕 Create Layer Package	
Find Associated Documents and Datasets	
S Find in Catalog	ArrToolhor
Properties	
	10.00

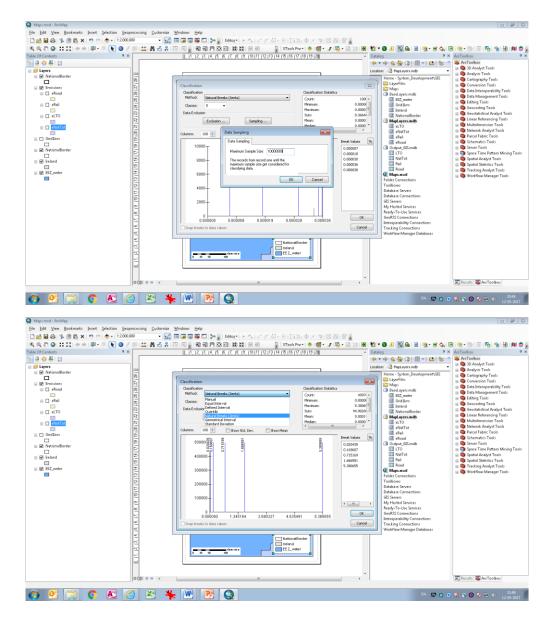
- Change the layer properties to adjust the visual settings
  - o Symbology
    - How to draw layer (Quantities as Graduated colours or Graduated symbols are useful for displaying emissions and shares)
    - Field to show

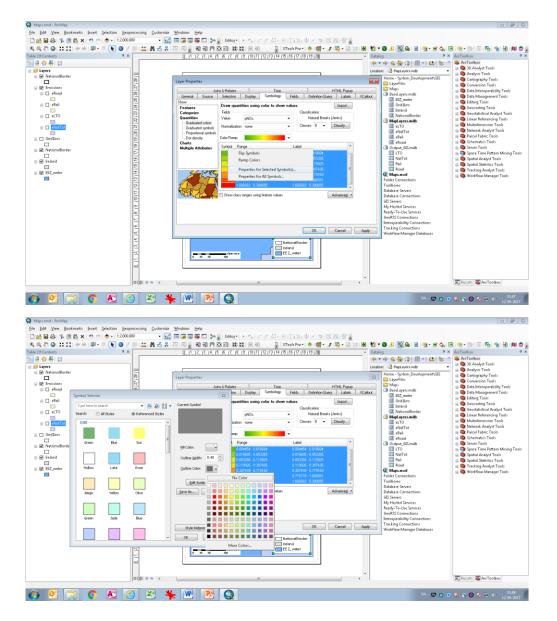
60

Colour ramp (be aware how the reader construes the col-• ours; green $\rightarrow$ red=good $\rightarrow$ bad, light $\rightarrow$ dark = little $\rightarrow$ much)

- Symbol settings (when using graduated colours for high resolution gridded data it is useful to set the outline colour to No colour)
- Number of classes
- Classification
  - Method (Natural breaks (jenks) are default)
  - Exclusion
  - Sample size (adjust so that all records are used to calculate ranges)
- Ranges (when edited the classification method are changed to Manual)
- Labels (will be shown in the legend on the map)
- $\circ$  Display
  - Transparent (colours are difficult to match to the legend when layers are partly transparent)

Q Maps.mod - AecMap			- 9 - 2
Ele Edit View Bookmarks Insert Selection Geopro	cessing <u>C</u> ustomize	Afindows Help	
🗋 🥶 🖬 💩 🐝 🗊 🇞 🗙 🔊 🕾 🚸 • 12.000.00	• 🛃	国 🗊 🗊 🖬 🛄 📴 🖬 🖬 / ア 年 米 115 店 中 × 文 1 目 図 1 8 🖕	
Q Q 2 Q 11 11 + + 12 - 1 R 0 / 8		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	🗑 📚 · 🛍 🗮 🛼 🛸 🗰 📚 🖡
Table Of Contents 7 ×			× ArcTeolbex # ×
Taking Consenses		1, 11, 12, 13, 14, 15, 16, 17, 18, 19, 10, 11, 112, 13, 14, 15, 16, 17, 18, 19, 20 · Cetalog #	
	0 (D) 0 H 4		Results ArcToolbax
🚯 🔮 🚞 🚺 🙆	) 📧 🍟	· 🐨 💽 🔕 · · 🕫 o	○ ♥ ● ● № = ↓ 10.43 12-05-2017

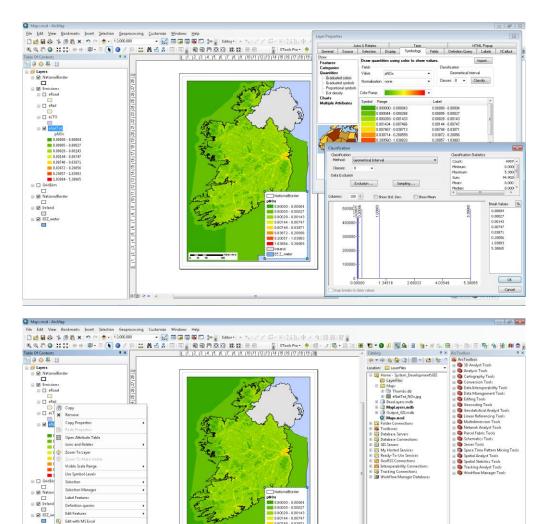




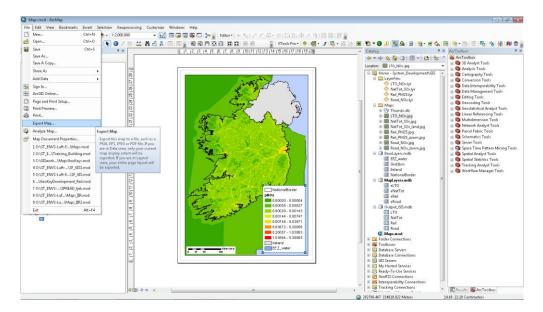
Convert Labell to Anostation
 Convert Patients to Graphics.
 Convert Symbology to RepreData
 Save As Layer File..
 Create Layer File..
 Find Associated Docume
 Find Associated Docume
 Find Associated Docume
 Find Associated Docume

Properties.

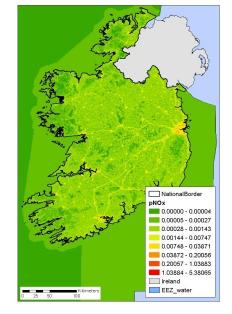
Save As Layer File Save this layer as a file (saves the layer definition not the data) 1 2



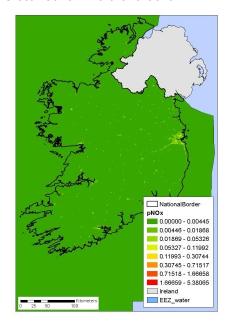
-2.45 -2.97 Centimeters

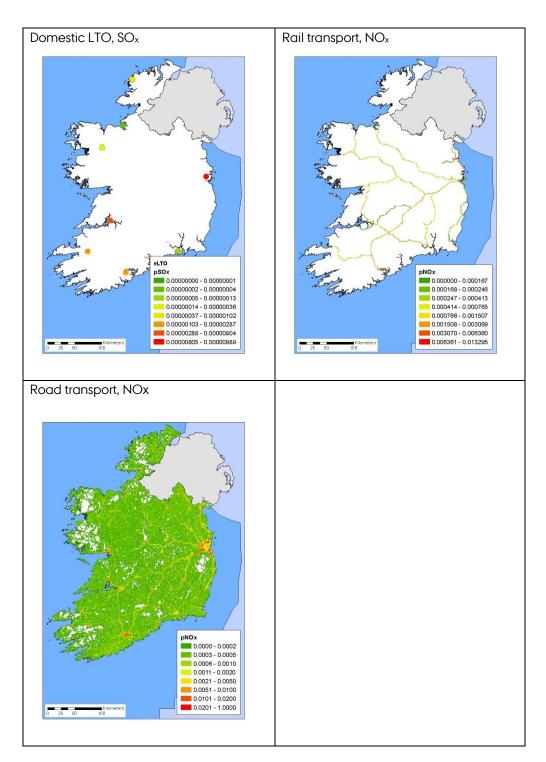


#### National total, NO<sub>x</sub> Classification: Geometrical intervals



National total, NO<sub>x</sub> Classification: Natural breaks





ANNEX 8 – PREPARING A GEOKEY FOR A POINT SOURCE

# Annex 8 – Preparing a GeoKey for a point source

- Open ArcMAP and create a new mxd file (...\\MapEIre\GIS\_Training\Training\_Building.mxd)
- Add the following layers from ...\\MapEIre\GIS\_Training\Data\
  - \Borders.mdb\Coastline
  - \Borders.mdb\Counties
  - \Borders.mdb\Monaghan
  - \Grids.mdb\WL\_1kmIE\_Monaghan
- Use the Spatial join tool in ArcToolbox (ArcToolbox\AnalysisTools\Overlay\SpatialJoin) to join attribute data from "WL\_1kmIE" to "Building\_Monaghan". Set JOIN OPERATION to JOIN ONE TO ONE and set the MATCH OPTION to WITHIN. Save layer as Building\_Monaghan.mdb\Build\_Mon\_1km

Q Training_Building.mxd - ArcMap			- 0 8 X
File Edit View Bookmarks Insert Selection Geoprocessing Customize	Windows Help		
ि 🛃 🛃 👶 🖐 🛞 🖄 🛪 🔊 🕾 🚸 । 12202 🔹 🖬	🛇 Spatial Join		
🔍 Q, 21 Q) 💥 22 💠 + 🕸 - 🗉 🖌 🕲 / 💷 🚢 🗛 🛃 🤐	Target Features	Join Operation (optional)	a 🗃 👒 • 🖻 🕼 🖼 🖼 🛸 👘 🕾 🖓 👘 🏶 🤹
Table Of Contents # ×	Building_Monaghan		# × ArcTeolbex # ×
		Determines how joins between the target	🖬 🖛 😭 🦖 🐃 ArcToplbox 🔺
	Join Features	features and join features will be handled in the	III 📭 3D Anabet Tools
Building_Monaghan	WL_1kmIE_Monaghan		tonaghan.mdb 🔹 🖶 🤤 Analysis Tools
Dollaing_wonagnan	Output Feature Class	found that have the same spatial relationship with a single target feature.	ng 🚖 💽 🇞 Extract
🗉 🗹 Monaghan	G25_Training)Data)Building)Building_Monaghan.mdb\Build_Mon_1km 🛛 😝	with a single target feature.	_ 😑 🇞 Overlay
	Join Operation (optional)	JOIN ONE TO ONE—If multiple join	Erase
🗉 🗹 Counties	JOIN_ONE_TO_ONE	features are found that have the same	Identity
	Keep All Target Features (optional)	spatial relationship with a single target	ban.mdb
WL_1kmIE_Monaghan	Field Map of Join Features (optional)	feature, the attributes from the multiple	naghan Spatial Join
		join features will be aggregated using a	Counties_generalised Symmetrical Difference
🖃 🗹 Coastline	OBJECTID (Long)     Journal (Long)	field map merge rule. For example, if a point target feature is found within two	Update
	buildingUs (Text)     Available (Text)		September     Proximity
		attributes from the two polygons will be	· · · · · · · · · · · · · · · · · · ·
000000	· vacant (Text)	aggregated before being transferred to	Results ArcToolbox
Table	underConst (Text)     demolished (Text)	the output point feature class. If one polygon has an attribute value of 3 and	# ×
11 • 💀 • 🖬 🗞 12 🖉 🗙	holidayHom (Text)     holidayHom (Text)		
Building_Monaghan		merge rule is specified, the aggregated	×
	⊕ county (Text)	value in the output feature class will be	^
OBJECTID_1* Shape* OBJECTID buildingId buildingUs dere 28574 Point 1718233 40625969 R N	iii - smalAreaR (Text) iii - edid (Long)	10. This is the default.	^
29575 Point 1716233 40625990 C N	ead (Long)     e-pop_per_ho (Float)	<ul> <li>JOIN_ONE_TO_MANY—If multiple join</li> </ul>	
29576 Point 1718235 40625990 C N	GridtimIE (Text)	features are found that have the same spatial relationship with a single target	
29577 Point 1718277 40627643 C N	ID_1kmIE (Long)	feature, the output feature class will	
29578 Point 1718285 40627735 R N	Match Option (optional)	contain multiple copies (records) of the	
29579 Point 1718287 40627741 R N 29580 Point 1718291 40627751 R N	WITHIN -		
29580 Point 1716291 40527751 R N	Search Radius (optional)	point target feature is found within two	
29582 Point 1718295 40627775 B N	Meters	separate polygon join features, the output feature class will contain two	
29583 Point 1718610 40626652 R N	Distance Field Name (optional)	copies of the target feature: one record	
29585 Point 1718624 40627263 R N 29585 Point 1718625 40627263 R N		with the attributes of one polygon, and	
29585 Point 1718625 40627263 R N 29586 Point 1718626 40627263 R N		another record with the attributes of the	
29587 Point 1718627 40627263 R N		other polygon.	
29588 Point 1718633 40627447 R N			
29589 Point 1718639 40627470 C N			
29590 Point 1718691 40627604 C N 29591 Point 1718692 40627605 C N		v v	
29592 Point 1718692 40627605 C N 29592 Point 1718693 40627613 R N	OK Cancel Environments << Hide Hel	to Tool Help	
29593 Point 1718701 40627644 R N			
29594 Point 1718717 40627765 C N	IN IN IN DETACHED		
29595 Point 1718780 40627773 R N	N N N DETACHED	MONAGH 0 0	-
If f 29595 → H 📄 = (0 out of 29595 Selected)			
Building_Monaghan			
Canceled			

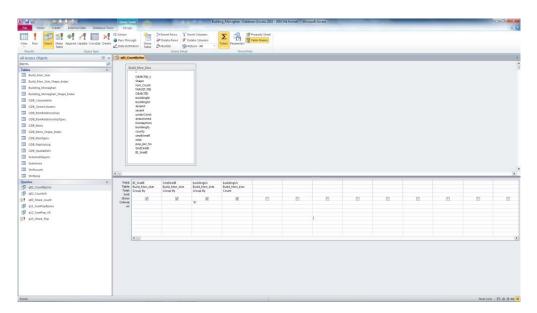
Open the attribute tables of Building\_Monaghan and Build\_Mon\_1km (right click the layers in table of content, TOC) and verify that the number of rows are equal, and that all rows in "Build\_Mon\_1km" have data in the 1km grid col-umns, e.g. "ID\_1kmIE" (use Sort ascending)

ANNEX 8 – PREPARING A GEOKEY FOR A POINT SOURCE

**Hint**: In this case one point cannot be spatially joined with the grid, as it is located inside the border of Co. Monaghan but outside the national border used in the model. The reason is that the county map is generalized and thereby less spatial accurate than the layer used for the national border

		rnod - Arci	viap																	9 🖻
ie Edit	View E	Bookmark	s Insert Sei	ection Geopro	cessing Cus	tomize Win	dows Help													
) 🛃 🗟	101	0.00.0	x   • > ~   •	• 1:2,202		- 🔜 💷	ji 🗔 📷 C	- <b>-</b>	Editor • >	h1284	1- *ISh	中×91								
0.1	0 35	5.8 de	- 1 <b>51 -</b> 12	<b>b</b> 0 7 0									1 1 - 3 3	🗃 🖬 🕶 🚳	7 🖻 🗛	- A	• R 0.1	19-80		
le Of Co		** · *		# X			adh 🖥 : sei s	an e a 190	COLOR ROLL		E MICONTIO	1. • 1. •	1971 <b>- 19</b> 1 - 1931 - 1931	<ul> <li>Catalog</li> </ul>				ArcTeolbex	sour 112 1 12 1 21	
				* ^														ArcToolbox		
	8 🗄																🖆 🐮 "	Arc Toolbi B 3D An		
📁 Løye				~		_	_	~						Location:	🛺 Building_M:	naghan.m	• dt	B G Analys		
	Build_Mon_	1km						-	-					ne - MapE	re\GIS_Trainin	0	*	Analysis		
•										۸				Data				= 🗞 0.		
	Building_Ma	lonaghan												🔤 Buildin			=		Erase	
															ding.mdb				Identity	
	Monaghan														Building				Intersect	
				1											ding_Monagh				Spatial Join	
	Counties														Build_Mon_1k				Symmetrical Diff	
															Building_Mon				Union	elence
🗆 🗹 🛛	WL_1kmIE_M	Monaghar	1												2011_Admin_0	Counties_(	peneralised		Update	
														Histos	ls .			🕫 🇞 Pri		
- 🗹 🤇	Coastline													🕳 🔤 Rail			*			
				-	00100	*							,				•	🔣 Results 🚺	ArcToolbox	
1	•   🖬 🕅 onaghan	I	×																	
ding_Mo	onaghan	Shape '	OBJECTID			derelict		derConst	demolished	holidayfforn				edid pop_						
•   🔁 ·	0naghan TID_1 * 29574 Pr	Shape '	OBJECTID 1718233	40625989 R		N N	I N	derConst	demolished	N	DETACHED	MON	AGH	0	0					_
•   🔁 ·	onaghan	Shape '	OBJECTID			N N	N N	derConst	demolished N N				AGH AGH							
•   🔁 ·	29574 Pr 29575 Pr	Shape '	OBJECTID 1718233 1718234	40625969 R 40625990 C		N N	N N		N N	N N	DETACHED	MON MON MON	AGH AGH AGH	0	0	_				_
•   🔁 ·	29574 Pr 29575 Pr 29576 Pr 29576 Pr 29576 Pr 29577 Pr 29578 Pr	Shape *	OBJECTID 1718233 1718234 1718235 1718277 1718285	40625969 R 40625990 C 40625990 C 40625990 C 40627643 C 40627735 R		N M N M N M N M	I N I N I N		N N	N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINOALOW	MON MON MON MON MON	AGH AGH AGH AGH AGH	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0					
•   🔁 ·	0naghan TID_1* 29574 Pi 29575 Pi 29576 Pi 29577 Pi 29578 Pi 29578 Pi 29579 Pi	Shape ' loint loint loint loint loint loint	OBJECTID 1718233 1718234 1718235 1718277 1718285 1718287	40625989 R 40625990 C 40625990 C 40627643 C 40627735 R 40627735 R		N 0 N 0 N 0 N 0 N 0 N 0	N N N N N N N N N N N N N N N N N N N		N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINOALOW DETACHED	MON MON MON MON MON MON	AGH AGH AGH AGH AGH	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
ing_Mc	29574 Pi 29574 Pi 29575 Pi 29576 Pi 29577 Pi 29577 Pi 29579 Pi 29579 Pi	Shape ' loint loint loint loint loint loint loint	OBJECTID 1718233 1718234 1718235 1718277 1718285 1718287 1718289	40625969 R 40625990 C 40625990 C 40627643 C 40627735 R 40627731 R 40627751 R		N M N M N M N M	N N N N N N N N N N N N N N N N N N N		N N N N N	N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINGALOW DETACHED BLINGALOW	AICM AICM AICM AICM AICM AICM AICM AICM	40H 40H 40H 40H 40H 40H	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			_		
ing_Mc	0naghan TID_1* 29574 Pi 29575 Pi 29576 Pi 29577 Pi 29578 Pi 29578 Pi 29579 Pi	Shape ' loint loint loint loint loint loint loint	OBJECTID 1718233 1718234 1718235 1718277 1718285 1718287	40625989 R 40625990 C 40625990 C 40627643 C 40627735 R 40627735 R		N 0 N 0 N 0 N 0 N 0 N 0	N N N N N N N N N N N N N N N N N N N		N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINOALOW DETACHED	MON MON MON MON MON MON	40H 40H 40H 40H 40H 40H	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
ing_Mc	29574 Pi 29574 Pi 29575 Pi 29576 Pi 29577 Pi 29577 Pi 29579 Pi 29579 Pi	Shape *	OBJECTID 1718233 1718234 1718235 1718285 1718285 1718287 1718287 1718291 1718291	40625969 R 40625990 C 40625990 C 40627643 C 40627735 R 40627731 R 40627751 R		N 0 N 0 N 0 N 0 N 0 N 0	N N N N N N N N N N N N N N N N N N N		N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINGALOW DETACHED BLINGALOW	AICM AICM AICM AICM AICM AICM AICM AICM	40H 40H 40H 40H 40H 40H	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
Ing_Mo	onaghan           TTD_1*           29874           29875           29876           29877           29877           29878           29879           29879           29879           29879           29879           29880           29881           29595	Shape *	OBJECTID 1718233 1718234 1718235 1718285 1718285 1718287 1718287 1718291 1718291	40625969 R 40625990 C 40625990 C 40627643 C 40627755 R 40627751 R 40627751 R		N 0 N 0 N 0 N 0 N 0 N 0	N N N N N N N N N N N N N N N N N N N		N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINGALOW DETACHED BLINGALOW	AICM AICM AICM AICM AICM AICM AICM AICM	40H 40H 40H 40H 40H 40H	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
Ing_Mc OBJEC	onaghan TID_1* 29574 Pi 29575 Pi 29576 Pi 29577 Pi 29579 Pi 29579 Pi 29587 Pi 29581 Pi 29581 Pi 29585 •	Shape *	OBJECTID 1718233 1718234 1718235 1718285 1718285 1718287 1718287 1718291 1718291	40625969 R 40625990 C 40625990 C 40627643 C 40627755 R 40627751 R 40627751 R		N 0 N 0 N 0 N 0 N 0 N 0	N N N N N N N N N N N N N N N N N N N		N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINGALOW DETACHED BLINGALOW	AICM AICM AICM AICM AICM AICM AICM AICM	40H 40H 40H 40H 40H 40H	0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
ding_Mo	0000000000000000000000000000000000000	Shape *	08.#CTIB 1718235 1716234 1716235 1718275 1718287 1718287 1718287 1718291 1716292 ■ (0 out of	40625969 R 40625960 C 40625960 C 406277643 C 40627741 R 40627741 R 40627760 R 29595 Selected)		N N N N N N N N N N N	I N I N Y N I Y I Y		N N N N N N	N N N N N N N N N	DETACHED DETACHED DETACHED SEMLDETACHED BUNGALOW DETACHED BUNGALOW BUNGALOW	MON MON MON MON MON MON MON	RGH NGH NGH NGH NGH NGH NGH	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
I Mon_	onaghan TID_1* 28574 Pi 29575 Pi 29576 Pi 29577 Pi 29579 Pi 29579 Pi 29579 Pi 29595 Pi 20595 Pi	Shape ' loint loint loint loint loint loint loint loint Shape '	OBJECTID 1718233 1718234 1718235 1718285 1718285 1718287 1718287 1718291 1718291	40625969 R 40625990 C 40625990 C 40627743 C 40627751 R 40627751 R 40627751 R 40627751 R 40627760 R 29595 Selected)	овлестив	N N N N N N N N N N N N N N N N N N N	I N I N I N I N I Y I Y I Y I N	s derei	N N N N N N N N N N N N N N N N N N N	N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BLINGALOW DETACHED BLINGALOW	MON MON MON MON MON MON MON	KGH KGH KGH KGH KGH KGH KGH KGH KGH KGH	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		pop_per_ho			
ding_Mo	onaghan TTUD_1* 29574 Pri 29575 Pr 29575 Pr 29577 Pr 29577 Pr 29579 Pr 29579 Pr 29595 Pr 29595 Pr 1km TTUD_1* 29597 Pr	Shape ' loint loint loint loint loint loint H Shape '	08.#CTIB 1718235 1716234 1716235 1718275 1718287 1718287 1718287 1718291 1716292 ■ (0 out of	40625969 R 40625990 C 40625990 C 40627743 C 40627751 R 40627751 R 40627751 R 29595 Selected) 29595 Selected) 29595 Selected	овлестив	N N N N N N N N N N N N N N N N N N N	I N N N N N N N N N N N N N N N N N N N		N N N N N N N N N N N N N N N N N N N	N N N N N N N N N	DETACHED DETACHED DETACHED SEMLDETACHED BUNGALOW DETACHED BUNGALOW BUNGALOW	MON MON MON MON MON MON MON	AGH	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	edid	0	1km_320_282	511787	
ding_Mo	onaghan TID_1* 28574 Pi 29575 Pi 29576 Pi 29577 Pi 29579 Pi 29579 Pi 29579 Pi 29595 Pi 20595 Pi	Shape * foint foint foint foint foint foint foint toint Shape *	08.#C118 1716234 1716235 1716235 1716235 1716285 1716287 1716292 ■ (0 out of Join_Count 1	40625969 R 40625990 C 40625990 C 40627643 C 40627731 R 40627731 R 40627731 R 40627751 R 29595 Selected) 29595 Selected) 29595 Selected)	0BJECTID 1710633 1718639	N N N N N N N N N N N N N N N N N N N		s derei	N N N N N N N N N N N N N N N N N N N	N N N N N N N N N V V V V V V V V V V V	DETACHED DETACHED DETACHED SEM-DETACHED BUNGALOW DETACHED BUNGALOW BUNGALOW BUNGALOW BUNGALOW	MON MON MON MON MON MON MON MON MON	KGH KGH KGH KGH KGH KGH KGH KGH KGH KGH	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0			
Ing_Mc oBJEC	onaghan TTD_1* 28574 Pr 28575 Pr 28576 Pr 28579 Pr 29587 Pr 29587 Pr 29587 Pr 29587 Pr 29588 Pr 29585	Shape ' loint loint loint loint loint loint H Shape ' loint loint	08.#CTIB 1716234 1716234 1716277 1716285 1716285 1716292 1716292 1716292 1716292 ↓ 01 out of Join_Count 1 1 1 1 1 1 1 1 1 1 1 1 1	40625969 R 40625990 C 40625990 C 40627741 R 40627741 R 40627751 R 40627750 R 29595 Selected) 74862ET_FID 29595 Selected) 29590 29590	08JECTID 1710633 1710639	N N N N N N N N N N N N N N N N N N N		s derel	N N N N N N N N N N N N N N N N N N N	N N N N N N N N N V V V N N N N N N N N	DETACHED DETACHED DETACHED SEM-DETACHED BUNGALOW DETACHED BUNGALOW BUNGALOW BUNGALOW BUNGALOW	Mona Mona Mona Mona Mona Mona Mona Mona	AGH	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0	1km_320_282 1km_318_281	511787 509653	
ding_Mo	nnaghan           TTUD_1*           29674           29675           29676           29677           29677           29678           29678           29679           29679           29679           29680           29599           29595           Ionaghan           3hm           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589           29589	Shape ' ford ford ford ford ford ford ford ford	OBJECTID 1716233 1716234 1716235 1716235 1716267 1716267 1716252 ■ (Ø out ef 1 1 1 1 1 1 1 1 1 1 1 1 1	40625969 R 40625990 C 40625990 C 4062763 R 40627751 R 40627751 R 40627751 R 40627751 R 29555 Selected) 29555 Selected) 29595 29590 29590 29590	08.JECT10 1710633 1716639 1718691 1718691 1716662	N N N N N N N N N N N N N N N N N N N	N         N           I         N           I         N           I         N           I         Y	s derol N N N N N	N N N N N N N N N N N N N N N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMLDETACHED BLNOALOW BLNOALOW BLNOALOW BLNOALOW BLNOALOW N N N N N N N N	holidayHom N N N N N N N N N N N N N N N N N N N	00H 00H 00H 00H 00H 00H 00H 00H	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000000000000000000000000000000000000000	000000000000000000000000000000000000000	1km_320_282 1km_318_281 1km_321_280 1km_321_280 1km_324_278	511787 509653 512416 512416 512416 514872	
ding_Mo	00143014           20074           200757           200757           200757           200757           200757           200757           200757           200757           200757           200757           20077	Shape * 'ourt 'our	OBJECTID 1716234 1716234 1716237 1716235 1716235 1716235 1716239 1717 1716239 1717 1716239 17176239 17176239 17176239 17176239 17176239 17176239 17176239 17176239 17176239 17176239 17176239 17176239 1717777 1717777777777777777777777777	40625999 R 40625999 C 406259990 C 40622763 R 40622761 R 406227751 R 406227751 R 406227751 R 20555 Selected) 25555 Selected) 26560 26560 26560 26560 26560 26560	08JECTID 1710633 1710639 1710661 1710663 1710663	N         N           N         N	N         N           N         N           N         N           Y         N           Y         N           Y         N           R         C           C         C           C         R           R         R           R         R	s derol N N N N N N N	N N N N N N N N N N N N N N N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED SEMI-DETACHED BUNOALOW DETACHED BUNOALOW BUNOALOW BUNOALOW N N N N N N N N	MOR4 MOR4 MOR4 MOR4 MOR4 MOR4 MOR4 MOR4	00H 00H 00H 00H 00H 00H 00H 00H	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000000000000000000000000000000000000000	000000000000000000000000000000000000000	1km_320_282 1km_318_281 1km_321_280 1km_321_280 1km_324_278 1km_323_277	511787 509653 512416 512416 514872 509476	
ding_Mo	nnaghan           TTUD_1*           29674           29675           29676           29677           29677           29678           29678           29679           29679           29679           29689           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599           29599	Shape *	OBJECTID 1716233 1716234 1716235 1716235 1716267 1716267 1716252 ■ (Ø out ef 1 1 1 1 1 1 1 1 1 1 1 1 1	40625969 R 40025969 C 40025960 C 40027943 C 40027751 R 40027751 R 40027751 R 20595 Selected) 20595 Selected) 20596 20596 Selected 20596 Selec	08.#CTI0 1710633 1710639 1710661 1710662 1710663 1710663 1710671	N N N N N N N N N N N N N N N N N N N	I         N           I         N           I         N           I         N           I         N           I         Y           I         Y           I         Y           I         Y           I         N           I         C           I         C           I         C           I         R           I         R           I         C	s derol N N N N N	N N N N N N N N N N N N N N N N N N N	N N N N N N N N N N N N N N N N N N N	DETACHED DETACHED DETACHED DETACHED SEMIDETACHED BUNGALOW BUNGALOW BUNGALOW BUNGALOW N N N N N N N N N N	holidayHom N N N N N N N N N N N N N N N N N N N	00H 00H 00H 00H 00H 00H 00H 00H	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000000000000000000000000000000000000000	000000000000000000000000000000000000000	1km_320_282 1km_318_281 1km_321_280 1km_321_280 1km_324_278	511787 509653 512416 512416 512416 514872	_

- Close ArcMAP
- Open Build\_Mon\_1km.mdb in Access
- Create a GeoKey based on count of residential buildings; "ShrRcount":
- Create a select query ("q01\_CountByUse") that counts buildings in Build\_Mon\_1km by grid cell and by building use, and set the criteria for building use to "R" (residential). Group by "ID\_1kmIE" and "Grid1kmIE", and count by "buildingUs" where the Criteria is set to "R"
- Create a select query ("q02\_Count All") that counts buildings in "q01\_CountByUse" by building use, and set the criteria for building use to "R" (Count by for "buildingUs")
- Create a Make table query ("q03\_Share\_count") that calculates the share of Rbuildings by grid cell ("ShrRcount":[CountOfbuildingUs]/[CountOfCountOfbuildingUs]). Set the new Table name to "ShrRcount"



File Home Create External Data Database	Tools Desig		-	Building	L'Monagnan i Lutabase	(Access 2002 - 2003 1	re tormato + Microsoft	Acces			_	_		0 0
View Run Results Crestals De Query Type	siete 🖉 Pass-Thre	ntion Table	P Deletz Rows 💕 Inset P Deletz Rows 🖉 Dele N Duilder 📴 Retu Query Setup	te Columns	East Presenters	perty Sheet Sie Names								
All Access Objects 🛞		untilyUse p q02	CountAll											*
Tables Build, Man, Lim, Shape, Jodes Build, Man, Lim, Shape, Jodes Building, Monaghan Building, Monaghan Golf, Columbrids		CountByUne * ID_SimilE GentSknitE buildingUs CountOfbuildingUs												
001, cerear columns           002, preventations right           003, preventations right           004, preventations right           004, preventations right           004, preventations           005, preventations           004, preventations           004, preventations           004, preventations           004, preventations														
Selections Shiftcount														
StyRpop	4.100													
Queries g q01_CountByUse	Table	CountOfbuildingUs glt_CountByUse Count	5 💽											
🗇 q02_CountAll	Sort	UN IN	8	10			-	12	15	15		10		
1     400_5Mare, count       2     11_SumPopEqUae       2     41_SumPopEqUae       2     41_SumPopEqUae       2     41_SumPopEquae	Criteria or	N					n		B		21			1
Fork		4.1.11											Numian	,
Really													Numtock	13 il /l +4

A A A 7	ols Desig		Building_Mon	aghan : Database (Acc	cess 2002 - 2003 file format) - Microsoft Access	And Address of the owner owner owner owner own			- • ×
View Run Results Select Make Append Update Crosstab Delet Table Query Type	OD Union     Pass-Thr     Z Data Del	ough 🛄 🍺	K Delete Rows 🖉 D	elete Columns elete Columns etum: All *	Totals Parameters Table Mames				
All Access Objects	Q03_SI	hare_count							×
Search.									-
Tables 2		q01_CountByUse		q02_CountAll					
Build_Mon_1km		ID_1kmlE		CountOf	CountOfbuildingUs				
Build_Mon_1km_Shape_Index		Grid1kmIE			A DAMA DADA A RANK				
Building_Monaghan		buildingUs CountOfbuildingU	us l						
Building_Monaghan_Shape_Index									
GD8_ColumnInfo									
GDB_GeomColumns				L					
GDB_ItemRelationships									
GDB_RtemRelationshipTypes					Make Table		9 ×		
GD8_Rems					Make New Table				
GDB_Rems_Shape_Index					Table Name: ShrRcount		OK		
GDB_RtemTypes					Current Database	121	Cancel		
GDB_ReplicaLog					C Another Database:				
GDB_SpatialRefs					File Nome:				
SelectedObjects						Browse			
I Selections									
StuRcount	4 [10]								•
ShrRpop		ID 1kmIE	Grid1kmlE	buildingUs	ShrRcount: [CountOfbuildingUs]/CountOfCountOfbuildingU				
Queries *	Table	g01_CountByUse	q01_CountByUse	q01_CountByUse	shincount: [countofbuilding0s]/[countofcountofbuilding0	i izi			
g01_CountByUse	Sort		(Z)	2	2	10	10	1	17
g02_CountAll	Criteria	4			E1				
g03_Share_count	10								
g11_SumPopByUse									
g12_SumPop_All		-							
gl3_Share_Pop									
		4.[m]							(F)
Ready				1.00			-		ET 100 M

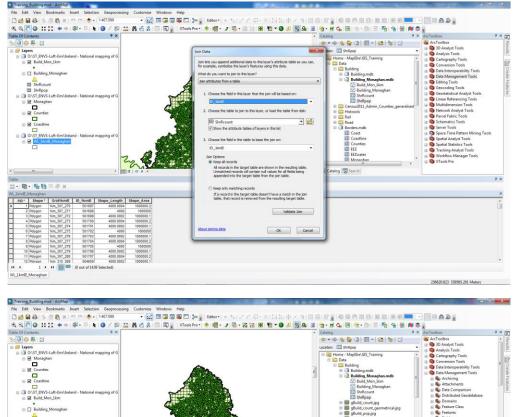
Create a GeoKey based on population in residential buildings; "ShrRpop":

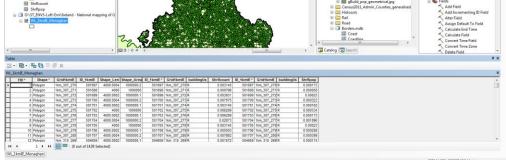
- Create a select query ("q11\_SumPopByUse") that sum the population in "Build\_Mon\_1km" by grid cell and by building use, and set the criteria for building use to "R" (residential)
- Create a select query ("q12\_SumPopAll") that sum the population in "q11\_SumPopByUse" by building use, and set the criteria for building use to "R"
- Create a make table query ("q13\_Share\_pop") that calculates the share of population in R-buildings by grid cell. Set the new Table name to "ShrRpop"

	The Home Create External Data Database To	Query			Bui	Iding_Monaghan ( Databa	ise (Access 2002 - 20	03 file format) + Micro	osoft Access			_	_	_	
Destination         Destination           Indextransformed rest plane         Indextransformed rest plane           Indextransformed rest plane         Indextransformed rest plane      <	View Run Seet Adata Append Update Crossbab Deat	C Union	1	Deleta Rows 2 A Duilder	Delete Columns Return: All •	Total Parameters	Table Names								
Image: Status	All Access Objects	all Se	mPop@yUse												×
Image: Status	Search.	0													
Instant     Image: Control of the stant of t	Table         n           Instruction         Instruction           Instruction         Instruction		<ul> <li>OBITCHD_1</li> <li>Shape</li> <li>Join, Count</li> <li>TARGET_HD</li> <li>OBITCHD</li> <li>Duildingld</li> <li>Duildingld</li> <li>Duildingld</li> <li>dereist</li> <li>waant</li> <li>denoished</li> <li>holdayttom</li> <li>buildingly</li> <li>county</li> <li>smalkees8</li> <li>edid</li> <li>pob, per, ho</li> <li>GridLimE</li> </ul>												.0
Control         Control <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>															
Control         Control <t< td=""><td>Shrkpey</td><td>110</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Shrkpey	110													
Image: Control of the state		1.00	-												121
(b)     (c)     (c) <td></td> <td>Field</td> <td>ID_timE</td> <td>GridtkmlE</td> <td>buildingUs</td> <td>pop_per_ho</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		Field	ID_timE	GridtkmlE	buildingUs	pop_per_ho									
Sile     M	g02_CountAll	Table	Build Mon 1ka Geoup By		Build_Mon_1km Group By	Build_Mon_1km									
(b)     (b)     (b)       (c)     (c)       (c)     (c)       (c)     (c)       (c)     (c)	g03_Share_count	Sort										1000			
	1 gil SumPerfective			(X)	- R	×.	10		10	10	13		E	12	
					-										
Resty Burntont D a A war V			( <b>4</b> ) a)												

Ren Seet Mass Append Update Crostab Deles Show Table Σ Property She Deleta Rover Make Table Jeans, **Jokes Solids, Man, Like, Build, Man, Like, Build, Man, Like, Build, Managle Build, Managle Build, Managle Gott, Cleans, Like, Gott, Senikation Gott, Reinkation Gott, Reink** ID\_1kmlE Grid1kmlE buildingUs SumOfpop\_per\_ho Pield SumOtpop\_per\_ho table Total Sot Show Criteria or 11 11 11 11 15 11 -Run Select Make Append Update Crosstab Delete Zata De Σ ? Show Table V Insert Columns Delete Columns ..... All Access Objects q11\_Su Pop\_All ID\_1kmIE Grid1kmIE fpop\_per\_ho Make New Table Table Name: Shri Current Databa Another Databa ОК Cancel Field: ID\_1kmIE Table: g11\_SumPopByUse Sort: Show: IZ Grid1km8E buildingUs q11\_SumPopByUse q11\_SumPopByUse Ofpop\_per\_ho] 💌 op\_per\_ho] V ¥ 8 в B E J

- Close Access
- Open Training\_Building.mxd
- Add the tables "ShrRcount" and "ShrRpop"
- Join "ShrRcount" and "ShrRpop" to "WL\_1kmIE\_Monaghan" (right click "WL\_1kmIE\_Monaghan" and select Joins and Relates, Join). Use "ID\_1kmIE" as join field and select the join option Keep all records
- Open the attribute table and verify that columns from both tables appear



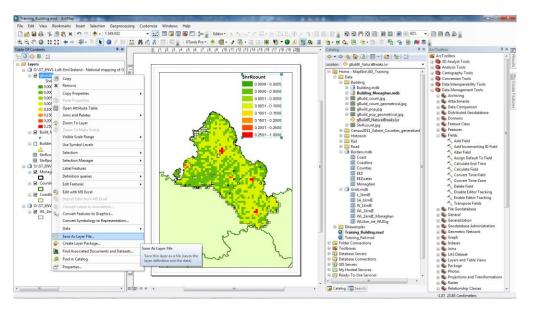


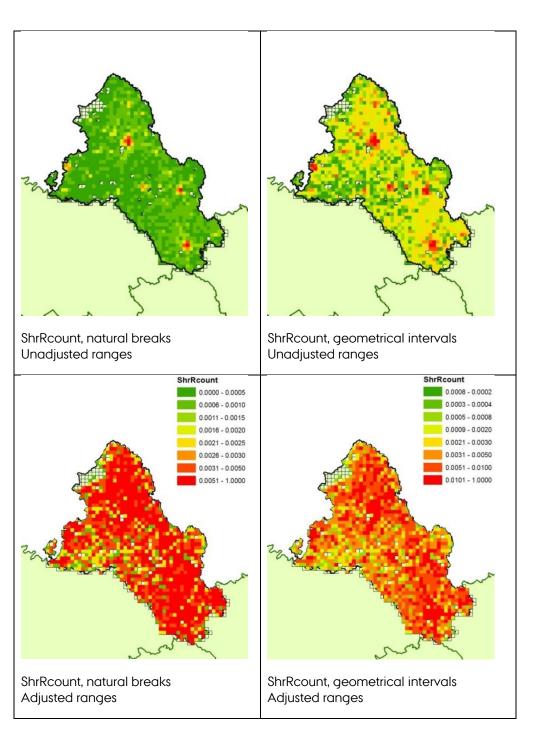
- Export the joined data to a new layer named "gBuilding" and add it to the map
- Remove all joins from "WL\_1kmIE\_Monaghan" (right click the layer in table of content, select Joins and relates and Remove all joins)
- Create maps for the two GeoKeys, using different classifications, and compare the maps

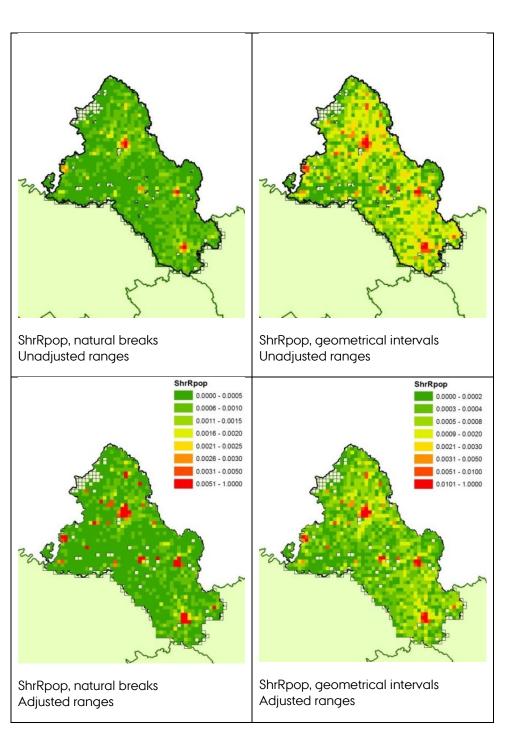
**Hint**: Saving symbology in layer files can be helpful for comparing maps of different parameters, using the same symbology. But be aware that values outside the ranges set in a layer file will not be displayed. E.g. if the maximum value in the value field

ANNEX 8 - PREPARING A GEOKEY FOR A POINT SOURCE

that the layer file is based on ("ValueField1") is exceeded in the value field to which the layer file is applied ("ValueField2"), the values in "ValueField2" that exceed the maximum of "ValueField1" will be excluded from the map. The same can be the case for minimum values



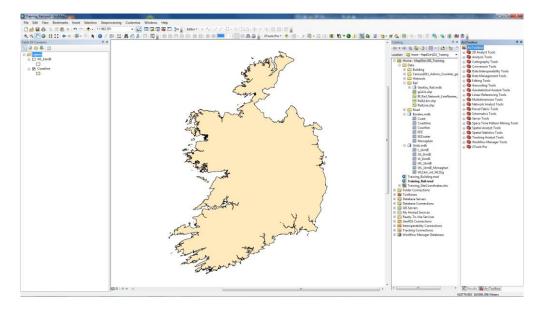




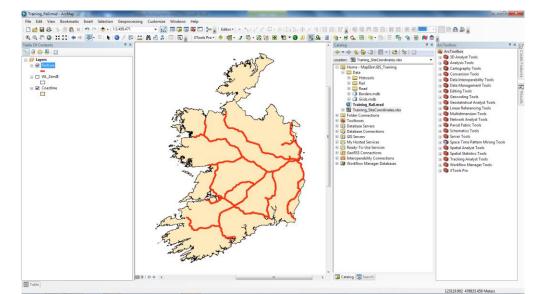
ANNEX 9 – PREPARING A GEOKEY FOR A LINE SOURCE

# Annex 9 - Preparing a GeoKey for a line source

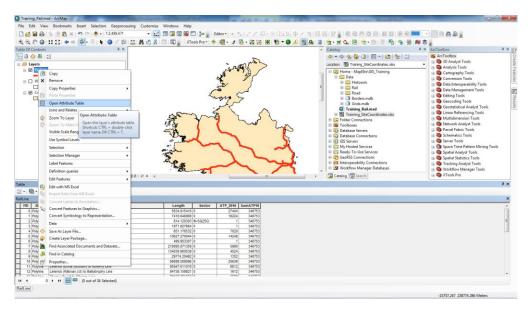
- Open ArcMAP and create a new mxd file (...\\MapEIre\GIS\_Training\Training\_Rail.mxd)
- Add the coastline (...\\MapElre\GIS\_Training\Data\Borders.mdb\Coastline ) and the 1 km grid (...\\MapElre\GIS\_Training\Data\Grids.mdb\WL\_1kmIE) using the Add data button or Drag-and-drop from ArcCatalog



Add the shapefile RailLine (\\MapEIre\GIS\_Training\Data\Rail\RailLine.shp)



 Open the attribute table for RailLine (right click layer in table of content, TOC). The attribute table holds the parameters for each line; name, annual train passages in 2016 ("ATP\_2016"), and sum of annual train passages in 2016 ("sumATP16")



 Use Add field from the attribute table menu to add 3 new fields for calculation. Name the fields "Length", "ATP16xLen" and "ShrATP16xL", and set the Type to Double 🔾 Tri

A

0 Switch Selection

rint

RailLine

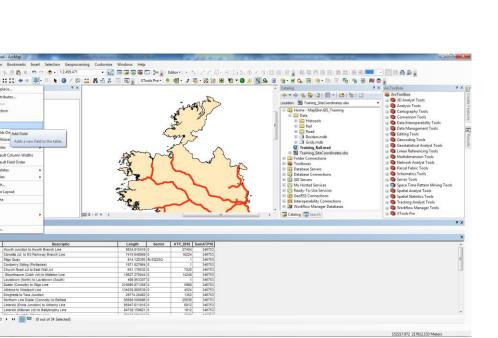
Athlone Drophed Northern Limerick

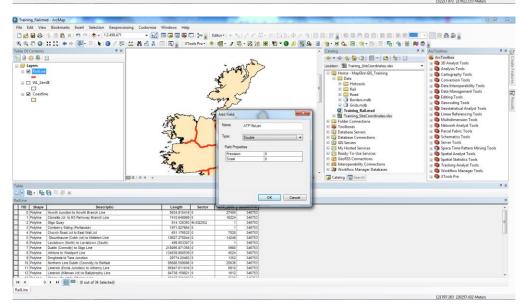
0 + + =

 File
 Edit
 View
 Bookmarks
 Insert

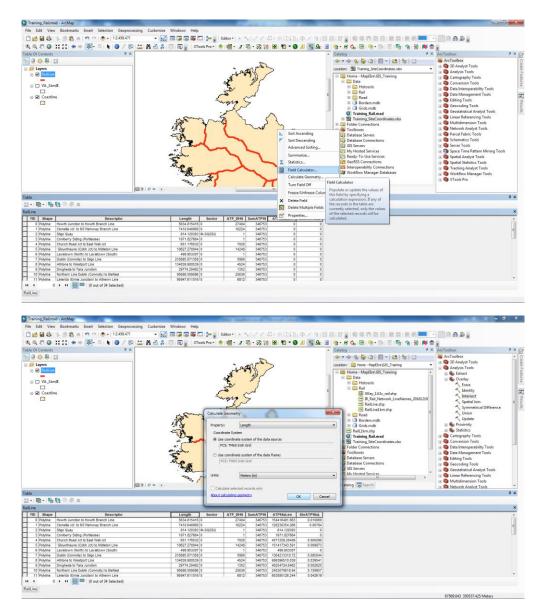
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □
 □</td

Adds a tore Default Column Widths oins and Relates

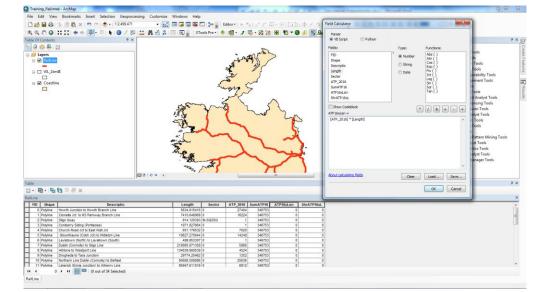




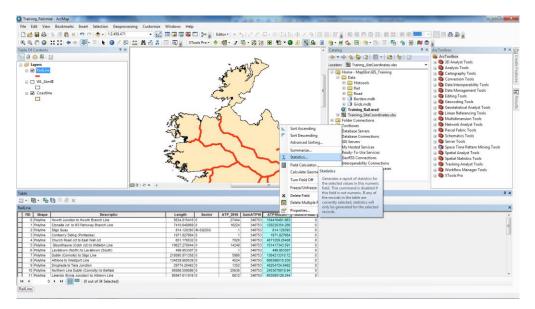
Open the Calculate geometry tool by right click on the column name "Length" • and calculate the length of each rail line. Make sure the calculation use the TM65 projection

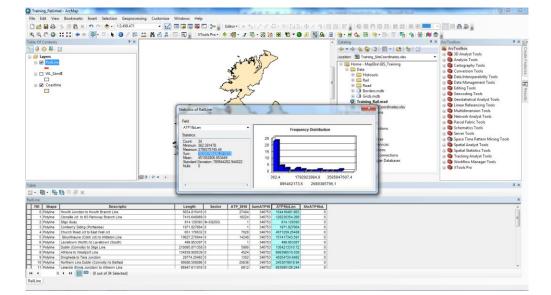


• Open the Calculate field tool by right click on the column name "ATP16xLen" and calculate values as [ATP16xLen] = [ATP\_2016] \* [Length]

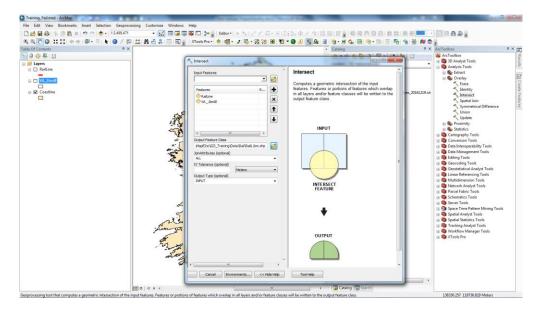


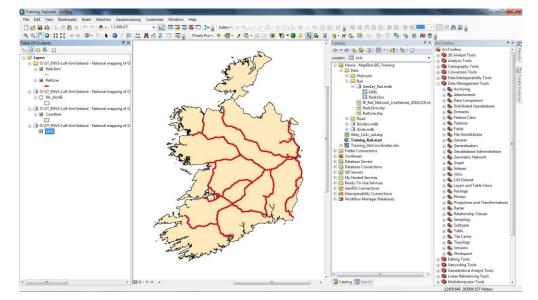
 Right click on the column name "ATP16xLen" and use the Statistics tool to calculate the sum for the column. Copy the sum for calculation of shares (Sum=15335795426.217272)



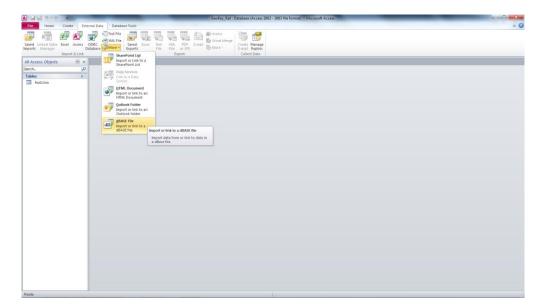


- Use Calculate field and calculate values as ([ShrATP16xL]=[ATP16xLen]/15335795426.217272), where 15335795426.217272 is the sum of ATP16xLen
- Use Statistics to verify that the sum of shares ("ShrATP16xL") is 1
- Use the Intersect tool in ArcToolbox (ArcToolbox\AnalysisTools\Overlay\Intersect) to intersect "RailLine" and "WL\_1kmIE". Save the new layer as RailL1km and add it to the map

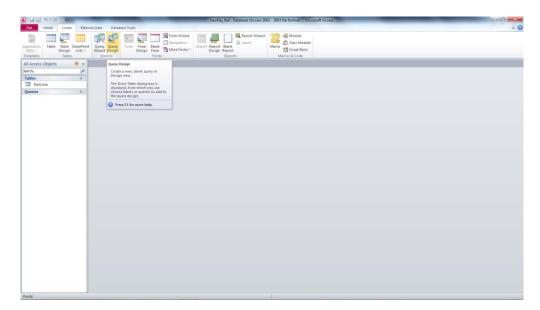




- Open the attribute table for "RailLine1km"
- Add a new field "Length1km" as double, and use Calculate geometry to calculate the length of the intersected line segments
- Add a new field "LenPrRoute" as double, and calculate values as ([LenPrRoute]=[Length1km]/[Length]) using Field calculator
- Add a new field "g1A3c" as double, and calculate values as ([g1A3c]=[ShrATP16xL]\*[LenPrRoute]) using Field calculator. Use Statistics to verify that the sum of "g1A3c" is 1
- Close ArcMAP
- Create a new access database (make sure to use the 2002-2003 format \*.mdb) and save as GeoKey\_rail.mdb
- Import the attribute data from RailL1km using the Import DBF file tool in Access



 Create a new query ("q1A3c") and drag the table "RailL1km" to the query. Drag the fields "ID\_1kmIE" and "Grid1kmID" to the selected fields. Add "Year" and "Share" in two new fields using the statements Year: "9999" and Share:g1A3c

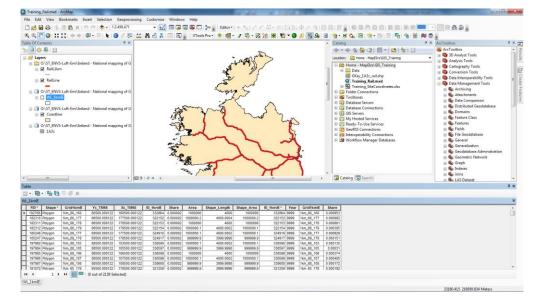


- Use the ∑ tool to Group by ID\_1kmIE, Grid1kmID and Year, and to summarize g1A3c in the field Share
- Change the query to a Make table query, naming the output table 1A3c
- Save and run the query to create the table "1A3c"

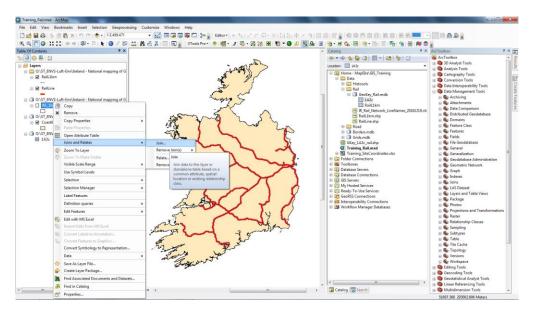
 Open the GeoKey table "1A3c" and use the ∑Totals tool to verify that the shares sum to 1 (a minor difference may occur when data moves between different programs)

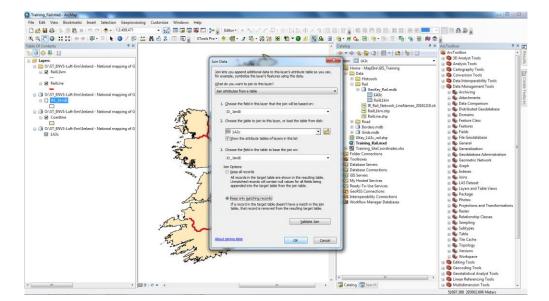
A DU Y CH	The scending Selection -			Eas Replace	Calibri		- 11 -	10 10	i ele ele	Here .		
View Paste	Filter			👄 Go To =								
* Format Painter	20 Remove Sort V Toggle Filte	All Y DI	siete * 🔚 More *	là Select -	виц	4.0	- 22 -		=			
fiews Clipboard G	Sort & Filter	R	ecords	Find		Ti	ed Formattin	g .				
ll Access Objects 💿 «	IA3c											
erch. P	ID_1kmlE + Year +	Grid1kmlE +	Share +		_							
Tables 8	354965 9999	1km_110_91	0.000422426210454									
143c	354966 9999	1km_110_92	6.43307715071E-05									
Raillikm	355961 9999	1km 111 89	0.000457669387537									
	355962 9999	1km_111_90	0.000115193617929									
Queries ×	356025 9999	1km 111 153	0.000543640282562									
1 q1A3c	356026 9999	1km 111 154	0.000438297434858									
		1km_112_88	0.000111326060066									
	356660 9999	1km 112 89	0.000277522338086									
	356725 9999	1km_112_154	0.000948514616429									
	356835 9999	1km 112 310	1.80805104969E-05									
	356836 9999	1km_112_311	0.00028414423144									
	356837 9999	1km 112 312	0.000221973960805									
	356838 9999	1km_112_313	0.000170377699091									
	357160 9999	1km_113_88	0.000413800271919									
	357225 9999	1km_113_153	0.000536941929827									
	357226 9999	1km_113_154	0.000482601518292									
	357265 9999	1km_113_259	1.28453015022297E-03									
	357266 9999	1km_113_260	0.00038541089928									
	357316 9999	1km_113_310	0.000268366830361									
	357609 9999	1km_114_84	0.000356382320492									
	357610 9999	1km_114_85	0.000373955442222									
	357611 9999	1km_114_86	0.000373986907474									
	357612 9999	1km_114_87	0.000374725295616									
	357613 9999	1km_114_88	0.000198281996241									
	357678 9999	1km_114_153	0.000957389425855									
	357768 9999	1km_114_309	None									
			Sum									
	357849 9999	1km_114_258	Average									
	357850 9999	1km_114_259	Count									
	358009 9999	1km_122_155	Maximum									
	358010 9999	1km_122_156	Minimum									
	358649 9999	1km_130_197	Standard Deviation									
	358650 9999	1km 130 198	Variance									
	Total		1.000000002336									

- Close Access
- Open Training\_rail.mxd inArcMap
- Import the table "1A3c" or use drag-and-drop from ArcToolbox

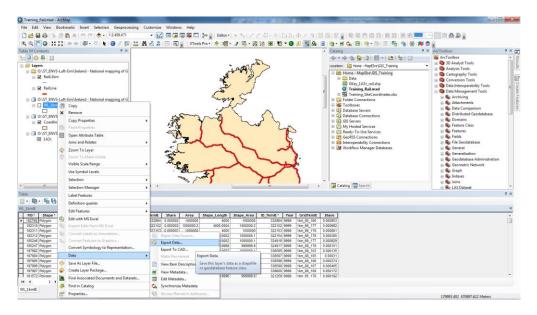


• Join the table "1A3c" to the layer "WL\_1kmIE" using "ID\_1kmIE" as join field (right click WL\_1kmI in the TOC, select Joins and Relates, Join). Keep only matching records and allow the program to create index

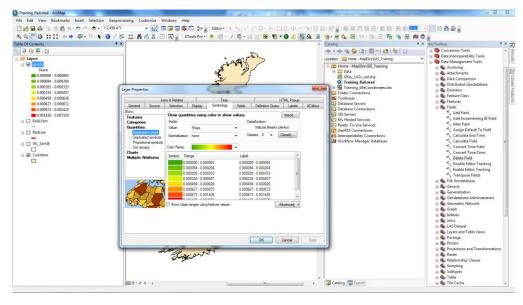


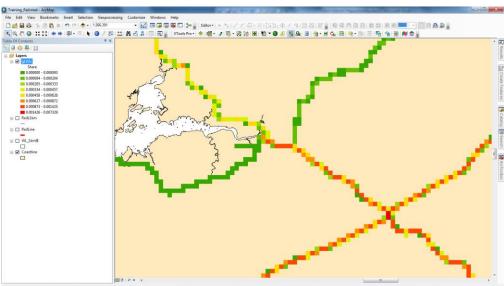


 Export the joined layer to a shape file or a geodatabase as "g1A3c" (right click WL\_1kml in the TOC, select Data, Export data), and add the new layer to the map



• Use Layer properties to change the symbology for "g1A3c". Set Share as Value field, and change Show to Quantities/Graduated colours. Select an appropriate number of classes, colour ramp, symbols and labels. E.g. use the classify tab to change classification method, exclusions and sample size





ANNEX 10 - WORKING WITH COORDINATES AND PROJECTIONS

## Annex 10 – Working with coordinates and projections

### Part 1: Coordinate transformation using Franson CoordTrans

Find and transform geographical coordinates. Use EPA, Monaghan as an example

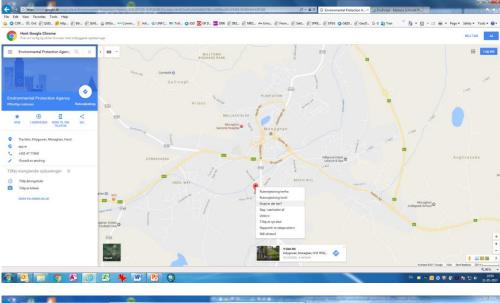
Open Google Earth and search for EPA, Monaghan. Read the coordinates in the bottom line

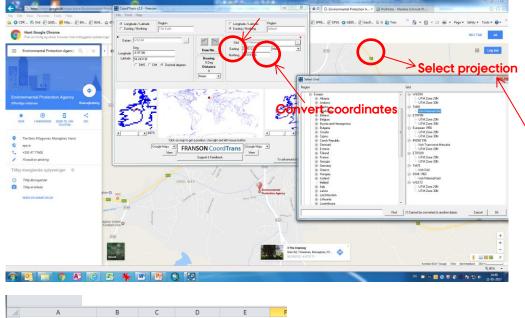
**Hint**: If coordinates don't show, right click the point of interest, select "What's here", and read the coordinates in the pop-up window. The format of the coordinates is decimal degrees and the datum is WGS84.

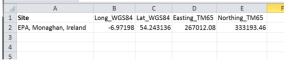
 Open the coordinate transformation program Franson CoordTrans (http://coordtrans.com/coordtrans/)

**Hint**: A 7 day free trial version of the program can be downloaded for free. A licence must be purchased to get unrestricted use of the program, including the feature to convert numerous coordinates in a file at one run

- Type in the first set of coordinates in the left side of the window. Make sure to select the right input type (Longitude/Latitude or Easting/Northing) and the right datum. Use the button right to the datum field to browse the datum.
- Change the settings for the output coordinates in the right side of the window. Select the output type (Longitude/Latitude) and set the output projection in the right side of the window (TM65 Irish National Grid). Use the button right to the grid field to change the selected grid.
- Click the arrow pointing to the right to convert the data in the left side of the window to the projection set in the right side of the window. Verify the location in the maps in Franson CoordTrans.







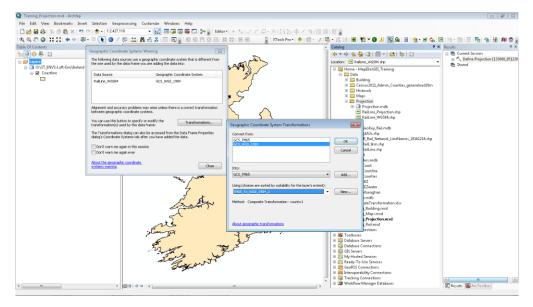
### Part 2: Working with projection - Project

The railway network has another projection than TM65, which is used in the MapElre model. The projection is WGS84. To be able to calculate geometries (length, area and coordinates) correct for use in the model, the file must be reprojected.

Open \\MapEIre\GIS\_Training\Training\_Projection.mxd

- Add \\MapElre\GIS\_Training\Data\Borders.mdb\Coastline
- Add \\MapEIre\GIS\_Training\Data\Projection\RailLine\_WGS84.shp

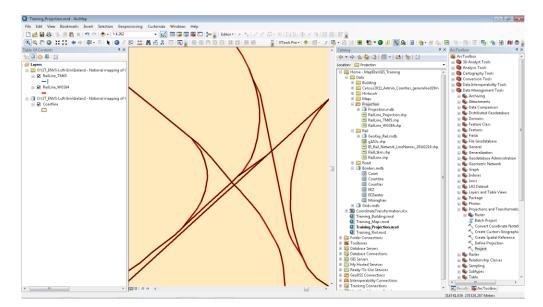
**Hint**: A warning appears when the geographical coordinate system for the added layer and the data frame is different. Select a built in transformation to let ArcMAP make an on-the fly reprojection to draw the added layer correct on the map. Note that the projection is not changed in the file.



 Change the spatial reference of RailLine\_WGS84 to TM65 using the Project tool (ArcToolbox\DataManagementTools\ProjectionsAndTransformations\Project). Save as \\MapEIre\GIS\_Training\Data\Projection\RailLine\_TM65.shp

Training_Projection.mxd - ArcMap						6.5
File Edit View Bookmarks Insert Selection Geopr						
। 🗋 🛃 🍓 🔥 🛞 🖏 🔊 🕾 🔊 🕾 🔥 • । 1:2,427,11		料フィカ・米国地中区の1回回1回				
े 🍳 🔍 🖑 🥥 💥 😫 💠 🔶 🔯 - 🖾 ┣ 📵 🚈			📲 💽 📲 🐨 🚱 🕖 🖡	🛐 💁 🗃 🦙 - 🖻 🖕 🞚	🖻 । 📚 • 🎼 । 📰 । 🖫 । 🐁 । 🐞 । 🍂 ।	•
Table Of Contents 7	S Project		9	# ×	ArcToolbox	<b>#</b> >
Image: Section 2016         Image: Section 2016           Image: Section 2016         Image: Section 2016           Image: Section 2016         Image: Section 2016           Image: Section 2016         Image: Section 2016	Type Debased or Feature Class           Ruillune_W0534           Paulic Conductors System (optional)           GC_W052_1094           GC_W052_1094           WbgE Perform Grassrow           WbgE Perform Grassrow           GC_W0540	Output Coordinate System The coordinate system to which the input data will be projected. Spatial Reference Properties	r 🖶 🏠 🕼 🧊 🚽 r r 🖻 Railine_WGS84.shp Home - MapEire\GIS_Train Data () 🔄 Building () 🔂 Census2011.Admin ()	ing	Image: Control of the second secon	1
	Cape Contants System Cape Contained Contained Cape Contained Contained Cape Contained C	Tr Conditude System     ■ Conditude System       Implements in south     ● State Flow       Implements in south	***	in.itg hyp ; i.inebime.,2010239.itg innutis at	Antochimet     Antochimet     Data Company     Data	atic tati
× ,	OK Canod Environments < <hda heb.<="" td=""><td></td><td>CK Cancel GeoRSS Connections Interoperability Connections Tracking Connections Workflow Manager Databa</td><td>ses</td><td>Create Spatial Reference Project Santar</td><td></td></hda>		CK Cancel GeoRSS Connections Interoperability Connections Tracking Connections Workflow Manager Databa	ses	Create Spatial Reference Project Santar	

• Zoom in on the map to verify that the two layers overlap



### Part 3: Working with projection - Define projection

- Open ...\\MapElre\GIS\_Training\Training\_Projection.mxd
- Add ...\\MapEIre\GIS\_Training\Data\Borders.mdb\Coastline
- Add ...\\MapEIre\GIS\_Training\Data\Projection\RailLine\_Projection.shp

Hint: Zoom to full extend if the data does not appear in the view

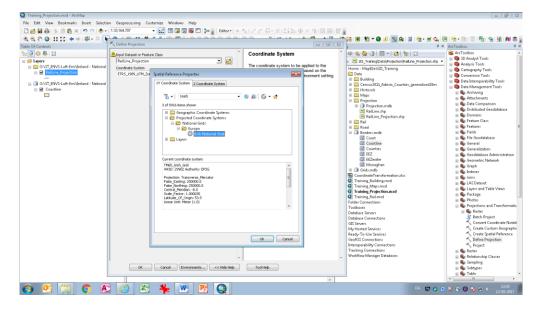
• Check the spatial reference of RailLine\_Projection in Layer properties (right click the layer in table of content, TOC)

rojection.mxd - A View <u>B</u> ookmarl							トレア ロ・米日	国际中区項目目	I FR H			
8 % 8 8 9 # # # •	$\times  $						R R 👔 XTe	ools Pro • 🚸 🗐 • 🥒 🛙	🌢 - 🚳 😫 🗃 •	0 I 🖲 🕰 🗏 🥱 🖉 🕼	🖲 i 🗣 • 🎼 🗮 🖷	1 😪 🕌 🛝
ents B			4 ×					-	Catalog	; ∭ -   <b>2</b>   1≥  3	ArcToolbox	
				5	e.					ng\Data\Projection\RailLine_Projection.shp	🗉 🔘 3D Analyst Tor	ols
ST_ENVS-Luft-Em	ni∖Irela	and - I	National mapping	2	- al				😑 😂 Home - MapEle		H S Analysis Tools     H S Cartography T     H     S Analysis Tools     H	: Feels
RailLine_Projectio	1	£op	nv	-					🖯 🔚 Data 🕑 🚰 Building		🗉 🧐 Conversion To	ools
ST_ENVS-Luft-Em	×	Ben	nove						E Gensus	l 111_Admin_Counties_generalised20m	🗄 🧐 Data Interoper 🖂 🧐 Data Manager	rability Tools
Coastline		Cop	py Properties		•				🗉 🚞 Histosol 🗉 🧮 Maps	3	Data Manager	ment roots
			te Properties						🗉 🧰 Maps	on		
	=	Ope	en Attribute <u>T</u> able						🖻 📑 Proje		Source Data Comp     Source Distributed	
			ns and Relates		•				Rail	ine.shp ine_Projection.shp	🗉 🗞 Domains	
	⊲∕	Zoo	om To Løyer						🖲 🧰 Rail		<ul> <li>Seature Cla</li> <li>Seatures</li> </ul>	<b>a</b> 55
			om To <u>M</u> ake Visible						🗉 🚺 Borders.	mdb	🗉 🇞 Fields	
			ible Scale Range		,				Coa:	t	🗉 🇞 File Geoda	tabase
			Symbol Levels		_				Cou		Son General     Son Generalizat	tion
		-	ection		•				ED EEZ		🗉 🇞 Geodataba	
			ection Manager		•				🖾 Mor	aghan	i Seometric Seometric	Network
		-	iel Features		_				🗉 📑 Grids.m	db	<ul> <li>South State</li> <li>South St</li></ul>	
			linition queries		•				Coordinate     G     Training_Bu	Fransformation.xlsx iilding.mxd	🗉 🇞 Joins	
					•				🔾 Training M	ap s.mod	<ul> <li>In the second sec</li></ul>	et E Tabla Missor
			t with MS Excel port Edits from MS E						Q Training_Pr Q Training_Ra	ojection.mxd	E Spers and Spers and Package	I TODIC VIEWS
					_				🗉 📴 Folder Connect	ions	🗉 🇞 Photos	
			overt Labels to Anno nvert <u>F</u> eatures to Gri						B S Toolboxes     Database Server		Source Section:     Source Section:     Source Section:	s and Transfo
			nvert Symbology to						III 😳 Database Serve	ections	🗉 🇞 Relationsh	iip Classes
		Dat	5 = 25						III 🛐 GIS Servers III 🔁 My Hosted Serv		<ul> <li>Sampling</li> <li>Subtypes</li> </ul>	
	0	Sav	e As Layer File		-				🗷 🔀 Ready-To-Use :	Services	🗉 🇞 Table	
			ate Layer Package						GeoRSS Conner     GeoRSS Conner	tions	🗉 🇞 Tile Cache	
	DA.	Find	d Associated Docum	ents and Datasets					🗉 🗔 Tracking Conn	tctions	Society     S	
	4	Fine	d in Catalog						🗄 🎯 Workflow Man	ager Databases	🗉 🇞 Workspace	e
	1	Pro	pertjes					45.4			Editing Tools	
	-							620			m 💼 Georgeting To	
			,	Layer Properties Display the prop	erties of this layer			<u>الل</u> 			B Geocoding To Geocoding To	Analyst Tool
rojection.mod - A View Bookman			, Selection Geop	Display the prop	erties of this layer			يم ب			Geostatistical     Geostatistical     Geostatistical     Geostatistical     Accredit      Geostatistical     Accredit	Analyst Tools
View Bookman	ks In ×	insert	×   🛧 🛛   1:33,164	Display the prop rocessing Custon 707 •	ize Windows Help	Editor • 🕨				• 4 • • • • • •	Geostatistical     Geostatistical     A	Analyst Tools aolbax 19 Meters
View Bookman	ks In ×	insert	×   🛧 🛛   1:33,164	Display the prop rocessing Custon 707 •	ize Windows Help					• ● J ■ ■ ● # 4	a Georatatised. C Results G AccTo 2191598.546 - 3501488.49 2191598.546 - 3501488.49 x AccToolbox	Analyst Tools aolbax 19 Meters
Aew Bookman I 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ks In ×	insert	×   🛧 🛛   1:33,164	Display the prop	ize Windows Help	Editor • 🕨			●・図 図 圏 間・ Catalog 中・中 全 優 図	:  ∭- ≅ % ∷	Contabilitation     C	Analyst Tools oolbox 19 Meters
Alew Bookmari Bill 14 (20) (20) Di 333 33 (14) Ales Ales Ales Ales	ks In ×∣ ⇒∣	insert ) () ()	×   ◆ •   1:33,164. • □   ▶ ① // ₽ ×	Display the prop	ize Windows Help	Editor • 🕨			- SS S3	ہ ای ای ا	Gentatistical     AccTo	Analyst Tools solbox 19 Meters
View Bookmarf Di 14 (10) (10) Di 111 (11) Di 111 (11)	ks In ×∣ ⇒∣	insert ) () ()	×   🛧 🛛   1:33,164	Display the prop	ize Windows Help	Editor • 🕨			●・図 図 圏 間・ Catalog 中・中 全 優 図	ہ ای ای ا	ArtToolbox	Analyst Toels aolbax IS Meters
View Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>1:33.164</li> <li>1:33.164&lt;</li></ul>	Display the prop	ize Windows Help	Editor • 🕨			- SS S3	ہ IngData/Projection/RaiLine_Projection.shp eVGIS_Training		Analyst Tool aolbax 19 Meters
View Bookman	ks In ×   ⇒	insert	×   ◆ •   1:33,164. • □   ▶ ① // ₽ ×	Display the prop	ize Windows Help	Editor -   >	Time	123 th: φ × 9   2 2 sold Po+1 ♦ (■ • ₽ 1	Catalog Catalog Coation:	ہ ای ای ا	C Geratssical     C Gerat	Analyst Toel oolbox IS Meters IS Meters IS Meters IS IS IS IS IS IS IS IS IS IS IS IS IS IS I
View Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>1:33.164</li> <li>1:33.164&lt;</li></ul>	Display the prop	ize Windows Hele		Time	1533: ⊕ × 9 = 2	Catalog Catalog Coation:	ہ IngData/Projection/RaiLine_Projection.shp eVGIS_Training	Constantial     Constanti	Analyst Toel colbax 19 Meters 19 Meters 10 Meters
View Bookman Di View Bookman Di View Bookman New State ST_ENVS-Luft-Em Railline_Projecto 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>1:33.164</li> <li>1:33.164&lt;</li></ul>	Display the prop	ize Windows Help	Joins & Relates Searce Selection Di	Time	123 th: φ × 9   2 2 sold Po+1 ♦ (■ • ₽ 1	Catalog Catalog Coation:	agData)Projection/FaiLine_Projection.shp etGS2_Training 11_Admin_Counties_generalised20m	Constanticul     C	Analyst Toel solbax 19 Meters 19 Meters 10 Meters
View Bookman Di View Bookman Di View Bookman New State ST_ENVS-Luft-Em Railline_Projecto 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ize Windows Helj	Joins & Relates Source Steletion D Top: 33670	Time I Time	Sola Pro-	Catalog Catalog Coation:	a ing/Data/Projection/Balline_Projection.dp eVCE_Training III_Admin_Counties_generalised28m tion.mdb he.hp	Certatolici     Correctorio     Corrector	Analyst Toel solbax 19 Meters 19 Meters 10 Meters
View Bookman Di View Bookman Di View Bookman New State ST_ENVS-Luft-Em Railline_Projecto 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ize Windows Hele	Joins & Relates Source Steletion D Top: 33670	XTe     XTe     XTe     XTe     XTe     XTe     XTe     XSPN000m     Right: 333	123 th: φ × 9   2 2 sold Po+1 ♦ (■ • ₽ 1	Catalog Catalog Coation:	(USE_Training 11_Admin_Counties_generalised28m h	Constanting     Constanti	Analyst Toel oolbox 19 Meters 19 Meters 10 States 10 Sta
View Bookman Di Xi 20 (%) Di Xi 20 (%) Di Xi 20 (%) ST_ENVS-Luft-Em Reilling_Projection 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ize Windows Hel	Joins & Pelates Source Statestion D Top: 33670	XTe     XTe     XTe     XTe     XTe     XTe     XTe     XSPN000m     Right: 333	Sola Pro-	Catalog Catalog Coation:	a ing/Data/Projection/Balline_Projection.dp eVCE_Training III_Admin_Counties_generalised28m tion.mdb he.hp	Constantial     Constanti	Analyst Toel oolbox 19 Meters 19 Meters 10 States 10 Sta
View Bookman Di Xi 20 (%) Di Xi 20 (%) Di Xi 20 (%) ST_ENVS-Luft-Em Reilling_Projection 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ize Windows Helj	Jore & Pelder Jore & Pelder Source Selection D 1.60000 m Bottom: 60000	Image         Image         Image         XTe           pplay         Symbolicgy	Sola Pro-	Catalog Catalog Coation:	a ing/Data/Projection/Balline_Projection.dp eVCE_Training III_Admin_Counties_generalised28m tion.mdb he.hp	Centantical     Contaction	Analyst Toel aolbox 19 Meters 19 Meters 10 Met
View Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	Iz Window Hell	Jore & Privers	XTe     XTe     XTe     XTe     XTe     XTe     XTe     XSPN000m     Right: 333	Pats Definition Berry 1277-13000 P	Catalog Catalog Coation:	A      A	Constanting     Constanti	Analyst Toel aolbax 19 Meters 19 Met
iew Bookman i i i i i i i i i i i i i i i i i i i	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	Iz Window Hell	Jore & Privers	Time splay Symbology 8.549000 m Right: 331 He Feature Class	Pats Definition Berry 1277-13000 P	Catalog Catalog Coation:	1 1 1 1 1 1 1 1 1 1 1 1 1 1	Constanting     Constanti	Analyst Tools aolbax 19 Meters 19 Meters 10 States 10 St
ENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell	Jore & Pieder - P Jore & Pieder Source & Selectors & D Botton: 6099 Botton: 6099 Collar Source & Source Collar Source & Source & Source Collar Source & Source & S	Time splay Symbology 6. 549000 m Right: 331 5190000 m Ha Feature Class Junis-Lut-Enalyteland - Na	Pats Definition Berry 1277-13000 P	Catalog Catalog Coation:	organizational and a second	Constantial     Constanti	Analyst Toel aolbax 9 Meters 9 Meters 9 Meters 9 Meters 9 Meters 1 @ # # 1 @ #
View Bookman Di Xi 20 (%) Di Xi 20 (%) Di Xi 20 (%) ST_ENVS-Luft-Em Railine_Projectio 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	is: Windows Hell State Propertie Exprementation Containing Con	Line of the second seco	Time Time Lafay Symbology Refeature Class (JMS-Luft-Enl/bried - 1a (JMS-Luft-Enl/bried - 1a (JMS-Luft-Enl/bried - 1a	Pats Definition Berry 1277-13000 P	Catalog Catalog Coation:	The second secon	Constantial     Constanti	Analyst Tool: aolbax 9 Meters 9 Meters 9 Meters 9 Meters 1 @ # 1 @
View Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Bottom 6000 Bottom 6000 Selectors Selectors Bottom 6000 Selectors Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Se	Time     Time     Time     Symbolicgy     Symb	Pats Definition Berry 1277-13000 P	Catalog Catalog Coation:	gravativescovipadame projection dip organativescovipadame projection dip dip Training 11./domini, Countries, generalized21m ben mdb le dip dip dis     dis dis dis dista dis     dis dis	Constanting     Constanti	Analyst Tool: aolbax 9 Meters 9 Meters 9 Meters 9 Meters 1 @ # 1 @
iew Bookman i i i i i i i i i i i i i i i i i i i	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Bottom 6000 Bottom 6000 Selectors Selectors Bottom 6000 Selectors Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Se	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Time           tage         Symbolicity           tage         Time	Edda Decision Composition	Catalog Catalog Coation:	The second secon	Constanting     Constanti	Analyst Toolson
iew Bookman i i i i i i i i i i i i i i i i i i i	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Bottom 6000 Bottom 6000 Selectors Selectors Bottom 6000 Selectors Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Bottom 6000 Selectors Se	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Time           tage         Symbolicity           tage         Time	Pats Definition Berry 1277-13000 P	Catalog Catalog Coation:	definition of the second	Constanting     Constanti	Analyst Toolson
View Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Time           tage         Symbolicity           tage         Time	Edda Decision Composition	Catalog Catalog Coation:	vignationalise and a second seco	Certantical     Constantical     Co	Analysi Tooloobaa 99 Meters 00
View Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Time           tage         Symbolicity           tage         Time	Edda Decision Composition	Catalog Catalog Coation:	Control of the second sec	Constanting     Constanti	Analyst Toello anothers on the southers on the southers of the
ENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	Edda Decision Composition	Catalog Catalog Coation:	and a second sec	Constanting     Constanti	Analyst Tools anothers anothers anothers another anoth
ew Bookman	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	solo Pro +	Contains	vignationalise and a second seco	Constanting     Constanti	Analyst Tools anothers anothers anothers another anoth
ENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	Edda Decision Composition	Contains	referentionals denned productional denned 11.4 denne, Countries, generalised 20m bennedb he den he den he den her proferentionals denned bennedb her proferentionals denned bennedb her proferentionals denned bennedb be	Constantion     Constanti	Analyst Tools anothers anothers anothers another anoth
ENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	solo Pro +	Control     Contro     Control     Control     Control     Control     Control     Co	and a second sec	Constanting Acres      Constanting Acres      Constanting Acres      Constanting Acres      Constanting Acres      Constanting      Const	Analyst Teels online:
iew Bookman i i i i i i i i i i i i i i i i i i i	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	solo Pro +	Contains	regravatives of the second sec	Constanting     Constanti	Analyst Tooli oolbox 9 Meters ool 5 Meters o
View Bookman Di Xi 20 (%) Di Xi 20 (%) Di Xi 20 (%) ST_ENVS-Luft-Em Railine_Projectio 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	solo Pro +		and a second sec	Constanting     Constanti	Analyst Teels oolbox 9 Meters
View Bookman Di View Bookman Di View Bookman New State ST_ENVS-Luft-Em Railline_Projecto 	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	Est Data Socre.	Contains	and a second sec	Constanting     Constanti	Analyst Teels oolbox 9 Meters
View Bookman Di 1	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors S	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	solo Pro +		and a second sec	Constanting     Constanti	Analyst Teel oolbox :
iew Bookman i i i i i i i i i i i i i i i i i i i	ks In ×   ⇒	insert	<ul> <li>1:33.164</li> <li>1:33.164</li> <li>1:32.164</li> <li>1:32.164</li> <li>2:32.164</li> <li>3:32.164</li> <li>3:32.164</li> <li>National mapping (</li> </ul>	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors Selectors Source Selectors Bottom 6000 Selectors Source Selectors Source Selectors Sourc	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	Est Data Socre.		and a second sec	Constanting     Constanti	Analyst Tool colless: S Meters S
ENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em CENVS-Luft-Em	ks In ×   ⇒	insert	National mapping (	Display the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors Selectors Source Selectors Bottom 6000 Selectors Source Selectors Source Selectors Sourc	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	Est Data Socre.		and a second sec	Constanting     Constanti	Analyst Teels solites (
View Bookman	ks In ×   ⇒	insert	National mapping (	Diplay the prop	ite Windows Hell W I I I I I I I I I I I I I I I I I I I	Jorg S Prider Source Selectors D Bottom 6000 Top: 3007 S Prider Source Selectors D Bottom 6000 Selectors Selectors Source Selectors Bottom 6000 Selectors Source Selectors Source Selectors Sourc	Time         Time           upper         Time           upper         Time           upper         Time           upper         Time           upper         Time           tage         Symbolicity           tage         Symbolic	Est Data Socre.		and a second sec	Constanting     Constanti	Analyst Tools another anothe

ANNEX 10 - WORKING WITH COORDINATES AND PROJECTIONS

The railway network is not located in Ireland on the map, and the projection is ETRS\_1989\_UTM\_Zone\_35N. The correct UTM zone for Ireland is 29N. Assume that the data set is correct, but have been assigned a wrong projection (this should always be verified by the data provider), and correct the projection to TM65 using the define projection tool.

 Correct the projection of RailLine\_Projection using Define projection (ArcToolbox\DataManagementTools\ProjectionsAndTransformations\Project\DefineProjection)



Verify on the map that the railway network is located correct on the map

## Annex 11- Importing a set of CRF variables

This procedure is useful if a lot off new CRF Variables has to be imported. You can mark all CRF Variables you need with a colour in CRF Reporting tables, run a macro and import the result to CRF\_Importer

- Open the macro sheet CRF\_macro.xlsm and copy the brown coloured cell in sheet 5
- Open the CRF Report and mark all cells you need in the CRF Report sheets with that colour. Paste the copied cell using the paste format function
- Select the Panel Developer, Select Macros, and Run Traverse\_MarkedCells
- Open the output file cel\_marked.csv from the same folder as the excel files, using a text editor.
- Change the output file in order to be able to import it properly to Access running the following find and replace (see example in the box below);
  - Replace : with ;
  - Replace " with nothing
  - Replace ][ with ;
  - Replace [ with nothing
  - Replace ] with nothing
- Save the file

#### Example of changing of csv file before import to Access

#### Before changing:

"Table1s1; [Public Electricity and Heat Production][Fossil fuels][Emissions][CO2][kt][no source][no method][no target][no option][no type] : 7A13F901-DB8D-4175-B68B-A7A6214B92AC; \$B\$10"

#### After changing:

Table1s1; Public Electricity and Heat Production;Fossil fuels;Emissions;CO2;kt;no source;no method;no target;no option;no type ; 7A13F901-DB8D-4175-B68B-A7A6214B92AC; \$B\$10

- Open the Access file CRF\_Importer
- Select External data, Select Text file, browse to documents and import *cells\_marked.csv*
- Run the query *qCRF\_Variable\_Append\_CellsMarked* to import only the rows with values, and not any notation keys like NO or IE
- Open the table CRF\_Variables and update the SectorID field.

