

How To Set Up A GIS Project

1. How to start a new GIS project:

The first step in using GIS in your research is to create a GIS project. A GIS project can be thought of as a space where you will do all your work with a specific set of data in order to achieve your intended outcome. This outcome might be as simple as making a map of locations where you recorded a particular species for inclusion in a presentation, report or paper, or it might be as complex as collating information from many different sources and looking at how they relate to each other on a spatial basis. Data are generally added to a GIS project as data layers, with each data layer representing a specific data set you wish to work with. Data layers come in a number of different types, such as points, lines, polygons or raster grids (see chapter five for more information), and all data within a single data layer must be of the same type.

Within a GIS project, there will be one or more data frames. A data frame is simply a grouping of all the data layers in a GIS project which can be displayed together and which can interact with each other. In general, when you start using GIS, it is best to only have one data frame in an individual GIS project. Once you get more experienced, you can start exploring the use of multiple data frames in the same GIS project.

At this stage, it is worth highlighting one feature of a GIS project which causes a great deal of confusion. When starting to work with GIS, most people assume that when you add a data layer to a project, you are somehow importing it into a file which contains all the information about the GIS project. This is not the case for most (but not necessarily all) GIS software. A GIS project is not like a word-processing document where you can paste in pictures from other files and which will then be stored within the project in a manner which is independent of their original source. Instead, a GIS project is more like a file with a list of addresses which tells the software where to find specific data layers on your computer. When you add a data layer to a GIS project, you are simply adding its address to this list. Similarly, when you delete a data layer from a GIS project, you are simply removing its address from this list. Therefore, each data layer in a GIS project is actually stored in a source file in a specific location on your computer and not in the GIS project itself.

This has some important implications for working with data layers in a GIS project. Firstly, if you move the source file for a data layer from one folder to another on your computer, any GIS projects which use that data layer will not be able to find it. This is because you will have changed its address and its actual location will no longer match that stored in the GIS project file. As a result, you need to think before you move data layer source files around your computer. This is one of the reasons why it is generally best to create a specific folder for your GIS data as it will reduce the chance that it will accidentally get moved to a new location without you realising it (see page 41 for more details).

Secondly, while, in general, you can only have one GIS project open at any one time, you can have the same data layers in a number of different GIS projects. This is important to remember because if you modify a data layer in one GIS project, the same modifications will appear in any others which use the same data from the same source file. For example, if you delete some features in a data layer in one GIS project, these will be deleted from the source file of the data layer and so will disappear from all GIS projects which use the same data layer. As a result, you should always archive an unedited copy of any data layers which you are going to modify, just in case you find that you have deleted something when working in one GIS project which is important for another one which uses the same data layer.

To create a new GIS project you first need to open your GIS software. For ArcGIS 10.1, this is best done by opening a module called ArcMap (which you can find in the program list in the windows START menu – it may be in a sub-folder called ArcGIS). In most cases, when you open ArcMap, you will be presented with a window which has the heading ARCMAP – GETTING STARTED. To create a new GIS project, click on NEW MAPS in the directory tree on the left hand side and then select BLANK MAP in the right hand section of the window. Now, click OPEN at the bottom of this window. This will open a new blank GIS project. This new project will not have a specific name associated with it. As a result, the first thing you need to do is click on FILE on the main menu bar and select SAVE AS. This will allow you to give your project a name and save it in a specific location on your computer. This new GIS project will have a single, empty data frame in it called LAYERS.

If the ArcMap module is already open (or if the ARCMAP – GETTING STARTED window does not appear when you open it), you can create a new GIS project by clicking on FILE on the main menu bar and selecting NEW. When the NEW DOCUMENT window opens, select NEW MAPS and then BLANK MAP in the order outlined above.

If you wish to create a new GIS project based on one you (or someone else) has already created, click on FILE on the main menu bar and select OPEN. You can then open the existing project you wish to base your new GIS project on. However, you will need to save it as a new project, otherwise anything which you do will change the contents of the original GIS project. This is done by clicking on FILE on the main menu bar and selecting SAVE AS to give it a new name and save it in a specific location on your computer. This new GIS project will have as many separate data frames, and contain the same data layers, as the original project on which it was based.

NOTE: If you base your GIS project on another pre-existing one, you need to be careful about any changes you make to the data layers it contains. This is because if you edit any of the data layers, any changes you make will be made in the source file for the data layer and not just your project. This means that the changes will also appear in the original copy of the project.

NOTE: In general, you can only have one GIS project open at a time (there are ways round this, which will not be covered here). As a result, before you can create a new project, you will have to close down any existing projects which are open. Remember to save any changes you have made to that existing project before you close it down, or you may lose any work you have done since the last time you saved it.

2. How to open an existing GIS project:

If you wish to work on an existing GIS project, you can simply open it, and start working. In most cases, when you open the ArcMap module of the ArcGIS 10.1 software, you will be presented with a window which has the heading ARCMAP – GETTING STARTED. To open an existing GIS project, click on EXISTING MAPS in the directory tree on the left hand side and then select the project you wish to open in the right hand section of the window before clicking OPEN at the bottom of this window. If the GIS project you wish to open is not listed here, click on the BROWSE FOR MORE option on the left had side of the window and use the browser window to find and select the GIS project you wish to open before clicking OPEN at the bottom of this window.

If the ARCMAP – GETTING STARTED window does not appear when you start the ArcMap module (or if you already have the ArcMap module open), you can open an existing project by clicking on FILE from the main menu bar area, and selecting OPEN. When the OPEN window opens, browse to the location where your GIS project is saved, select it and then click OPEN.

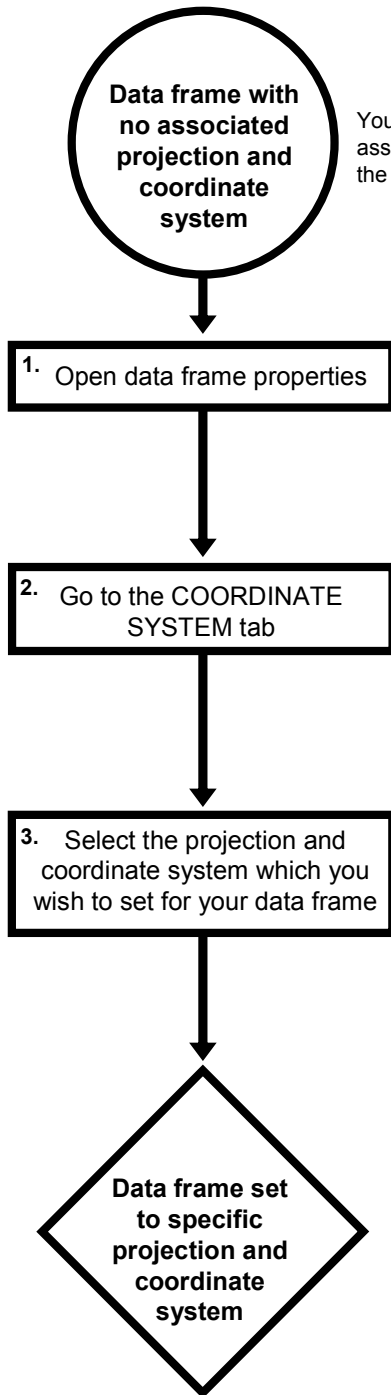
3. How to set the projection and coordinate system for a data frame in a GIS project:

While you can simply start plotting data in a GIS project, you are much less likely to run into problems if you use the correct projection and coordinate system from the start. In particular, if you initially use an inappropriate projection and/or coordinate system and then realise that you need to use a different one later, you may find that you need to start the whole project again from scratch, wasting both time and effort. In addition, if you do not use an appropriate projection and coordinate system, you may find that the data in different data layers do not overlay each other properly, which again may cause you problems (see chapter four for more information on projections and coordinate systems).

Therefore, one of the first things you should do when starting a new GIS project, or creating a new data frame within a GIS project, is to set the projection/coordinate system. Which projection/coordinate system you will use will depend on the type of data you are using, the aim of your project and the spatial scale that you are working at. Generally, if you simply want to plot data which are in degrees of latitude and longitude, you will probably want to use a geographic projection. However, if you want to make nice looking maps, measure distances, areas or do any calculations based on distance and/or area, you will probably want to use a different projection/coordinate system. For small, approximately square, study areas, the most appropriate projection is generally either a local, regional or national projection system for a particular part of the world where you are working, or if one is not available, a transverse mercator or Lambert azimuthal equal area projection centred on the middle of your study area. For larger scale areas, and for study areas which are long and narrow, other projection/coordinate systems are like to be more appropriate (see chapter four for more details on selecting an appropriate projection/coordinate system). In terms of datum of the coordinate system, this will primarily depend on the one which any data you are going to use were collected in. For most data gathered from a GPS and most modern data sets, the coordinate system will use the WGS 1984 datum (see chapter four for more information on the importance of datums). However, there are many other possible datums, so this will not always be the case, and you need to make sure that you know what datum any data you use are set to.

There are two ways to set the projection/coordinate system for a data frame in your GIS project. You can either use a predefined one, or create a custom one specific to your study area or GIS project.

To use a predefined projection/coordinate system, work through the flow diagram which starts on the next page.



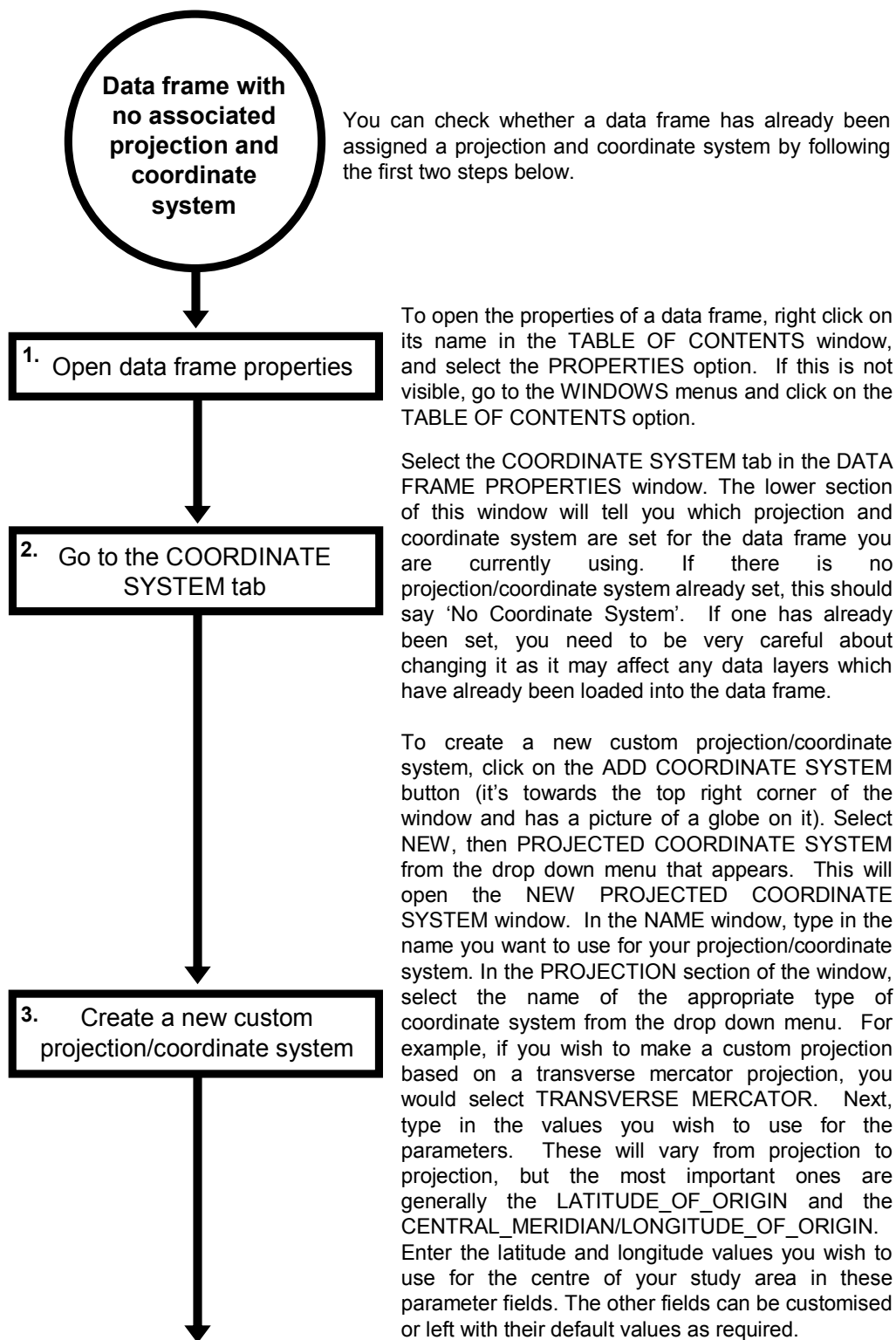
You can check whether a data frame has already been assigned a projection and coordinate system by following the first two steps below.

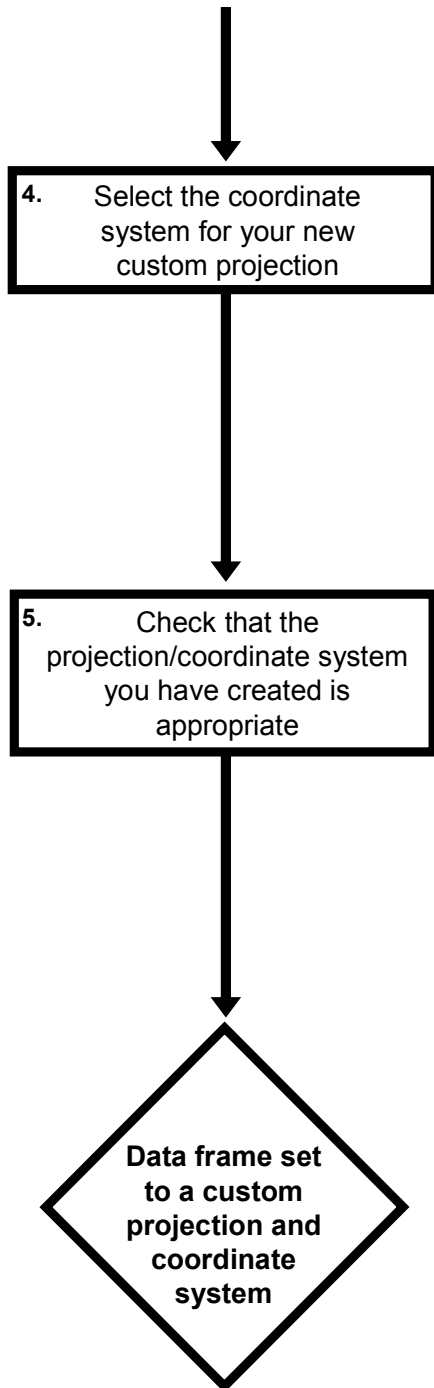
To open the properties of a data frame, right click on its name in the TABLE OF CONTENTS window, and select the PROPERTIES option. If the TABLE OF CONTENTS window is not visible, go to the WINDOWS menus and click on the TABLE OF CONTENTS option.

Select the COORDINATE SYSTEM tab in the DATA FRAME PROPERTIES window. The lower section of this window will tell you which projection and coordinate system are set for the data frame you are currently using. If there is no projection/coordinate system already set, this should say 'No Coordinate System'. If one has already been set, you need to be very careful about changing it as it may affect any data layers which have already been loaded into the data frame.

To set a specific projection and coordinate system, choose from the appropriate options in the upper window. For example, you can select the geographic projection and the WGS 1984 coordinate system by double-clicking on the GEOGRAPHIC COORDINATE SYSTEMS menu. Next select the WORLD menu, and finally select the WGS 1984 option. Now click APPLY and then OK.

To create a custom projection/coordinate system for a data frame, work through the following flow diagram:





In the GEOGRAPHIC COORDINATE SYSTEM section of the NEW PROJECTED COORDINATE SYSTEM window, click on the CHANGE button. This will open a window where you can select the datum you wish to use for the coordinates in your projection. For example, if you wished to use the WGS 1984 datum, select GEOGRAPHIC COORDINATE SYSTEMS> WORLD> WGS 1984, and then click on the OK button. Now click the OK button in the NEW PROJECTED COORDINATE SYSTEM window. Finally, click OK in the DATA FRAME PROPERTIES window.

Once you have created a custom projection/coordinate system, you need to check that it is appropriate. This involves examining how data layers look in it. For example, you could load in a polygon data layer with countries in it, and look at the shape of countries in your study area. Do they look squashed or stretched? Similarly, if you have data layers with objects of known size in them, you can use the MEASURE tool which is found on the TOOLS toolbar to see if they are the right size. More information on using the MEASURE tool can be found in the instruction set called HOW TO MANUALLY MEASURE DISTANCES, PERIMETERS AND AREAS IN THE MAP WINDOW (page 335). If land masses look oddly shaped, or important measurements are not accurate, you may need to create a different custom projection/coordinate system.