MapAction

Field Guide to Humanitarian Mapping

First Edition, March 2009

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This field guide was produced by MapAction to help humanitarian organisations to make use of mapping methods using Geographic Information Systems (GIS) and related technologies.

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MapAction (www.mapaction.org) is a non-governmental organisation that specialises in using geospatial technologies at field level in humanitarian emergencies. When disaster strikes a region, a MapAction team arrives quickly at the scene and creates a stream of unique maps that depict the situation as the crisis unfolds. Aid agencies rely on these maps to coordinate the relief effort. The charity also believes in assisting with efforts to prepare for disaster events; training international emergency professionals as well as national staff, all of whom work in disaster response.

This guide has been compiled from MapAction's experience in disaster preparedness and relief operations drawn from many training sessions and disaster emergency missions; however every situation is different. We greatly value comments and suggestions, and we will do our best to answer your questions about using GIS and GPS for humanitarian mapping in the field: please email info@mapaction.org.

Preface: How to use this field guide

There are now many possible ways to create maps for humanitarian work, with an ever-growing range of hardware and software tools available. This can be a problem for humanitarian field workers who want to collect and share mappable data and make simple maps themselves, during an emergency.

This guide aims to explain a limited range of tried-and-tested methods suitable for humanitarian field work, using free or low cost tools. The main requirements are a PC, an internet connection (to download the software and data you need before you go into the field) and a little time to practise using the various tools. A GPS unit (or maybe a satellite phone with built-in GPS) is a very useful extra item, if you have one or can get access to one.

Where to start

The guide is written in modular chapters with the aim that you can start in different places depending on your level of prior knowledge. The guide contains tutorials on the use of two alternative mapping toolkits: Google Earth (Chapter 3) and an open-source GIS software package called MapWindow (Chapter 4). There is also a section on using a GPS to collect data (Chapter 2).

If you have time, or if you're completely new to the subject, we recommend that you read Chapter 1 first. It contains an introduction to the whole subject and explains some important terms and concepts. But don't be discouraged by these technicalities: it's quite possible to start using the software tools without an in-depth understanding of all the details. Google Earth in particular is very easy to use.

If you want to use a GIS software package other than the MapWindow suite which is covered here, this guide may still be useful to you because almost all the main concepts (particularly those described in sections 1.4 to 1.7) are relevant whatever software you intend to use.

Finally, if you find difficulty in understanding or using any of the content of the guide, or if you have suggestions to improve it, please email us at info@mapaction.org.

We wish you success in your humanitarian work.

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Chapter 1: An introduction to mapping for humanitarian operations

1.1 Introduction to chapter 1

Humanitarian emergencies necessitate the fast and effective use and sharing of geographical information. Sophisticated computer-based Geographical Information Systems (GIS) have been available for over a decade but humanitarian organisations have found them problematic to deploy and use. But new, more streamlined and accessible computer-based tools make mapping technologies potentially useable by agencies and NGOs at field level. There is a growing demand from humanitarian practitioners for guidance on how to use these tools in their work.

This guide is about humanitarian mapping and also about sharing and using geographical data in non-map forms. It is intended for use by any aid workers in the field or at a headquarters level. Many of the techniques should be equally useful in development as well as humanitarian work.

The contents of this guide are intended primarily for use by humanitarian organisations in their own operations, but can also be used as a basis for training within beneficiary communities. There is great potential for communities in hazard-prone areas to use map-based methods to enhance disaster resilience and MapAction strongly advocates the use of these techniques in disaster risk reduction initiatives and these are explored later in this chapter.

In this guide, we are focusing on tried and tested technologies, readily deployable by almost any organisation, with a minimum of changes to existing systems but assuming access to a computer. The technologies described are accessible at low or no cost (beyond the basic costs of computer hardware). Internet access is required pre-mission to download software and data to set up mapping systems: however in keeping with the realities of emergency response work it is assumed that in humanitarian field operations there can be no reliance on internet connections.

The contents of this guide form one part of a package of support available from MapAction to help humanitarian organisations to exploit geospatial technologies in their work, including web-based services, data and software tools.

1.2 Why maps in humanitarian work?

Maps are useful and may indeed be vital for navigation, both in everyday life and in the emergency environment. In humanitarian work the real power of maps is as a means of communicating and sharing complex information that is a crucial resource in disaster response.

> *"Information is very directly about saving lives. If we take the wrong decisions, make the wrong choices about where we put our money and our effort because our knowledge is poor, we are condemning some of the most deserving to death or destitution."*
>
> **John Holmes, UN Emergency Relief Coordinator and Under-Secretary-General for Humanitarian Affairs**

Of all the information needed in an emergency, the 'where' dimension is of crucial importance: aid in the wrong place is no help at all. Humanitarian emergencies typically affect large areas and often require responding organisations to make sense of unfamiliar geographical environments. Maps become important as tools to plan and coordinate relief interventions.

In the preparation of this guide, MapAction discussed the needs for mapping and spatial information with users from a range of NGOs and humanitarian agencies, as well as drawing on MapAction's own experience in the field during emergencies. Some of the insights gained are explored here.

The use of maps is not of course limited to the post-disaster response phase. Maps are a prerequisite for understanding natural hazards, and communities' vulnerability to them. Risk assessment by communities themselves can be supported by mapping tools – including low- or no-tech methods involving little more than sketches using paper and pencil. These methods are explored a little more in section 1.8.

> *"In the pre-disaster context we would like to map vulnerability and develop baselines for it. The data for these baselines would include scientific hazard data and the outputs from qualitative assessments at community level."*
>
> **Bhupinder Tomar, Senior Officer Disaster Preparedness, International Federation of Red Cross and Red Crescent Societies**

In the disaster response phase, maps can be invaluable for making sense of the emergency and for planning response, both at individual organisation level and for inter-agency coordination. There is a need for mapped information from the earliest stage of response, during the search-and-rescue (SAR) phase. SAR teams need ways to create rapid maps of their area of operations; for Urban SAR (USAR) work this may require a high level of detail.

> *"We need maps of the affected area showing specific hazard areas, roads, key landmarks and work areas with GPS coordinates, logistics resources, and medical treatment areas."*
>
> **Joe Kratochivil, USAR Specialist, Fairfax County Fire and Rescue Team**

In a catastrophic disaster the very landscape may have been changed by a natural event, such as widespread flooding. Even NGOs with long-term development programmes in the affected country may need new maps that depict the changed geography in the disaster zone. They may need to plan relief programmes for areas of the country that are unfamiliar to them, and to do so alongside new actors.

> *"In an emergency we want maps of the affected population and displacements, major routes, other actors, clinics, water points and so on. All the things you need if you are sitting hundreds of miles away, to plan and coordinate the response."*
>
> **Charlie Mason, Logistician, Save the Children UK**

We can see therefore that demand for mapped information will be great once a disaster response operation is in progress. Relief actors do not just want information related to their own operations, they also need to coordinate their programmes with other organisations – possibly dozens of them.

> *"Both the maps and the information displayed on them are equally important. Early in the incident maps will themselves become tools for prioritising areas of most concern. Later, the situation information on the maps will gain the spotlight – but the best way to present the information is a map."*
>
> **Ramiro Galvez, UNDAC team member, Bolivia floods 2008**

1.3 What mapping tools can my organisation use today?

MapAction and other specialist mapping agencies have shown the usefulness of geographical information systems in the humanitarian world. This still relies heavily on 'conventional' but sophisticated and powerful desktop GIS software such as the **ArcGIS** and **MapInfo** software suites. However, many humanitarian organisations do not have the resources to acquire and deploy these mainstream GIS solutions which require significant investment in money and training.

Fortunately, the range of alternative methods of collecting, sharing and mapping geographical information has broadened. Since its launch in 2005, **Google Earth** is claimed to have been downloaded hundreds of millions of times. It is a desktop GIS toolkit with world-wide map data neatly integrated into it, useable online or offline, available free of charge to anyone with a computer.

At the same time, there has been a steady growth in the number of 'conventional' desktop GIS packages available under free or open-source licences. Although some of these offer functionality to rival the leading commercial GIS software packages, they are not all easy to use even in a normal work environment, let alone under the pressures of a humanitarian operation.

This guide, alongside other resources available from MapAction, aims to share with the disaster response community MapAction's experience with basic GIS tools and methods, available at minimal cost, which are judged to be 'appropriate technology' for use by humanitarian organisations of any size and level of resources.

However, don't assume that spatial data can only be processed using sophisticated GIS software. Maps that are perfectly fit-for-purpose can often be created using other tools including a pad of graph paper and a pencil, or even an Excel spreadsheet (for example, to 'map' individual blocks in a refugee camp that is laid out on a grid pattern). Consider whether 'low/no tech' methods could meet your needs before investing time in computer-based methods.

1.4 Some key concepts

1.4.1 What is 'spatial data'?

Spatial data is any data that has a 'where' component that can be recorded and mapped. Examples include:

- A village where you are doing a needs assessment (where is it?)
- A safe route for trucks to deliver relief supplies (can you plot it on a map?)
- A district for which you have health statistics (what are its boundaries?)

Spatial data records have **coordinates** ('where') and **attributes** ('what'). For example:

Coordinates	Attributes
Lat 51.675 Lon -0.604	Amersham Health Centre, open Mon-Fri 0830-1700

Attributes can be any data about the specified place. So, by adding the coordinate data to an existing data set, you have created a *spatial database* – data that can be mapped.

As **Global Positioning System (GPS)** devices have become cheaper, GPS receivers are being incorporated into equipment like mobile/cellular phones, and cameras. So in future we will often have opportunities to attach **coordinate 'tags' (geotags)** to data that we collect: for example geotagging photos taken during fieldwork. This is just another way of collecting spatial data that can be shared and mapped.

1.4.2 How can we use and share our spatial data?

Uses of spatial data

GIS is about **analysis** and **visualisation** of spatial data.

- **Analysis.** Using computer tools, you can analyse several sets of data to create new data sets. For example: combine locations of health clinics with village data, to find out how far people have to walk to their nearest clinic.
- **Visualisation.** Mainly, this means creating maps using your data, and is the main type of activity described in this guide.

Sharing data

Humanitarian and development actions often involve multiple teams (as a minimum, your aid organisation and the beneficiary community). So, **sharing of spatial data** is very important. To share data you and your partners need to find a common 'language' to describe your data, including:

- **Coordinate systems.** Latitude/longitude is one system, but there are many more. Fortunately, they can be translated quite easily.
- **File formats.** There are quite a few different file formats used by GIS software, including **ESRI Shapefiles**, **KML files**, **geodatabases** and others. These are explored further later in this chapter.
- **Metadata.** This means 'data about the data'. It is very helpful to others if your data has metadata fields that describe the data, how and when it was collected, etc.

Types of data

GIS software can handle, broadly, two types of spatial data formats: **raster data** and **vector data**. A map created by GIS can easily be made up of various layers of both types.

Raster data is most often a 'picture', either of the earth's surface (for example a satellite image) or a scan of an existing map. The coordinates of certain points such as the corners are specified, but 'features' (such as a road) cannot be described or attributed specifically in the database. The name raster comes from the type of scanning process used.

Vector data consists of **points**, **lines**, or **polygons** (areas) that have specific coordinates and attributes and can be laid out as a table. For example, a road (line feature) that starts at point A, passes through point B and C, and ends at point D, and which is called 'Station Road' can be held in the database with those coordinate and attribute details. A vector data file can contain many point, line or polygon feature records. **ESRI Shapefiles** are a common way to share vector data.

1.4.3 What kinds of spatial data may be useful in my work?

Spatial data comes in a wide range of types and formats. In some cases you may have only a small amount of spatial data available for the area in which you plan to work; however in other cases there may be a wide range of potential data sources and types. It's useful to have some idea of the actual needs for mapped information before you start gathering and inputting the data. This will help you to make a prioritised 'shopping list' for spatial data.

Using GIS software, all maps are made by combining spatial data layers to create the desired combination of geographic information. Types of layers of particular interest in humanitarian and development work include the following.

Terrain

Hills and valleys can be represented by a **digital elevation model (DEM)** which can create a contour map layer. Google Earth has a terrain model built in. A commonly used DEM for GIS work is that derived from the **Shuttle Remote Topography Mission (SRTM)** dataset which is freely available from NASA.

Remote sensed images

These comprise satellite or aerial photography. The images must be processed and **geo-referenced** before they can be used.

Base maps

These could be a scanned (raster) image of a paper map. Or, built up from a series of vector data layers – roads, rivers, settlements, etc.

Administrative boundaries

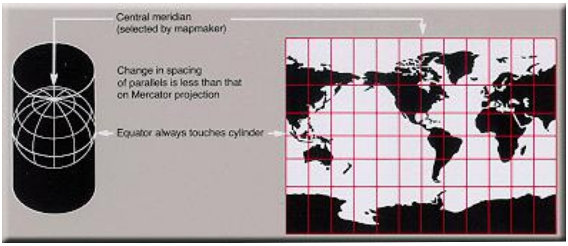
Vector files showing the various levels of the country's administrative geography (provinces, districts etc) are often essential. This is because much situation information of humanitarian relevance is collected via the normal administrative apparatus of the country; to map, for example, disease incidence by district it is necessary to have map data showing the district boundaries.

Human and situation data

Such as the locations of the beneficiary population, the locations of aid resources, and so on. This may be data you collect yourself, or obtain from partners. It should be linked to your other work data sets – assessment data, programme plans, etc. Remember that any spatially-referenced data in a suitable format can be imported into your GIS.

1.5 Projections and datums

Because a map has to depict the multi-dimensional surface of the earth onto a two-dimensional medium (paper, or a computer screen) all maps must have a defined **projection system** which involves complicated geometric calculations, fortunately carried out by the computer. You may have heard about some examples of projection systems, such as 'Mercator' or 'Lambert' but there are many of them.



When creating maps using GIS, the datasets have to be re-projected to match the chosen projection of the map. With conventional desktop GIS the software has add-in tools to convert data between many different projection systems. However with Google Earth all the internal map data is projected to a standard (**Simple Cylindrical projection**): so any map data imported to this would need to be adjusted to this projection to achieve a high level of accuracy – however in practice this isn't always a problem for field mapping within a small area.

When using GIS software packages that can handle a range of projection systems (including the MapWindow package in the tutorial in chapter 4) it is important to know a little about projections. Firstly, it is important to understand that data that has spatial references (that is the specific locations of features) may have also been projected, although this does not have to be the case. If the data has been projected, this means that mathematical formulas have been used to covert the data from a simple geographic location (latitude and longitude) to a location on a flat surface.

It is very helpful to decide early in your mapping work which projection system you will use. This may depend to some extent on the projection system used for your base map data: however it is often straightforward to convert (re-project) the data from one projection system to another using your GIS software.

You will usually set up the projection system for your new map when you first create it, using the software. Or, the software will take the projection of the first data to be added as the 'default' for that map. Then, any new data that is added will be 're-projected on the fly' - this just means that it will be adjusted within the map without changing the base data files. Or, you can use software tools to change permanently the projections of your data, which will speed up processing later on.

Datums

Another question that can be confusing is: what **datum** has been used? The term has several meanings in mapping and is potentially a complicated topic. But in simple terms it means the reference system (global or regional) that has been applied when compiling the coordinates. It is also sometimes called the **spheroid**. It may be surprising, but a 'unique' latitude/longitude fix can be interpreted as slightly different positions on the ground, depending on the datum that is applied been used. This is not enough to be a problem for small or medium-scale mapping – for example locating villages. However it can still cause errors of several hundreds of metres, which would of course be a problem for some mapping applications, for example in landmine surveys. Fortunately a global standard called **WGS84** is now commonly used (and is always used in Google Earth).

1.6 Storing and sharing data

1.6.1 Data formats

There are many different data formats that you may encounter when working with GIS. Some of the most commonly encountered are as follows:

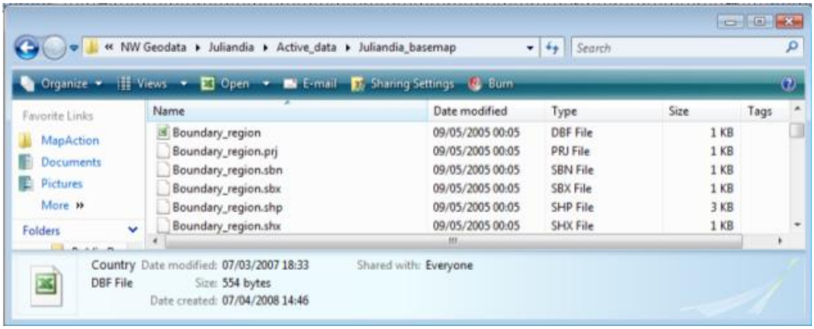
Shapefiles

As mentioned above, ESRI Shapefiles are commonly used for GIS vector data. In fact, shapefiles are used as the standard file format by many GIS software packages including free and open source toolkits such as MapWindow which is the subject of chapter 4. So it is useful to have a basic understanding of what a shapefile is composed of and how it works.

A shapefile can only contain one type of vector data—it must be either points, lines or polygons, not a mixture. In a shapefile containing say 10 points representing water wells, each point is an individual **feature** and has a corresponding **record** in the file. Each feature is described by its location and may have other information tagged to it (perhaps for example the depth of the well, and the name of the nearest village).

If you view a shapefile in Windows Explorer you will see that it is actually a collection of individual files with the same name but different file extensions. This is because the location data (the **geometry**) and the **attributes** data are held in separate files.

There may be other shapefile components, notably a **spatial reference** file (.prj) that can contain data about the shapefile's geographic referencing including the projection system that has been set for the file.



The screenshot above shows the file components of a typical shapefile. If you share a shapefile with a colleague, make sure that you send all the components. Also, it is not recommended to edit any of the data outside of specialist GIS software tools, because you may cause inconsistencies in the data. As a general principle, only open and edit a shapefile within your GIS software package.

KML and KMZ

Keyhole Markup Language (KML) is the file format used in Google Earth and is now a widely recognised format. It is based on XML and is relatively easy to understand with minimal knowledge. When KML files are zipped with related content (like pictures) the format becomes KMZ.

Geodatabases

Although it is also a general term for spatial databases, **ESRI geodatabases** are a specifically-defined format used in the latest versions of some GIS software, alongside or instead of shapefiles.

Raster and image data

While much spatial data is held in 'vector' formats (points, lines and polygons), images and scanned maps are managed as a 'raster' such as a TIFF format. However, to be usable in GIS, raster data files must have linked data to geo-reference the data – that is to define its spatial coordinates in relation to the earth's surface. There are many specific file formats used for raster data.

1.6.2 Data management

When working with several data sets it is vital to be strict with your data management. Come up with a logical, simple system to name your files enabling you to remember what it represents, for example date, type of data , source and the version. This will enable you to work efficiently and keep track of your data. It also helps to have a well-organised folder structure in which to store your files. Always copy and save a version of the 'raw' data before you start to work on it. Then, if any irreversible problems arise the original data source remains intact.

An important concept with spatial data, mentioned earlier, is **metadata**. This means, simply, data about the data. Important metadata fields for a spatial dataset include when the data was collected, by whom, how it is projected, and so on. Metadata may be held inside some file formats, or attached separately for others (or even supplied on paper).

Finally, it is useful to know that there are several emerging standards for spatial data that enable it to be shared effectively and automatically between systems. Examples of these are **Web Feature Service (WFS)** and **Web Mapping Service (WMS)**. The technicalities of these standards are beyond the scope of this guide.

1.7 An introduction to cartography

Cartography is the process of turning spatial data into a visualisation of the earth's surface – that is, a map – that communicates as clearly as possible the most relevant and important information for the map's purpose. There are some accepted 'rules' and good practices of cartography, and these should always be applied selectively with your user's needs in mind. Otherwise, the person using your map may have to work hard to make sense of the information; or worse still they may misunderstand vital information and make poor decisions based on this, potentially with negative consequences in a humanitarian operation.

Some of the most important things to consider when designing your maps are as follows.

Does your map have a clear purpose?

Unless you have thought about what you are aiming to communicate, you may struggle to include the right information.

Is the extent of the map (that is, the area that it covers) appropriate?

Have you set the boundaries of the map to include important towns or landmarks as reference points for someone who does not know the area well?

Do the most important features of the map stand out clearly?

If it is a logistics map then the roads and airfields etc should be prominent. For **thematic maps** (for example health information) then less essential landscape layers could be de-emphasised or left off the map altogether.

Have you simplified colours and symbols?

Often, 'less is more' in terms of communication. Don't use too many different symbols or styles.

A humanitarian symbol set from UNGIWG is available from:
http://www.ungiwg.org/map_prod.htm
For more information on the symbol set contact maps@reliefweb.int

Have you made effective use of labels?

Even if your symbols give proportionate information on relative size (for example, numbers of casualties), consider adding labels and annotations to indicate specific figures or other information.

Have you added the important 'map furniture'?

This means items in the margins of the map. In almost all cases you should include at least the following:

- Map title – describing the main theme of the map
- Date (and time if necessary) that the information represents
- Date/time that the map was created – note this may not be the same as above!
- North arrow
- Scale bar and/or statement of scale
- Legend – a list of the symbols used and what they mean
- Sources of data used on the map and contact details for your organisation

Have you considered displaying a map grid?

Some software gives options to show grid lines or border markings for various coordinate systems. Choose what will be most useful to your users (if they have their GPS receivers set to UTM, then make that the map grid).

Final thoughts - practical map-making in the field

Although it's a good discipline to apply all the above principles, you should not of course allow cartographic aesthetics to slow up the creation and issuing of maps that are important in an emergency.

You can often combine several computer and other tools to add information to basic maps: for example take a 'screen print' of a map created using GIS software and import it into Microsoft PowerPoint, or Adobe Photoshop, to add more graphics and annotations – or even use a marker pen!

1.8 Community-level mapping techniques

Community-level mapping is a powerful method for disaster risk mitigation and preparedness. It is driven by input from the beneficiary participants; this benefits the plan output with a broader overview of the area, while allowing the community to be involved. Local people can, using simple maps that they have created, quickly see and analyse important patterns in the risks they face.

Computer-based tools are not essential for community risk mapping. At their core, maps are visual expressions of measurements. You can compile sketches, data from assessments and notes into representations of the region you are looking at using simple tools like pen and paper. In a situation with no time or resources a map drawn on paper can be enough to help to identify the most at-risk areas of a settlement, and to mark the location of valuable services such as water resources.

Data collection for community-level mapping

Data to be collected should be based on the analysis of potential risks, the incidence of previous disasters, and the vulnerability of the population. There are many guides on collecting data for various stages of the disaster cycle. Some organisations have their own systems and guidance.

A good collection of methods for risk assessment can be found on the **ProVention Consortium** website:
http://www.proventionconsortium.org

Methodologies for **vulnerability and capacity assessments (VCA)** can be found on the **IFRC**'s website:
http://www.ifrc.org/what/disasters/resources/publications.asp

The first step is to collect all the necessary information you have available to you, this could include:

- **Studies and analyses** of hazards, vulnerabilities and risks - information on past emergencies taking into account probability, frequency, location, magnitude and potential impact climate, topography.
- **Number of people at risk** – population data, population's proximity to risk, local infrastructure. available essential services and land use zones.
- **Geographical location** – an overview of the main features of the settlement and its surroundings; fields, roads, infrastructure, rivers and land use. Define and prioritise geographic zones to assist with the development of highlighting areas at risk.

Creating the community risk map

When drawing your community map, try to keep the overall scale as accurate as you can, but don't be too worried about this. If in a vehicle use the odometer (kilometre/mileage counter); if on foot keep an idea on how many steps you have taken. Start from a known geographical point and work outwards from this in a logical way, sketching in key locations first.

If you want to re-use the sketch map at a later stage it is important that you use good quality paper. It may help to use graph paper as a spatial reference. For advice about map layouts, symbols etc see section 1.7.

1.9 GIS software recommendations

Software that is used to create, manage, analyse and visualise geographic data is usually referred to by the general term 'GIS software'. In risk analysis of disasters, emergency planning and response several different groups of GIS functions are required. Before any geographic analysis can take place, or maps be produced, the data needs to be collected from field assessments, maps or satellite imagery, or acquired from other data owners. Data from new sources needs to be previewed and eventually integrated with existing data.

To answer specific questions, for example which organisation is working in which area, or which displaced persons camp is affected by disease outbreaks, the spatial data can be queried and analysed. However, some specific analysis tasks may need the data to be transformed and manipulated first, before any analysis can take place. The query and analysis results can finally be displayed on a map.

Desktop GIS software tools can be grouped into three basic categories. These are sometimes together termed **desktop GIS** and mainstream GIS software suites typically include functions and tools from all three of these groups:

- **GIS viewers** are software packages that allow you to view the spatial data that you have, and assemble it into relevant layers – the basis for a simple map. Some free GIS packages simply allow you to view your data in various ways, but you can do little else.

- **GIS editor** tools allow you to manipulate and change your spatial data. For example, to add new locations to a data set of clinics, or to change a boundary line between two districts.

- **GIS analysis** tools give the ability to 'answer questions' about the data and to create new outputs: for example to create a new map layer showing travel times to clinics based on different modes of transport.

There are also some other tools that may be used to support the above basic functions:

- **Spatial Database Management Systems (**DBMS) are mainly used to store the data, but often also provide (limited) analysis and data manipulation functions themselves.
- **WebMap servers** are used to distribute maps and data over the internet.
- **WebGIS clients** are used for data display and to access analysis and query functions from Server GIS over the internet or an intranet.
- **Libraries and extensions** provide additional analysis functions that is not part of the basic GIS software. For instance functions for network and terrain analysis, or functions to read specific data formats.
- **Mobile GIS** tools can be used for field data collection. Both appropriate software and hardware are needed.

GIS software is not only provided by companies such as **Autodesk**, **Bentley**, and **ESRI Inc** but increasingly also by **free and open source software (FOSS)** projects. Open software projects often concentrate on a single category especially with respect to server applications (**MapServer**, **GeoServer**) and spatial DBMS (**PostGIS**). Free desktop GIS software projects, such as **Quantum GIS**, **gvSIG** and **MapWindow** have growing user communities. Such free GIS software complements the set of proprietary software instead of competing with it.

Various desktop software for GIS has been tested during research for this guide to provide a comprehensive list of software available that meets the required functions. This field guide will give direction on **Google Earth** (chapter 3) and **MapWindow** (chapter 4) as they have been identified as highly capable software for the functions required in humanitarian mapping. Alternatively however, the following software packages and resources may also be useful to your organisation.

Low-cost alternative GIS software tools

- **OS Geo Foundation**. Support for custom functionality/programming www.osgeo.org/search_profile
- **Manifold GIS.** www.manifold.net
- **Tatuk GIS.** www.tatukgis.com/products/Editor/Editor.aspx

Free-of-cost GIS software (but not open-source)

- **Spring GIS**. www.dpi.inpe.br/spring/index.html Developed by the Brazilian Space Agency
- **SavGIS**. www.savgis.org/es. Maintained by an official body. Spanish language software.

Free and open source software

- **Quantum GIS.** www.qgis.org. Large user community, available functionality is a bit restricted.
- **OpenJUMP GIS**. www.openjump.org. Smaller user community, but highly specialised on vector data editing and ease of use.
- **Grass GIS**. www.grass.itc.it. Overwhelming functionality, but difficult to use. However, QGIS can be used as an interface to Grass GIS functions. Good raster analysis for flood prediction.
- **gvSIG**. www.gvsig.gva.es/. Raster analysis functionality is added from the SEXTANTE plugin a separate project www.sextantegis.com/.
- **ILWIS**. www.ilwis.org. This was originally developed at ITC in the Netherlands.

There is a tendency for international aid organisations to use several of the GIS mentioned above for different tasks. Where the tools are free, there is of course no direct cost penalty of doing this. However it does take time to learn each software package and using multiple packages across an organisation may therefore not be very efficient.

1.10 Data Sources

There are many free sources of data to be found for humanitarian mapping. The following lists some of the most common.

***ReliefWeb* directory of websites related to GIS and mapping**
www.reliefweb.int/w/contactDir.nsf/RelatedSites?OpenForm&Query=MAP2

geo4ngo
www.geo4ngo.org
An exchange platform of information related to the use of geographical information by humanitarian organisations, especially NGOs.

GIS Development
www.gisdevelopment.net
Aims to promote usage of GIS and related technologies in various areas of development.

Public Health Mapping
www.who.int/csr/mapping
WHO is promoting the use of GIS to support decision-making for a wide range of infectious disease and public health programmes.

The Geography Network
www.geographynetwork.com
A global network of geographic information users and providers.

Digital Map Archive
http://dma.jrc.it/

Satellite Remote Sensing: Integrated CEOS European data Server
http://iceds.ge.ucl.ac.uk/

Satellite Remote Sensing: Global Land Cover Facility
http://glcf.umiacs.umd.edu/index.shtml

Satellite images from 'The 'International Charter'
www.disasterscharter.org

SRTM Data 90m Digital Elevation Data
http://srtm.csi.cgiar.org/

Sources of finished maps

Paper maps: obtained before departure or in-country
http://whc.unesco.org/en/mapagencies/

Virtual OSOCC
http://ocha.unog.ch/virtualosocc/

Reliefweb
www.reliefweb.int

UNOSAT
www.unosat.org

Alertnet
www.alertnet.org

1.11 Case Study

The following is a fictitious description of how an NGO responding to a natural disaster might effectively use spatial data in its work during the emergency phase.

A severe earthquake has struck the developing country of Marginalia. The international NGO 'Humanity In Need' (HIN) is considering a disaster response programme and appeal.

HIN has an ongoing community water supply programme in Marginalia. Their watsan engineers have, over the past two years, built up a dataset of bore holes with GPS coordinates. In their country office one of the team has learned the basics of a free GIS software package. She has also gathered various spatial data layers including a good rivers and streams dataset surveyed by a regional conservation institution. She has shared these datasets with HIN's international headquarters where there is a small GIS department using ESRI ArcGIS software.

Within 24 hours of the earthquake, HIN's national staff have compiled initial reports of affected communities. HIN's international emergencies team, arriving in the capital, uses Google Earth to locate the damage reports and to make a plan for a rapid needs assessment mission. They confer with International Red Cross and United Nations disaster assessment team members and coordinate a plan of assessment actions. The teams share their plans and intended routes as KML files which can be combined and viewed by any other Google Earth user.

Assembling map data

While the assessment teams are gearing up, HIN's GIS-savvy staffers in-country and at headquarters quickly come up with a data-gathering plan to assemble appropriate base map layers that can be used both in the commercial and open-source software packages that they use. They approach a wide range of data owners both within Marginalia (including the ministries of health and agriculture, universities and aid development agencies), and beyond.

At this stage a MapAction team is deployed to the emergency and contact is made with HIN's national staff. Both organisations share their map datasets. Within hours, MapAction has obtained satellite data, analysed by UNOSAT in Geneva, that identifies the areas and settlements most likely to have been damaged by the earthquake. This is overlaid on population data and the information generated is used to adjust the assessment priorities.

Combining data to create maps for decision-making

HIN's assessment team in the field sends by satellite phone the most urgent data that it has collected, including GPS coordinates of key roads into the affected area that have been blocked by landslides. On their return to base the following day, their village assessment reports are tagged with GPS waypoint numbers and the routes they used to avoid the landslips have been tracklogged. All this data is quickly downloaded onto computer and shared with other agencies, notably with MapAction which is producing overview maps of assessment activity, damage and the most urgent humanitarian needs.

Due to its local sectoral expertise, HIN takes a key role in the Water Sanitation and Hygiene (WASH) Cluster. Its dataset of water boreholes is combined with other spatial data, including health data, to produce maps that identify communities lacking secure water supplies who therefore become priorities for assistance.

International relief donors both within and outside Marginalia find the maps that HIN's staff have produced during the emergency to be very important ways to assimilate and understand the humanitarian situation, and give them confidence in committing relief funding early to the most needy areas.

The above 'case study', while fictitious, gives an insight into the multiple ways in which mapping and sharing of spatial data can be used practically by any relief agency or NGO to enhance its emergency response.

Chapter 2: Using GPS to collect data

2.1 Introduction to chapter 2

The information you collect during humanitarian assessments will have much greater value if others can locate it on a map. Just writing down a place name (eg of a village you visited) is dangerously imprecise: what if that village doesn't appear with that name on other people's maps? What if there are two places with the same name?

If you have a **Global Positioning System (GPS)** receiver, you can and should use it to record the unique coordinates of the places you are referring to in reports. If you don't have a GPS unit, check your satellite phone: some have a GPS receiver built in and can give you your position.

Assuming you have a device equipped with GPS, this short guide is intended to help you to use the basic functions to collect data on the ground in a way that will ensure it has greater use back at base, and greater value when shared with other organisations.

2.2 Before your field mission

If you have a GPS receiver, make sure it works! In a new location (even after moving a few hundred kilometres), the GPS needs to be 'warmed up'. Switch it on outdoors and let it search for the satellites. This can take up to half an hour. After that, it will 'remember' where it is in the world and get a satellite 'fix' quickly when you switch it on next time.

Set an appropriate **coordinate system** and **datum** – see below for an explanation. It's a good idea at this stage to clear the memory of any unwanted points or tracks from previous trips.

Take a co-ordinate point at your base. Does it appear correct compared with any map you have?

Before setting off, make sure your GPS will work correctly throughout your fieldwork. This means thinking firstly about batteries: ensure you have enough spares. Battery life can be lengthened by adjusting the GPS settings, for example by ensuring the screen backlight does not come on unless necessary. Also, there are accuracy-enhancing features (**WAAS** and **EGNOS**) that do not work in most parts of the world and will drain power, so disable them via the setup menus if you can.

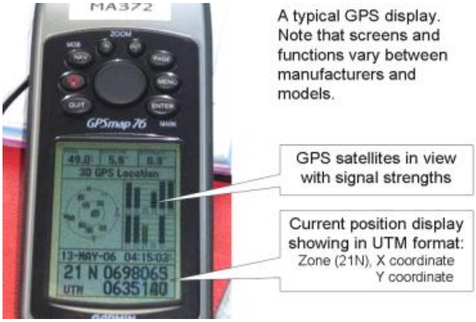
Remember that unless your GPS is the most up-to-date model with a high-sensitivity antenna, it will need a clear view of the sky, place under the front or back window in the car to get a signal. Also, it won't work well under trees, or amongst tall buildings, or even in steep-sided valleys. You can get external antenna accessories that help with this problem.

2.3 Coordinate systems and datums

This sounds confusing, but it does not need to be! The absolute essentials to know are:

Coordinate systems

Coordinate systems are ways of describing a point on the earth's surface. The best-known is **latitude/longitude**. Another is **UTM**, and there are many regional and national systems.



A typical GPS display. Note that screens and functions vary between manufacturers and models.

It does not particularly matter which coordinate system your GPS is set to display, provided that you know which one you are using, and note this in your report! Try to match the coordinate system to any field mapping that you are already using.

Latitude/longitude can be denoted in several different ways. Here are two ways of reporting the same position. It is not too important which one you use, provided you are consistent.

- **Degrees-minutes-seconds**: eg N(orth) 51° 40' 57" W(est) 0° 39' 25"
- **Decimal degrees**: eg lat 51.682, long -0.627 (note: north and east are positive numbers, west and south are negative).

UTM (Universal Transverse Mercator) is also widely used. It is a global system, based on a scale of metres, and has three components:

- **The UTM zone**: eg 30U
- **The X coordinate**: eg 0661965. This is measured *across* the map.
- **The Y coordinate**: eg 5728316. This is measured *up* the map.

Note that UTM positions are sometimes just as, for example, "0661965, 5728316". The X coordinate comes before the Y. This assumes the UTM zone is already known, but it's not a bad idea to state this also.

Datums

Datums are parameters within the GPS which set a known location as an origin for the coordinate system in use. We recommend that you always use **WGS84**, unless you are advised to do otherwise.

2.4 Types of data you can collect using the GPS

There are two basic types of data that you can collect, and store within the memory of your GPS. They are **waypoints** (sometimes called **points**, or **placemarks** in Google Earth), and **tracklogs** (or **tracks**). Some GPS can also store **paths** or **routes** but these are less useful.

Waypoints (WPs) are a record of a specific point on the ground that you have visited. On most GPS you press a *Mark* or *Enter* button, then save. The GPS then saves the coordinates at that point, and allocates a sequential number (like 001) to that WP. You need to note down separately (see *Recording your data* section 2.6) what is of interest at that waypoint.

Most GPS units can record hundreds or thousands of waypoints. They stay in the memory, even when the unit is switched off, until you delete them.

Tracklogs are a record of where you have been, which can be collected automatically by the GPS as you go along. With most GPS this will only happen if tracklogging is switched on through the setup menus, using the setup menu, although on some units, like the **Garmin eTrex**, tracklogging is permanently on.

Tracklogs are a very good way to map the route you have travelled along. While tracklogging, you can still add specific waypoints as you go, to note particular features, settlements or landmarks along the way. The waypoints and tracks form separate datasets.

Once the tracklog memory is full, some GPS units start to over-write the earlier track. There may be various options to avoid this, such as changing the distance between tracklog points: check the setup menu or user manual if you are not sure.

2.5 Suggestions on how to use GPS to collect data

Surveying features along a route

You may be travelling a 'circular' route in a vehicle, for example. Consider tracklogging the whole route, if you have enough GPS memory.

Log a WP at the start and end of damaged road sections (for example, a flood washout). Log a WP at each village or settlement you pass through.

Remember that unless your GPS is the most up-to-date model with a high-sensitivity antenna, it will need a clear view of the sky, place under the front or back window in the car to get a signal. Also, it won't work well under trees, or amongst tall buildings, or even in steep-sided valleys. You can get external antenna accessories that help with this problem.

Village-based assessments

Log a WP at the centre of the village you are assessing. It may be useful to WP various other features within the village, if detailed mapping would be helpful. For a big village or town, record tracklogs along the main roads through the settlement, and gather assessment data with reference to these (eg "south of main road, to west of mosque, 150 houses partially damaged").

Flood and damage surveys

You can use the GPS to capture the extent of various types of damage, eg a flood or area of collapsed buildings. Go to various positions at the boundary of the flood, and take a waypoint at each. If possible, record a tracklog around the perimeter of the damage.

Photographs

Save WPs for locations of photographs taken, for example when recording damage to specific structures or facilities. You can then report the exact place the picture was taken.

Surveys from aircraft

If you position your GPS unit appropriately (and safely) in a light aircraft or helicopter, it will work well. It is 'flight safe' because it does not transmit, it only receives. It is useful to have an assistant to record the assessment information as you go along.

For instructions on basic functions in various commonly-used GPS models see Appendix 2B.

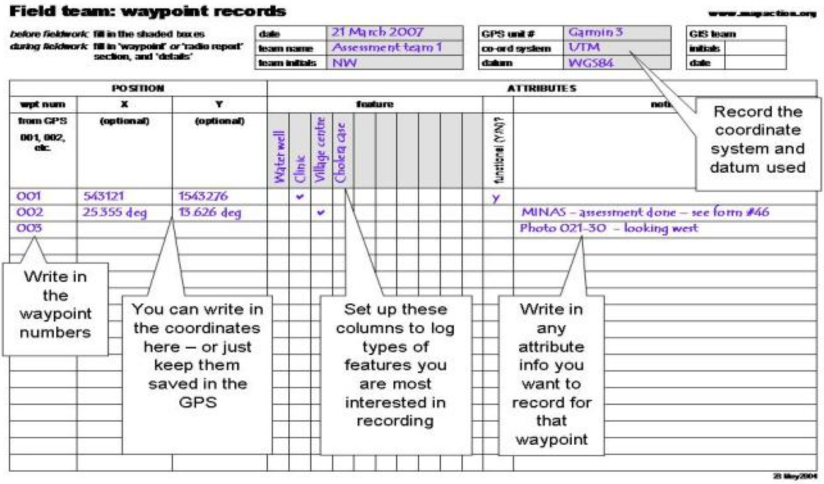
2.6 Recording your data

Remember that the GPS only records the WP numbers: you must also make a record of what these points represent (these are called the **attributes**).

Some newer GPS receivers and other GPS-enabled devices such as hand-held computers allow you to enter attribute information by keying it into the device directly when you create a waypoint. By all means experiment with these, but you may find it awkward in a field environment to mess around with tiny keypads to enter information. A paper record as shown below often proves a more practical way to capture various kinds of information.

You can use a notebook to record the attributes of WPs as you go along. Just write down the WP number, and what you want to record at that place. A better way is to use a purpose-designed form.

At Appendix 2A is a copy of MapAction's blank WP form for you to reproduce and use if you wish. Here is an example showing how the form can be used.



It is not essential that you use a recording sheet exactly like the one above, but whatever you do you must be able to record accurately the attributes for each waypoint you have saved with the GPS.

2.7 Back at base

When you hand over the notes or report from your assessment, make sure you also pass on the coordinate data you have collected. There are various ways to do this. If there is room on the assessment report forms, you could write in the coordinates of places visited. For high precision, make sure you write down the coordinate system and datum that the GPS was set to (eg UTM and WGS84).

Next you will want to transfer the data from the GPS onto a computer. If there are only a few waypoints, you can simply read the coordinates for each saved waypoint off the GPS screen and input them directly into your GIS software: for example using *Add > Placemark* in Google Earth and then keying in the latitude and longitude readings.

However if you have collected a lot of data, including tracklogs, you will need to download the data from your GPS onto computer. You will need a GPS interface cable (for modern GPS units this is often simply a USB cable) and appropriate software to do this. The latest free version of Google Earth (version 5.0) includes GPS connectivity so you can save your waypoints and tracks as KML features. Other GPS software tools available include the following.

- **GPS Utility**. www.gpsu.co.uk. The free trial version allows a reasonable amount of data to be downloaded at once.
- **GPS Babel**. www.gpsbabel.org. This free tool interfaces with a large number of GPS types and allows conversion of many data formats.

You can then save the waypoints and tracklogs and pass them on to mapping teams equipped with Geographical Information Systems (GIS). Once again, make sure you tell them the coordinate and datum used. They will also need a copy of your attribute records on paper, so they know what each waypoint represents.

If you have appropriate PC software for your GPS, you can save your data in KML files which allow you, and others to whom you email the KML file, to view your data using Google Earth.

2.8 Final thoughts about using GPS in the emergency environment

Please remember that your humanitarian assessment or other information-gathering effort may be wasted if the place you visited can't be located again when relief assistance begins. Trying to figure out how to use a GPS once you're in the middle of an assessment is too late! Practice the basics as soon as you have a GPS in your hands.

Appendix 2A: Waypoint recording sheet

Field team: waypoints & radio reports

www.mapaction.org

before fieldwork: fill in the shaded boxes
during fieldwork: fill in 'waypoint' ***or*** 'radio report' section, and 'details'

date	
team name	
team initials	

GPS unit #	
co-ord system	
datum	

GIS team	
initials	
date	

WAYPOINT	RADIO REPORT				DETAILS											
wpt num	**ref num**	**X**	**Y**	**sent?**	**feature**											**notes**
from GPS 001, 002, etc.	R1, R2, etc.	('easting') use all digits	('northing') use all digits												functional (Y/N)?	

Appendix 2B: Examples of GPS unit functions

	GARMIN 12XL	GARMIN MAP76	GARMIN eTrex
Verify coordinate system and datum settings	Press *Page* button until you reach: *Main Menu > Setup Menu >Navigation* In *Nav Setup* screen, check position format is as you require, and map datum is WGS84	Press *Menu* button Scroll down to *Setup (Enter)* then scroll right to *Location* Check position format is as you require, and map datum is WGS84	Press *Page* button until you reach Menu screen. Scroll down to *Setup (Enter)* then down to *Units* Check position format is as you require, and map datum is WGS84
Erase all prior data (waypoints and tracks)	Switch off GPS. Hold down *Mark* button while pressing *ON* button. Confirm you wish to delete all data.	Switch off GPS. Hold down *Menu* button while pressing *ON* button. Confirm you wish to delete all user data.	Delete points: *Menu> Waypoints> Delete All* Delete tracks: *Menu> Tracks> Clear*
Mark a new waypoint	Press *Mark* button Record waypoint number on sheet Press *Enter* to confirm and save	Press *ENTER* button Record waypoint number on sheet Press *ENTER* to confirm and save	Press *Enter* button and hold down until *Mark Waypoint* screen appears Record waypoint number on sheet Press *Enter* to confirm and save
Start or stop recording tracks (tracklog)	Press *Page* button until you reach the map screen, Highlight *OPT (Enter)* Choose *Track Setup (Enter)* and *Record (Enter)* then scroll to *Wrap* or *Fill* *Quit* will save new settings	Press *Menu* button Scroll down to *Setup (Enter)* then scroll right to *Location* Check position format is as you require, and map datum is WGS84	The eTrex automatically records tracks. Ensure you have cleared previous saved tracks before you begin a new project.
Navigate to a previously recorded waypoint	Press *GOTO* button Choose waypoint to which you want to navigate Press *Enter* to start navigation mode	Press *NAV* button Choose *Go To Point> Waypoints* Select waypoint to which you want to navigate Press *Enter* to start navigation mode	Press *Page* button until you reach the Menu screen Select *Waypoints* Choose the waypoint to which you want to navigate Select *GOTO* to start navigation mode

Chapter 3: Google Earth humanitarian mapping tutorial

How to use Chapter 3

Google Earth and **Google Maps** are widely used to explore the world's geography. The following tutorial is specifically for exploiting Google Earth in humanitarian work. You will use a variety of functions and processes which are aimed at giving you the knowledge and resources you need to create and share useful and informative maps quickly and easily. If you are already familiar with Google Earth, use the contents panel to direct yourself to the appropriate pages. There is a field guide at the end of this chapter for quick reference. In humanitarian work you can use Google Earth to:

- Obtain and display information to orientate new arrivals
- Show "who-what-where" data: coordination centre's, health facilities, distribution centres, refugee camps, airfields, drop zones
- Display information about infrastructure, damage and hazards
- Divide up the disaster zone into search and rescue sectors, affected zones, unsafe zones and so on
- Show possible evacuation routes

Chapter 3: Google Earth

The tutorial in this chapter will give you a basic understanding of using Google Earth within disaster risk reduction and relief. We will be working with data from various locations including data from previous MapAction deployments.

After completing this tutorial you will be able to portray geographical information as a digital image file suitable for display on a computer screen in Google Earth, sharing over a network or the web and as pictorial formats such as PNG, GIF or JPEGs.

Beyond Google Earth itself, it's useful to have a basic understanding of GIS. For a general introduction to humanitarian GIS see chapter 1 of this Field Guide. Similarly, we also refer to some GIS and remote sensing terminology for which you can find introductory information in the Annex to guide and chapter 4, together with guidance on using the free/open source software.

This tutorial is based on Google Earth version 5 which was released in January 2009. However most of the content will also work with earlier versions.

3.1 Introduction: What is Google Earth?

3.1.1 Using Google Earth

Google Earth is a free product which allows you to view and explore the whole of the earth's surface, and other geographical information such as settlement names, roads and **thematic** information. As well as the information provided via Google themselves, it is possible to use Google Earth as a platform to view and map spatial data that you collect yourself, or obtain from partner organisations in appropriate formats.

Google Earth maps the Earth's surface by displaying satellite images and aerial photography of varying **spatial resolution**: this means the distance on the ground represented by each pixel or grid cell in the image. The degree of resolution available varies between more and less economically developed regions, but most land is covered in at least 15 meters of resolution. Google Earth also has digital terrain model data collected by NASA's **Shuttle Radar Topography Mission (SRTM)**; this allows you to view the terrain in three dimensions.

- Google Earth is a **Web Map Service (WMS)** client; this means it uses geographical information to create maps of spatially referenced data and adheres to international standards.

- Google Earth supports managing three-dimensional geospatial data through **Keyhole Markup Language (KML)**.

- Google Earth image dates vary. The image data can be seen from squares made when the layer DigitalGlobe Coverage is enabled. See chapter 3.2 for more information.

You can use Google Earth online (connected to the internet) or off-line, provided you carry out some basic set-up actions first. See section 3.8 for more information on this.

Downloading Google Earth

If you do not already have Google Earth installed on your computer go to the following web page:

http://earth.google.com/

Select the download option and follow the online instructions.

If you experience problems installing Google Earth you can directly download the latest version of Google Earth from here:

PC: http://dl.google.com/earth/client/current/GoogleEarthWin.exe

Mac: http://dl.google.com/earth/client/current/GoogleEarthMac.dmg

Minimum configurations for Google Earth downloads:

- Pentium 3, 500 MHz
- 128 MB RAM
- 12.7 MB free disk space
- Network speed: 128 Kbit/s
- 16MB 3D-capable graphics card
- Resolution of 1024x768, 16-bit High Colour
- Windows XP or Windows 2000, Windows Vista, Linux, Mac OS X

For use as a browser plug-in:

- Firefox, Safari 3, Internet Explorer 6 or 7

Google Earth is available in 23 languages:

Arabic, Chinese, Czech, Danish, Dutch, English, Finnish, French, German, Hebrew, Indonesian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Thai, Turkish.

Google Earth Image providers:

DigitalGlobe, Earthsat, GEBCO, GeoEye-1, GlobeExplorer, IKONOS, Pictometry, Spot Image, Terralook, ViewGL, CNES, SIO, NOAA, NGA, NASA

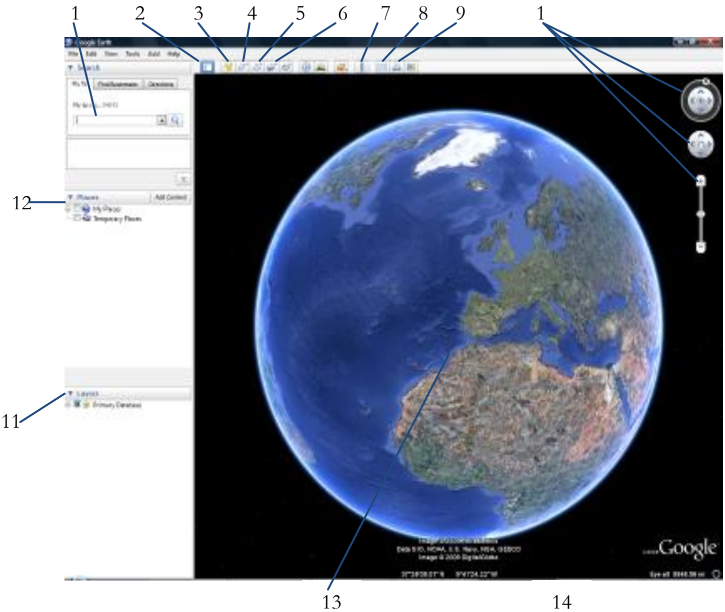
Google Earth is available under two licenses:

- Google Earth (free version)
- Google Earth Pro ($400 per year): this has some enhanced features, however it uses the same imagery and content as the free version

3.1.2 Viewing the Globe

The purpose of this first exercise is to give you an overview of the basic layout, terminology and functionality of Google Earth. Double click on the Google Earth icon on your desktop or locate it in your programs list. The icon looks like this: 

Each time you start Google Earth, the Earth appears in the main window. The area that shows the Earth is called the 3D viewer.



1. Search panel	6. Image overlay	11. Layers panel
2. Hide/Show sidebar	7. Measure	12. Places panel
3. Placemark	8. Email	13. 3D Viewer
4. Polygon	9. Print	14. Status bar
5. Path	10. Navigation	

3.1.3 Changing Languages

You can change the language displayed in Google Earth. To do this:

1. Click *Tools* > *Options (Mac: Google Earth* > *Preferences)* > *General tab.*

2. Under *Language settings*, choose the appropriate language of your choice. *System Default* corresponds to the language used by the operating system of your computer.

Three technical points to note at this stage:

Datum. Google Earth uses the WGS84 datum for its imagery base. This is important to be aware of because any data you import, for example from your GPS unit, should be set to the same datum in order to display accurately.

Projection system. Google Earth uses the Simple Cylindrical projection. If you import any map data that uses a different projection system from this, Google Earth will re-project it: this may create some spatial inconsistencies.

Coordinate systems. Google Earth can work with coordinates in Latitude-Longitude (degrees-minutes-seconds or decimal degrees) or Universal Transverse Mercator (UTM). This is explained in Appendix 3B of this chapter.

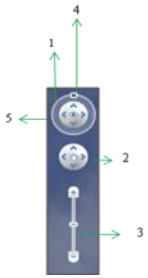
3.1.4 Using the navigation controls

To view and use the navigation controls, move the cursor over to the right corner of the 3D viewer.

To hide or show the compass icon in the 3D viewer: Click *View* > *Show Navigation*

The Google Earth navigation controls offer the same type of navigation action that you can achieve with mouse navigation.

To move the 3D view in any direction, position the mouse cursor on the viewer and press the left main mouse button. The cursor icon changes from an open hand to a closed hand allowing you to drag a new part of the earth into view.



1. Navigation ring to tilt the terrain toward a horizon view.
2. To move the centre point of the view down, up, right or left.
3. Use the zoom slider to zoom in or out (+ to zoom in, - to zoom out). Double click the icons at the end of the slider to reset the zoom.
4. Click the north up button to reset the view so that north is at the top of the screen.
5. Click, hold and drag the navigation ring to rotate the view

Zooming in and out

Zoom In and Out Using the Mouse

Zoom out by doing one of the following:

- Scroll the mouse wheel down (toward you) a number of times.
- Hold down the alternate mouse button, drag the mouse up.
- Zoom in by doing the opposite.
- Scroll the mouse wheel up (away from you) a number of times.

- Hold down the alternate mouse button, drag the mouse down. Do this a number of times.

Zoom in and out using the navigation controls

The navigation controls appear in the top right corner of the 3D viewer.

Zoom out by clicking the zoom out button 

Zoom in by clicking the zoom in button 

Zoom in using a placemark

In Google Earth, a **placemark** marks a location. Each placemark appears as a pushpin with a label. You can learn how to create these in chapter 3.3.

In the *Places* panel (left of 3D viewer), locate the *Sightseeing* folder. You may need to scroll down to view this folder.

Expand the *Sightseeing* folder by clicking +.

Double-clicking on a place name zooms to it.

Tip: To stop the tilt when you zoom in Click *Options* > *Navigation* > uncheck box

3.1.5 Finding places and directions

How might I use this?

There are a lot of **placenames** in the Google Earth database, even for developing countries. Use the *Search* feature to find places you want to locate but be aware of variation in spelling. If someone gives you coordinates, for example in latitude/longitude, you can 'fly' straight to that point on the earth's surface.

You can search for specific locations using the *Fly To* Tab in Google Earth. To do this, enter the location in the input box and click on the *Search* button.

Google Earth recognizes the following types of search terms, entered with or without commas.

- City, country
- Number, street, city, state
- Zipcode or postal code
- Latitude, longitude in decimal format
- Latitude, longitude in degrees, minutes, seconds (DMS) format

For more information on coordinate formats see Appendix B.

The most recent search terms are saved in the search entry history (indicated by the small black triangle on the right of the search input).

Tip: Currently, street-level searching is limited to certain countries, try to use coordinates where possible for accuracy.

To clear search results, click on the *Clear* button at the bottom of the search results listing.

Tip: To view the Earth back from top-down type U or click on N on the navigation tool.

Activity One

To navigate in Google Earth you need to be able to drag, zoom, tilt and rotate the view.

1. Drag the view using the mouse or navigation controls so you are directly over the Falkland Islands.

2. Zoom in and out to see how much detail Google has for this location

3. Tilt the view so you are looking at the Falkland Islands from a low angle

4. Rotate the view to give a different perspective of the Falkland Islands.

To find locations you can also use the *Fly To Tab*

1. Type the Falkland Islands into the tab and click on *Search*

2. Type in the latitude and longitude in DMS format for Port Stanley, Falkland Islands, *51 41 41S 57 49 12 W* and click on *Search.*

3.1.6 Display tools

How might I use this?

You can customise your Google Earth software to suit the type of work you are doing. For example, in a relatively low-lying region you may want to change the terrain scale so that you can see more easily the features of the landscape where you will be working. You can set a number of other preferences to affect 3D viewer imagery, as well as how icons, labels, and other elements are displayed. `

Displaying a latitude/longitude grid

Google Earth provides a special layer accessible from the View menu that displays a grid of latitude and longitude lines over the imagery in the 3D viewer. To turn on the grid:

Select *View* > *Grid.*

The grid appears over the earth imagery as white lines, with each latitude/ longitude degree line labeled in an axis across the centre of the 3D viewer. You can position a geographical feature in the 3D viewer and determine its basic geo-spatial coordinates using this grid.

Setting the view size

To enter full-screen mode, or to return to window mode from full-screen mode:

Select *View* > *Full Screen*

Use the *View Size* options in under the *View* menu to select a number of pre-set aspect ratios designed for best playback modes or printing modes. The selected option resizes the 3D Viewer for the best display for your intended purpose.

3.1.7 Using the overview map

The **overview map** window feature displays an additional view of the Earth with a position indicator that corresponds to the current view inside the 3D viewer.
To show or hide the overview map window, do one of the following:

Select *View* > *Overview Map*

Adjusting the overview map size and zoom ratio

Select *Tools* > *Options* > *3D View* (Mac: *Google Earth* > *Preferences* > *3D View*).

Adjust the slider control in the overview map options to scale the overview map from small to large.

Using the settings in the *Options > 3D View Tab*, you can also adjust the ratio of territory displayed in the overview map window relative to that in the 3D viewer.

3.1.8 Viewing preferences

To access these settings, do the following:

Windows/Linux: Click *Tools > Options > 3D View.*
Mac: Click *Google Earth > Preferences > 3D View.*

Show lat/long
By default, the display of the coordinates is in degrees, minutes, seconds. You can choose the *Show Lat/Long* option to display geo-coordinates in *decimal degrees* or *Universal Transverse Mercator.*

Elevation units
By default, the display of the elevation of the terrain beneath the pointer is displayed in feet and miles. You can choose to display elevation in meters and kilometers.

3.1.9 Viewing a location in Google Maps

To display the current view in Google Maps in your web browser, do one of the following:

Either: Click the map icon in the toolbar 

Or: Click *Ctrl + Alt + M* (+ Option + M on the Mac)

Activity Two

Zoom back into the Falkland Islands using your preferred method. Insert an *Overview Map* to the *3D Viewer* showing the Falklands location relative to South America. Using the *Pan* and *Zoom* navigation methods note the changes in the *Red Extent Window.*

Add a *Grid* to the 3D Viewer and change the coordinates to UTM and the elevation to meters.

3.2 Layers

How might I use this?

The **Layers** feature in Google Earth provides a variety of data points of geographical interest that you can select to display over your viewing area. This includes **points of interest (POIs)** as well as map, road and terrain. You can use this information to help plan routes, look at elevation and check boarder lines in your location of work.

3.2.1 Basic layers

Layers content is created by Google or its partners. Information which appears in the Places panel, however, can be created by anyone using Google Earth or KML.

Here are some examples of layers included with Google Earth:

	Description	Examples
Roads	Road map information for viewing area	Major highways, county roads and streets
Terrain	3D elevation data for the viewing region	Limited to natural geographic features, eg mountains and canyons
Borders	Turns on all possible borders	Coastlines, International boundaries, State and province boundaries.

Turn POIs on and off by checking and un-checking it in the *Layers* panel. You can save any point of interest (POI) displayed in the 3D viewer to the *My Places* folder by right-clicking (CTRL clicking on the Mac) on the placemark in the viewer and selecting *Save to My Places* from the pop-up menu.

To adjust the icon size Click *Tools> Options > 3D*. The icon size is set in the *Labels/Icon size* area.

If you are having problems seeing your POI zoom straight in. Icons, like road data, appear at different elevations, and not all icons appear from an extended elevation. In addition, zooming in to a lower elevation often resolves the problem of icons that appear to overlap when viewed from a higher elevation.

Tip: Layers will take longer to load with the terrain layer switched on.

3.2.2 Terrain elevation

When you tilt your view you can see the 3D effect of the elevation data, and by default it is showing elevation at the same scale as the horizontal map scale. However, the effect may not be visible and you can increase the exaggeration of height by setting it to any value from 1 (the default) to 3. A useful setting is 1.5, which achieves an obvious yet natural elevation appearance.

Windows and Linux: *Tools > Options > 3D View*. Modify the *Elevation Exaggeration value*.

Other layers of interest are:

King's College London's Collection of KML databases
http://www.kcl.ac.uk/schools/sspp/geography/research/emm/geodata

Real-time severe weather monitoring products from WDSS-II: The Warning Decision Support System - Integrated Information
http://wdssii.nssl.noaa.gov/geotiff_new/

Activity Three
Zoom **to** ***Tumbledown, Canada*** **and experiment selecting and deselecting various layers.** ***Exaggerate*** **the elevation to 1.5 and practice tilting the** ***3D Viewer*****.**

3.3 Adding new features

3.3.1 Create and edit folders and placemarks

How might I use this?
You will probably want to record specific places that are important in your field work, for example locations of affected groups of people, or resources such as health clinics. A **placemark** is a point of interest on your map. They are like push pins and could be used to locate where key facilities are.

Google Earth lets you create as many placemarks as you wish and give them appropriate symbols and labels. This means you can create and share maps of your relief activities.

Left of the 3D viewer is your *Places* panel which is split into *Temporary* and permanent *Places*. You can organize your data in the *Places* panel in a way similar to how you would organise files and folders on your computer's hard drive.

When you first start Google Earth, the *Places* panel contains an empty *My Places* folder to hold places that you want to save. If you are upgrading from a previous version of Google Earth, it will import your saved *Places*. Items located in the *Places* panel but not saved in the *My Places* folder are located in the T*emporary Places* folder and are unavailable in the next Google Earth session if you do not move or save them to your *My Places* folder.

The following table gives instructions on how to create and edit *Folders* and *Placemarks:*

Task	Description
Creating a new placemark	Position the viewer to the location you want to put the placemark. Zoom into the best viewing level for the desired location. Click *Add* > *Placemark* or use the Toolbar menu and click the pushpin icon:  The *Edit Placemark* window appears and a placemark icon inside a flashing yellow square. Position the cursor on the placemark and drag it to the desired location. Note: the *Edit Placemark* window must be open to move the placemark or set any properties.
Setting placemark properties	*Name*: Identifiable name *Description*: information about location includes use of HTML text, see section 33.3 for more information. *Style*: Choose a colour, scale (size) and opacity for the placemark icon. *View*: Choose the desired location for the Placemark. *Altitude*: Choose the height of the Placemark as it appears over the terrain. *Icon* : Click the icon for the Placemark (top right corner of the dialog box) to choose an alternate image. Click *OK* to apply. Your placemark appears in the 3D viewer and as an entry in the selected folder.
Creating a Folder	Right-click on a folder in the places panel, (automatically set as the container for the new folder). Select *Add* > *Folder*

(Table continued on next page)

Task	Description
Setting folder properties	*Name*: Identifiable name *Description*: General description for the folder, including the use of HTML tags to format your description and include images. *Style/Colour*: Available when there are icons within the new folder. Use this feature to apply label and icon styles universally across all items within the folder. *View*: Set the date, range and tilt. Double-click on the folder it and repositions the 3D viewer to that position.
Reordering placemarks or folders	Select and drag item to a new position in a list of items. Select item and drag and drop it over a folder. Right-click (Mac : CTRL) the item, use the drop down menu to cut and paste to new location
Renaming a placemark or folder	*Select item> right-click* (CTRL click on the Mac) > *Rename* You can enter the new name directly into the name field.
Removing a placemark or folder	*Select item > Right-click* (CTRL click on the Mac) > *Delete* If you delete a folder, you also delete all its contents, including other folders and icons.
Saving places data (placemarks, shapes, folders to hard drive)	*Select item > Right-click* (CTRL click on the Mac) > *Save as* Folder is saved as a single file in KML format.

Task	Description
Opening saved placemarks	*File* > *Open* > Navigate to KML> *Open* The folder or placemark appears beneath the Temporary Places folder and the 3D viewer files to the view set for the folder or placemark.
Showing and hiding places data	Use the show/hide features of Google Earth to quickly manage the amount of content visible in the 3D viewer. Select or de-select the check box next to an item or a whole folder.
Repositioning placemarks	Dragging the placemark: Select *placemark* > drag yellow square to the new location. Locking a placemark to the centre of the view: Select *placemark* > right click > *properties* >*View tab* > check centre in view box >drag the earth to desired location

Activity Four

Find the Berg River Bridge in South Africa at 32°47'15.58"S 18°10'8.26"E and assign a placemark. Call it “Bridge Out” and describe that the road is “impassable at this point.”

Find an open area in the same region and place a symbol to locate it as a possible displaced persons location.

Create a folder in Places and move the two placemarks you just created into it.

3.3.2 Advanced folders and placemarks

Using custom icons

For single Placemarks and folders of Placemarks, you can select a custom image to use as an icon rather than one of the default set of icons available to all Placemarks.

1. Right Click *Icon* > *Properties*. Select icon next to *Name Field*

2. Click *Add Custom Icon* from the icon palette.

3. Indicate a valid path or Web URL in the field next to the *Icon File/URL* label or click *Browse* to specify the file on your computer or network. If you refer to an image on the web, be sure you have entered the path to the *image itself*, not the web page containing the image.

Editing line colour and width

When your placemark data consists of lines, such as with saved directions, you can use the line properties in the Style Tab to modify the colour, width and opacity of the line in the 3D viewer.

Right click *Placemark* > *Properties* > *Style, Colour*

Setting altitude

The values set in the *Altitude* area can be used to show the feature above the surface of the earth at a user-defined altitude.

Right click *Placemark* > *Properties* > *Altitude.*

There are three options:

1. **Clamped to ground.** This is the default option. Altitude for the placemark is locked to the ground, no height value is allowed for altitude. The placemark remains fixed to the earth, regardless of whether terrain is on or off.

2. **Relative to ground.** The altitude of the placemark is relative to the actual ground elevation of the view.

3. **Absolute**. The altitude of the placemark is above sea level. You can adjust the altitude using the slider or by entering a value in meters in the *Altitude* field.

Modifying folder settings

Applying description, label, and advanced settings to a folder provides display characteristics that differ from settings applied to individual placemarks or to other geometry features.

The name and description and view that you provide when you edit a folder applies only to that folder and not to the items it contains. Setting a view for a folder is useful when you want to create a viewing angle to encompass all the items contained by the folder.

As with styles, altitude settings can apply to all items in the folder once style sharing is enabled. This includes subfolders. Altitude settings apply to all geometry within the folder.

Modifying settings for a single item

You can modify all settings for a single item to affect the display of that item only. When you change the style and altitude settings for an item in a folder, style sharing is disabled for that folder. However, styles that have been previously applied via the shared styles are preserved for other items in the folder.

Tip: It is recommended if using a combination of shared styles with individual placemark modifications to first apply shared settings to the folder then modify individual items without affecting the general style settings for the other items.

Activity Five

Re-locate your "Bridge Out" placemark created in Activity Four. Change the height to 7 meters relative to the ground.

Change the icons to a suitable size and colour image of your choice.

3.3.3 HTML

How might I use this?

The description field for places and folders can contain a lot of text allowing room for sharing of detailed information. You can enhance your descriptions using fonts and other formatting, even including images using **HyperText Markup Language (HTML)**, the predominant language for web pages. This allows you to share more information in a clearer format. HTML provides a means to describe the structure of text-based information in a document by denoting certain text as links, headings, paragraphs and lists. HTML tags are respected in Google Earth; the following table gives some examples.

Attribute	Code	Example
Bold	Test	**Test**
Italics	<i>Test</i>	*Test*
Font type	<FONT FACE="Times New Roman">Example</FONT>	Example
Font size	<FONT FACE="Times New Roman" SIZE="12pt">Example</FONT>	Example
Font colour	<FONT FACE="Times New Roman" SIZE="10pt" COLOR="red">Example</FONT>	Example
Line break	Example Example	Example Example
Centre	<CENTER>Example</CENTER >	Example
Paragraph	Example New paragraph	Example New paragraph
Website	MapAction	MapAction (www.mapaction.org)
Email	Contact MapAction	Contact MapAction (opens email)
Insert image from computer	<img src=”image file path”>	Image displayed
Insert image from website	<img src=”http://image URL”>	Image displayed

Activity Six

Open the Properties for the Possible Displaced Persons location placemark created for Activity Four. Using the HTML example commands write the following information:

Possible IDP Location

North/South (depending on chosen location) entry point impassable due to bridge collapse

Need for assessment to check fits IDP camp criteria

3.3.4 Basic Tools: Shapes and Measurement

How might I use this?

Google Earth offers tools that you can use to create shapes, measure distances and estimate sizes. Quick measurement of a distance, perhaps along a winding road, is a very useful feature for field work of all kinds. Google Earth also lets you quickly check the area of any space you define: potentially very useful for estimating resources or for planning a camp for displaced people. Shapes save automatically into Temporary Places when you click OK.
(Table continued on next page)

Description	To Create	To Measure
A path which consists of two or more points connected with a straight line. 	*Toolbar* > *Add* > *Path* > enter properties> draw in 3D viewer using cursor Try zooming in closely to the feature and adding more points for better accuracy. **Line:** Click and release left mouse button for a straight line. **Path:** Click and hold for free hand drawing allowing for curvy roads etc.	*Tools* menu> *Ruler*> *Path* > choose unit of measure **Or** *Tools* menu> *Ruler*> *line* > choose unit of measure Click in the 3D viewer at beginning of point for measurement and at the end of desired region. Units of measurement can be changed using the down arrow and selecting from the list.

Tip: To label shapes on the map, add a placemark near the line or in the area to describe the feature

Description	To create	To measure
A polygon consists of three or more points enclosing an area.  Measurement for a polygon tool is done for both perimeter and area.	*Toolbar* > *Add* > *Polygon* > enter properties > drawing 3D viewer using cursor **Free-form shape:** click once, hold, and drag. The shape follows the path of your cursor. **Regular shape:** click and release. Move the mouse to a new point and click to add additional points. You can use a combination of these drawing modes to combine curved edges with straight edges. **To make the shape a 3D object:** a. Click the Altitude tab b. Slide the slider from ground toward space. c. Check Extend sides to ground	View the earth from top-down (type U) and with terrain turned off. *Tools menu* > *Ruler* > *polygon* > choose unit of measure Click in the 3D viewer at beginning of point for measurement and at the end of desired region Units of measurement can be changed using the down arrow and selecting from the list.

Tip: icons with smaller file sizes work best

3.3.5 Further Editing of Shapes

Task	How to do this
Modify or reposition a shape	Have the type of shape you want to modify selected in the Ruler dialog box. Click on a desired point, cursor changes to a finger, drag it to the new position.
Add additional points	For area shapes, you can add additional points by clicking in the 3D viewer. Points are added in an area shape in a strict sequence from first to last, regardless of where you click in the 3D viewer.
Remove selected shape	Right click (CTRL click on the Mac) the shape in the Places panel and click *Delete*.
Remove selected point	If you want to remove a point from either a path or an area shape, select a point and press the Backspace key.
Remove all shapes	You can clear all measuring shapes from the viewer by clicking on the *Clear All* button in the Ruler dialog box regardless of which tab is active.

Activity Seven

Flooding is a natural hazard which affects thousands of people every year. Bolivia has faced more severe flooding in recent years due to the effects of La Niña.

Fly To 14°50'16.25"S 64°54'13.18"W **and create a placemark named** ***Field Operations Centre***

Locate areas of high, flat land for possible refugee camps and draw red polygons around them.

Change the settings of the polygons so you can just see the ground beneath.

Measure the distance via road in meters between your perspective IDP camps.

Using the measuring tool again calculate the area accumulated for IDP camps.

3.4 Using image overlays

How might I use this?

Although the basic imagery, roads and settlements layers in Google Earth may sometimes be all you need, often you will want to use other maps that you have obtained, for example a detailed local map or a map showing health statistics. The **image overlay** feature is a very easy but powerful way to import such maps into your Google Earth 'world': you just need to obtain an electronic version of the add-on map, for example by photographing it with a digital camera.

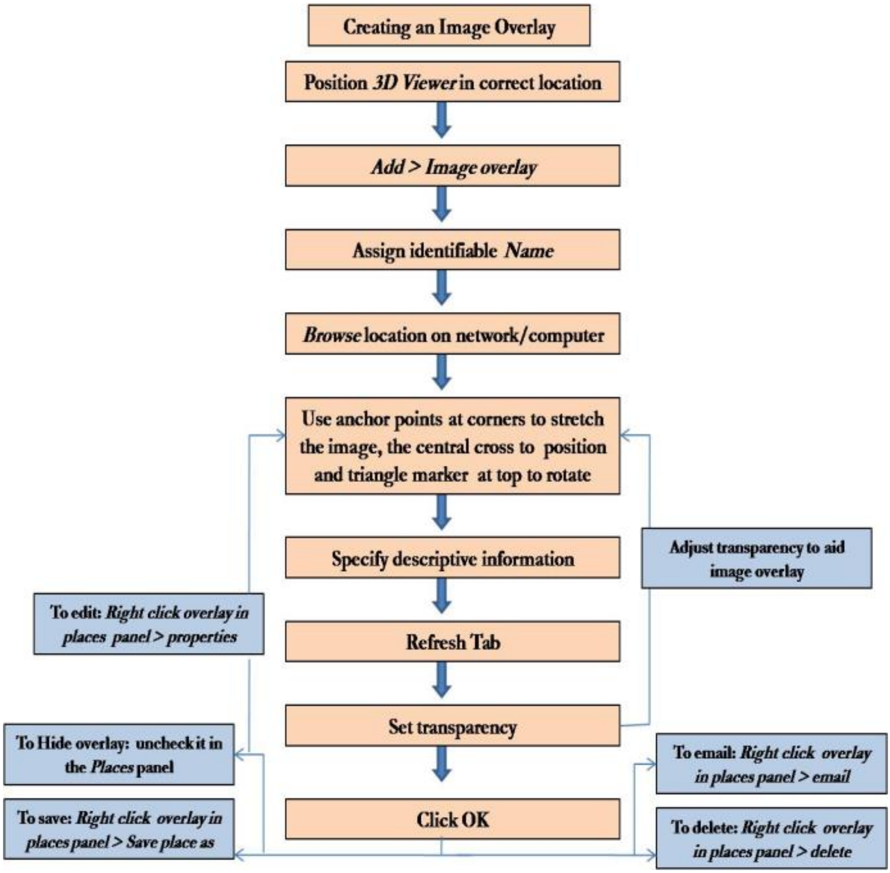
File formats that can be used to create an image overlay:
JPG, BMP, GIF, TIFF, TGA or PNG

Tip: If you are having trouble importing a large image, you can reduce its size using image editing commercial software such as Adobe Photoshop or freeware such as IrfanView or GIMP.

3.4.1 Image overlay basics

Image overlays provide additional information about the underlying earth imagery.

They can be taken from your computer, from your network, or from a web site. It completely integrates with the terrain or shape of the land beneath if the terrain layer is turned on.



3.4.2 Advanced image overlays

To edit an image overlay further, open its dialogue box, right click *Overlay* in the Places panel and select properties.

> **Tip: To determine the size in pixels of an image, display the image file in a Windows Explorer window, right click (CTRL click on the Mac) , and select *Properties* from the pop-up menu.)**

Change position settings

Select the *Location Tab* in Properties:

1. Manual coordinates for each corner of the image overlay. You set coordinates for each corner of the image overlay. For more on coordinates see Appendix B.

2. Fit to Screen. Resize the image to fit the current view.

Try positioning the center of the image as a reference point first, and then use the *Shift* key in combination with one of the anchors to scale the image for best positioning.

> **Tip: When using multiple image overlays on the same region, set a drawing order.**

Updates for time sensitive imagery

The refresh tab sets the correct refresh properties for your overlay imagery. Most imagery that is updated automatically and located on a server will need refresh properties set. Select the *Refresh Tab* in Properties.

Opening overlays emailed to you

Double-click on the attachment in the email message and click the appropriate button in the confirmation box to open the attachment. If Google Earth is not running, it will first start up before loading the emailed overlay. Otherwise, it appears in the *Temporary Places* folder in the *Places* panel and the image overlay displays in the viewer.

Opening overlays on a web server

You can open overlays posted to a web server simply by clicking on the link that references the overlay image.

Posting image overlays to a web server

You can share overlay data with other Google Earth users by posting the overlay file to a web server that other users also have access to.

Placing Web Mapping Service (WMS) image overlays

These are mapping images that are provided through a WMS over the internet. They can show you interesting information, such as weather formations and conditions, topographical maps, alternate high resolution satellite imagery.

1. Position the 3D viewer in the location where you want to place the overlay image file.

Try to position the viewer so that it corresponds in viewing altitude to the overlay.

Add menu> Image Overlay> Refresh Tab

2. Click *WMS Parameters*. The Web Mapping Service Parameters dialog box appears.

3. Beside WMS Service, choose an appropriate service or click Add to use a URL (website address) for a WMS. After a brief period of time, Google Earth populates the *Opaque* and/or *Transparent Layers* fields with available layers from the WMS you choose.

4. Choose the appropriate layer(s) and click *Add* > to add the layer(s) to the *Selected Layers* field. This places this information in the WMS image overlay in Google Earth. To remove a layer from the Selected Layers field, select it and click >*Remove.*

5. When you are finished, click *OK* and continue as you would with an image overlay.

3. 5 GPS and Google Earth

Please see Chapter 2 of this Field Guide for a more detailed introduction to using a GPS for humanitarian mapping.

How might I use this?

If you have been on a field assessment or have obtained data from someone who has you can import it into Google Earth and create a map making any planning and data sharing much easier.

GPS devices currently supported within Google Earth: Garmin, Magellan

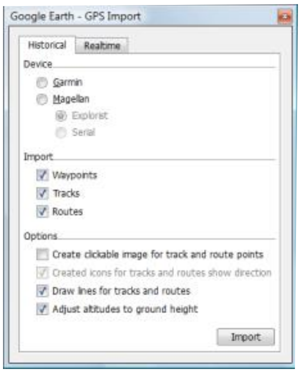
3.5.1 Using GPS Devices with Google Earth

The Global Positioning System (GPS) is a satellite based navigation system made up of a network of 24 satellites. GPS works in any weather conditions anywhere in the world. If you have a GPS device, you can connect it to your computer and import your waypoint and track data into Google Earth. You need either a serial or USB cable to connect your GPS device to your computer. If you do not have a cable visit your manufacturers web site to purchase the correct cable for your model.

When your GPS data is imported into Google Earth, it is categorised into three possible folders, depending upon the type of data.

Tracks	Waypoints	Routes
Points are automatically recorded by the GPS device periodically along the recorded route. Eg paths, roads.	Waypoints are points entered manually by the user. For example, hospitals or airfields.	Route points are those points that the GPS device uses to create the routing, such as when you instruct the device to "go to" a recorded point from another recorded point..

3.5.2 Importing GPS Data



If you are using a Garmin device and a Windows computer install the driver from the CD that came with the GPS or download it from the Garmin website.

1. Using the cable connect the GPS to the computer and turn the GPS on

2. On the computer screen select *Tools* > *GPS* > *Historical*

3. Select the correct manufacturer for your device

4. Under *Import* select the type of data you want

5. Under *Options* select drawing preferences. Create clickable image assigns icons to the track/route points with pop-up data for them.

6. Click OK and data will commence downloading

7. Once download is complete confirmation box will appear

8. Data will be stored in the Places Panel and can be edited.

Tip: If you receive a connection error, turn the GPS device on and off and start again from step 2.

If you're using a device that is not supported within Google Earth, you can try importing GPS data from the device to your computer using free GPS software GPSU or GPSTrackmaker. Download the data from your GPS as a .gpx or .loc or .kml file and then open it in Google Earth (*File > Open*).

Tip: A KMZ file is a compressed version of a KML

3.5.3 Real-time GPS tracking

This allows live tracking of your position in Google Earth, via a connected GPS receiver.

1. Using the cable connect the GPS to the computer and turn the GPS on.

2. On the computer screen select *Tools > GPS > Realtime Tab.*

3. Select the correct *Protocol* for your device.

4. Select *Polling Interval*: determines how often GE gets position data from your GPS.

5. Select *Track Point Import Limit:* determines how many position points are imported and averaged for every polling.

6. Click *Automatically Follow the Path*: Google Earth will zoom to the current GPS location, and follow it as it changes.

7. Click *Start* and tracking will commence.

8. Your path is saved and displayed on screen. To save permanently Right Click *Route > Save as.*

Tip: More points - accurate but slower position update.
Less points - updates position quickly but less accuracy

Activity Eight

If you have a GPS, collect some data from where you are located.

Download the data into Google Earth.

Annotate the features with a new style, colour and labels.

3.6 Sharing GPS data

How might I use this?

Sharing information, collaborations on tasks and coordination of activities among personnel in different organizations is an important part of successful humanitarian work. Sharing data helps to provide near real time situational awareness and collect/display assessment data for operations. With new data against old you can evaluate and monitor change in a situation and transfer knowledge within a community.

3.6.1 KML

KML, or **Keyhole Markup Language**, is a grammar and file format for modeling and storing geographical features such as points, lines, images, polygons, and models for display in Google Earth and Google Maps. You can use KML to share places and information with other users of Google Earth and Google Maps.

To open KML: *File > Open (Ctrl + O in Windows/Linux, + O on the Mac)*

Navigate to the location of the KMZ or KML data you want to open in Google Earth. Select the file and click the *Open* button. The folder or Placemark appears in the *Places* panel and the 3D viewer flies to the view set for the folder or Placemark.

Setting KML error options

You can set how Google Earth reacts when it encounters erroneous KML.

1. Click *Tools > Options > 3D View*. (On the Mac, click *Google Earth > Preferences > 3D View*). The Options dialog box appears.

2. Click the *General* tab.

3. Under *KML Error Handling*, choose one of the following:

- *Silently accept all unrecognized data* - Choose this to load KML regardless of any errors
- *Show prompts for all errors* - Choose this to show a message upon each instance of an error
- *Abort file load on any error* - Cancels loading of a KML file when Google Earth detects an error

4. Click OK.

3.6.2 Sharing Places Information

Share placemarks, shapes, and folder data with other people including both users and non-users of Google Earth. You can share your places data by emailing an image, emailing places data, sharing data over a network and creating a network link.

Tip: You can share places information with other Google Earth users via the Google Earth Community BBS website. See Appendix 4.

Emailing an image

You can email the current view of the earth shown in the Google Earth 3D viewer as an image file for people who don't have Google Earth, or a KMZ file for other users of Google Earth

When you email an image, a JPEG file is automatically attached to an outbound email message. When you email the view as a KMZ, a KMZ file is automatically attached to an outbound email message.

Click *File* > *Email* > *Email Image*
or
Click on the email icon on the toolbar and choose *Email Image*

In the *Select Email Service* window, choose your default email program or your Gmail account. Wait while the Google Earth software sends the data to your email application. A new email window appears with the image file. (This can take a few seconds.) The image is a JPG file of the current view in the 3D viewer.

Fill in the recipient's email address and any other information in the body and send the email.

Emailing places data

Right click on *Placemark* > *Email*

When you email KMZ files that reference custom icons or image overlays from your local file system those items are included with the placemark data. For this reason, KMZ files that include imagery overlays might be larger than those containing a simple placemark.

You cannot send a placemark file to a user of a Google Earth (Keyhole) client version 2.2 or lower: the file format for placemarks has changed for Google Earth versions 3.0 and higher. Send an image file instead.

Tip: On the Mac, you can only email KML files through the Mail, Eudora and Entourage applications

Troubleshooting Email Issues

If your email application does not respond to the *Email View* command, you may need to set the default email program.

Windows: *Start Menu > Control Panel > Internet Options > Programs Tab*. Select the default email program that you use from the *E-mail* drop-down list, and click *Apply*.

Mac: Open Mail. *Click Mail > Preferences*. Pick the email application you would prefer as your default email handler.

3.6.3 Sharing data over a network

In addition to saving placemarks or folders to your local computer, you can also save place data to a web server or network server. Other Google Earth users who have access to the server can then use the data. Storing a placemark file on the network or on a web server means you will have better accessibility to your data, ease of distribution, automatic updates to network people with network access and a backup. As with other documents, you can create links or references to KMZ files for easy access.

Saving data to a server

To make your placemarks or folders available to other people via a server, you need to first save the file to the appropriate location.

Network server. To save a folder or placemark to a location on your network, simply save the file in a location on your organization's network rather than to your local file system.

Web server. To save a Placemark or folder to a web server, first save the file to your local computer. Once the file is saved on your local computer as a separate KMZ file, you can use an FTP or similar utility to transfer the file to the web servers.

Opening data from a network server

If you are working in an organization where place data is saved to a network that you have access to, you can open that data in the same way you would open a saved KMZ file on your local computer, navigate to the network and locate the KML file.

Creating a network link

Add > Network Link>

Type in the *Name* field and enter the full path of the KMZ file in the *Link* field, or browse to the file location if the file is located on a network. You can use a URL to reference the KMZ. The 3D viewer immediately flies to the default view for the linked data.

Tip: The text you enter in this description is your description of the link only and is not viewable by anyone else linking to the KMZ file. Only you will be able to see the description you enter here unless you email your link folder to other people.

3.7 Google Earth add-ons

How might I use this?

Google Earth has many tools, however, to enable for further adding, editing and sharing of existing data there are many external tools that you can utilize with Google Earth. The table below is not an exhaustive but consist of tools that have been tried and tested. Look at the task to locate what you need to do, follow the link and the online instructions for each.

Task	Name	Website
Reduce the number of intermediate points of an line in order to speed up the calculation	GeoUtilities	www.geo-news.net/index_geof.html
Enable mapping of administrative region data	MEASURE Evaluation Excel to Google Earth (E2G)	www.cpc.unc.edu/measure/tools/monitoring-evaluation-systems/geographic-information-systems
Buffering algorithm, upload point, lines and polygons	GeoUtilities	www.geo-news.net/index_geof.html

(more tasks and tools on next page...)

Task	Name	Website
Calculate the area of the buffer	GeoUtilities	www.geo-news.net/index_geof.html
Allow the polygon features of one layer to be overlaid on the polygon, point, or line features of another layer.	GeoUtilities	www.geo-news.net/index_geof.html
Export point, line and polygon shapefiles, with more attribute data.	Shp2KML	shp2kml.sourceforge.net
Export shapefiles to Google Earth's KML format.	GPS TrackMaker	www.gpstm.com
Convert shapefiles in virtually any coordinate system	MapWindow	www.mapwindow.org
Drawing grids, paths and polygons	GE Path	www.sgrillo.net/googleearth/gepath.htm
Create, process, and import/export KML code	KMLToolbox	www.zonums.com/kmltoolbox.html
Building better balloons	Outreach Tutorial	http://earth.google.com/outreach/tutorial_balloon.html
Plot tabular data to bar graphs with geometrical shapes, colours and polygons	GE-Graph	www.sgrillo.net/googleearth/gegraph.htm
Cache Google Earth data	GE Cacher	http://bx11.110mb.com/gecacher.htm Or www.download.com/Google-Earth-Voyager/3000-2648_4-10667194.html

3.8 Saving and printing images

3.8.1 Save current view

Use *File > Save > Save Image* to save the current view as an image file to your computer's hard drive.

The image is saved with all visible placemarks, borders, or other layer information visible in the 3D viewer.

3.8.2 Printing

File > Print

Print dialog box appears that asks you to choose one of the following:

Selected Folder in My Places: this is available if you have selected any placemark or folder in the Places folder. This prints the current 3D view plus placemark information and images.

*Graphic of 3D View: c*hoose an appropriate resolution and then select available printers, just as you would for any document.

Most Recent Search Results: most recently searched location.

3.8.3 Memory and disk cache preferences

You can use Google Earth offline without an internet connection. To do this you need to have the data 'cached' (saved onto your hard disk). First connect to the internet, launch Google Earth, and clear its disk cache:

Tools > Options > Cache > Clear disk cache > OK

Then, make sure that the borders and roads layers are switched on; zoom to the affected area; and systematically 'sweep' it at an appropriate level of resolution. As you do this, the background imagery is cached to disk.

To copy the cache

You can make a copy of the cached data on your computer, and pass this to another user so that they can view and use the same regional content without having to connect to the internet. To do this, close Google Earth, then go to this location:

C:\Documents and Settings\<u>USER</u>\Local Settings\Application Data\Google\GoogleEarth

Or in Windows Vista:
C:\<u>USER</u>\AppData\Local\Google\GoogleEarth

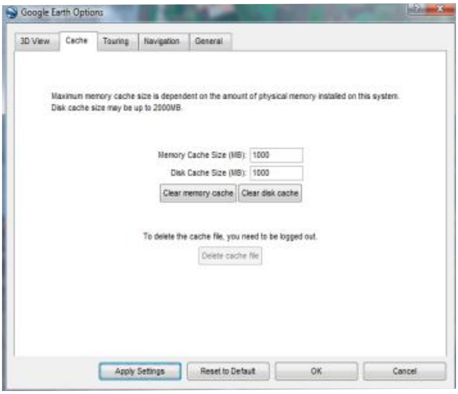
Take copies of the files *dbCache.dat* and *dbCache.dat.index*.

By increasing your memory and disk cache size, you can improve performance. To do this, follow the steps below.

1. Click *Tools* > *Options* (*Google Earth* > *Preferences on the Mac*). Click on the *Cache* tab.

2. Enter a value in the *Memory Cache Size* field. You do not need to know the actual limits of your computer's memory because Google Earth automatically limits the size according to the physical memory available on your computer.

3. Enter a value less than 2000 in the *Disk Cache Size* field.



Disk cache is limited to 2GB. Google Earth uses this cache when you are viewing imagery offline.

You can recover some disk space by deleting the disk cache. To do this:

1. Click *File* > *Server Logout*.

2. Select *Tools* > *Options* (*Google Earth* > *Preferences on the Mac*). Click on the *Cache* tab.

3. Click *Delete Cache Files*.

Appendix 3A:
Google Earth quick guide

Data Source

You

Create

Single Point Placemark

Toolbar>Add>Placemark >drag to desired location and edit properties

Paths

Toolbar>Add>Path>enter properties>click/hold cursor to draw

Lines

Toolbar>Add>Path>enter properties>click/release cursor to draw

Polygons

Toolbar> Add>Polygon> enter properties>draw using cursor

Folder

*Add >Folder>*edit settings as required

Website/Email

Locate Website/Email and Save KML File to your local drive

Network/USB/Computer

KML: *File>Open>*navigate to File>*Open*

Image: *Add>Photo/Image Overlay>*navigate to file>*Open*

Edit: Select item>*Properties*
Save: Select item >*Right-click >Save as*
Share: *File>Email >Email Placemark/Veiw/Image*
Delete: Click *File>Delete*

GPS

Install GPS Driver and connect cable

Download Data

Tools > GPS Historical> Waypoint/Tracks/Routes
Click Import
Data is stored in *Places Panel*

Realtime Tracking

Tools > GPS >Realtime >select settings>*Start*
Data Stored in *Places Panel*

Appendix 3B: Entering coordinates in Google Earth

For entering coordinates for placemarks, fly-to and descriptions, latitude and longitude values can be set using the following notations:

Decimal Degrees (DDD)
In this notation, decimal precision is set in the *degree* coordinate.

Degrees, Minutes, and Seconds (DMS)
In this notation, decimal precision is set in the *seconds* coordinate.

Degrees, Minutes with Decimal Seconds (DMM)
In this notation, decimal precision is set in the *minutes* coordinate.

Latitude and longitude syntax is specified as follows:

Numeric Values
Simply separate each coordinate notation with a white space and the entry will be recognized correctly.

Direction Notation (North/South, East/West)
Use *N*, *S*, *E*, or *W* to indicate direction. The letter can be entered either upper or lower case or it can be placed before or after the coordinate value.

You can also use the minus sign (-) to indicate a westerly or southerly position.

Entering latitude-longitude pairs

When entering latitudinal or longitudinal pairs, the first coordinate is interpreted as latitude unless you use a direction letter to clarify (E or W).

Appendix 3C: Google Earth keyboard equivalent commands

Command	Keyboard
Open File menu	Alt + F
Open Edit menu	Alt + E
Open View menu	Alt + V
Open Add menu	Alt + A
Open Tools menu	Alt + T
Open Help menu	Alt + H
Open file	Ctrl + O
Save image	Ctrl + Alt + S
View in Google Maps	Ctrl + Alt + M
Print	Ctrl + P
Email view	Ctrl + Alt + E
Copy current selection	Ctrl + C
Cut placemark	Ctrl + X
Paste placemark	Ctrl + V
Open Find Field	Ctrl + F
Delete item	Del
Rename item	Ctrl + Alt + R
Zoom to selected placemark/item	Enter
Full screen mode	F11
Show/Hide sidebar	Ctrl + Alt + B
Lat/lon grid	Ctrl + L
New placemark	Ctrl + Shift + P
New folder	Ctrl + Shift + N
New image overlay	Ctrl + Shift + O
New model	Ctrl + Shift + M
New path	Ctrl + Shift + T
New polygon	Ctrl + Shift + G

Appendix 3D: Useful websites for Google Earth

Free Geography Tools http://freegeographytools.com/2009/using-the-google-earth-cache-basics. For various add-on tools for use with Google Earth.

Geolyzer http://geolyzer.dirkoester.de/eng/. A compact usability-lab for KML-content. It allows you to record and playback subject-activities, generate 3D-Heatmaps to analyze mouse-activity on the globe and export reports.

Google Earth Blog www.gearthblog.com/**.** For Google Earth news and updates.

Google Earth Community http://bbs.keyhole.com. An online forum which is dedicated to producing Placemarks of interesting or educational perspectives.

Google LatLong http://google-latlong.blogspot.com/**.** A news and notes webpage by the Google Earth and Maps team.

Google Outreach (US) website http://earth.google.com/outreach/.

Google Spreadsheet Mapper http://earth.google.com/outreach/tutorial_mapper.html**.** Allows you to create 400 placemarks with six ready made templates.

KML Documentation - http://code.google.com/apis/kml/documentation/ . Particularly useful if you want to find further codes , also the interactive sampler is a good way of trying things and seeing the results.

Northgates KML Editor http://www.northgates.ca/KMLEditor/ . A useful editor.

Official Google Earth Website http://earth.google.com/**.** For download of software and updates.

Ogle Earth www.ogleearth.com/**.** A Google Earth news site charting innovative uses and political implications of Google Earth.

The KML Handbook: Geographic Visualization for the Web http://my.safaribooksonline.com/9780321574404. Gives examples on what things are and how to do them.

Chapter 4: Humanitarian mapping using MapWindow

How to use Chapter 4

MapWindow is a powerful **Geographical Information System (GIS)** software toolkit that is free to download and use. This chapter focuses on the use of **MapWindow** for mapping in humanitarian operations. For a general introduction to GIS for humanitarian mapping see chapter 1 of this guide, and for quicker, easier mapping tools see chapter 3 which utilises Google Earth.

Free and Open Source Software (FOSS) with GIS functions is widely available in many different packages. For the purposes of this guide we have used one package that has a user-friendly interface and fast access to most standard raster and vector formats. MapWindow allows a user with a basic understanding of the functions of GIS and its applications to create many useful map products for work within disaster risk reduction (DRR) and relief.

MapWindow is a sophisticated GIS toolset. Unlike Google Earth, it does not open automatically with integrated imagery and mapping; however its functionality is considerably wider than Google Earth for managing and mapping spatial data and performing complex analyses on it. MapWindow can be used in a wide range of humanitarian mapping tasks, including:

- Obtaining and displaying information to orientate new staff arrivals.
- Showing 'who-what-where' data: coordination centres, health facilities, distribution centres, refugee camps, airfields, drop zones.
- Displaying information about infrastructure, damage and hazards.
- Dividing up the disaster zone into search and rescue sectors, affected zones, unsafe zones, possible evacuation routes.
- Mapping and analysing data about the affected population and their needs, and highlighting spatial gaps and overlaps in response.

The purpose of this chapter is to give you an overview of the layout, terminology and functionality of MapWindow. To receive further direction in using this software please utilise the on-line manuals and forums available in many languages at: www.mapwindow.com

4.1 Introduction: getting started with MapWindow

4.1.1 Download MapWindow

Navigate to the **MapWindow** website and follow the on-line instructions to download the most recent stable version.
www.mapwindow.org/

Select your set up language.

Read and accept the terms and conditions and choose a file location.

Open MapWindow by finding it in your programs or by clicking on the icon .

The initial interface offers various links where you can gain more instruction and advice about MapWindow. These can also be accessed from the main toolbar once in MapWindow.

For now, close it. Click *Red Cross.*

Features of MapWindow

Free to use and re-distribute.

Advanced users or developers can write plug-ins to add additional functionality.

Standard GIS data visualisation features as well as DBF attribute table editing, shapefile editing, and data converters.

GIS formats are supported, including Shapefiles, GeoTIFF, ESRI, ArcInfo, ASCII and binary grids allowing for efficient data sharing.

Compatible with Windows 98 and upwards.

MapWindows complies with all international standards regulated by the Open Geospatial Consortium (OGS).

Languages

Portuguese , Chinese Dutch, English, Farsi, French, German, Greek, Italian, Japanese

UpdatingMapWindow GIS

MapWindow GIS update can be acquired by clicking on *File> Check For Updates.*

4.1.2 Basic layout

The following will appear. This is your **Main View**.

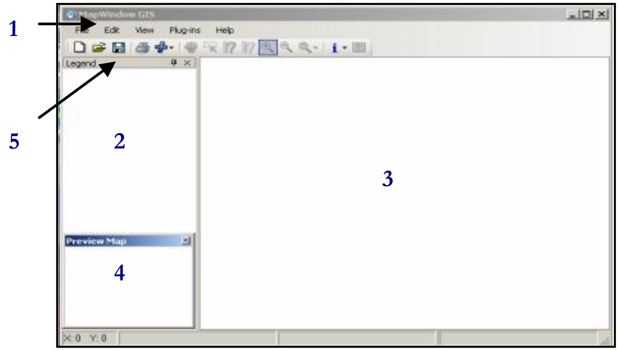
1 Standard toolbar

2 Legend

3 Map view

4 Preview map

5 Icon toolbar



Using additional windows

You can alter the general layout of the interface by taking off and on different windows.

Standard Toolbar >*View* >*Panels* > Uncheck *Show Legend* or/and *Show Preview Map*

Re-check either of the options to return the windows to the default position.

4.2 Creating and saving a new project

How might I use this?

It is possible that you will have many different sets of data, so it is important to manage them efficiently to prevent mistakes and wasting valuable time. You will store all your work in *Projects*. The data you use will not be stored within the project file but will be linked to it; therefore the same data can be used for many projects.

4.2.1 Loading and saving an existing project

Loading

File > *Open* > navigate to folder > *Open* (ends in .mwprj)

Saving a project

It is advisable to save regularly especially if you are in the field with /poor power supply and may have to move quickly.

Standard Toolbar > *File* > *Save* > navigate to folder and assign name >*Save*

It is important to note that a saved project file does not contain any map data. The project file contains references to map data, as well as other information such as the data's symbology.

Projects are stored on the hard drive with an .mwprj file extension.

4.3 Data

How might I use this?

In humanitarian mapping, data falls into categories: background and situational. For more information on data sources please see chapter 1 of the user guide.

Background data can be time-consuming to collect and organise. If you are working in disaster management then download and obtain as much data as you can beforehand and try to ensure it is correctly spatially referenced, and perform any necessary data organisation (see chapter 1 for an explanation). Situation data is 'current' information about the emergency. At the beginning of a disaster you may have very little: but it might include field hospitals, evacuation centres, road status, bridges. Other situation data may come in the form of statistics. The number of people affected, deaths and injuries. All tend to be collected at the level of ***admin unit*** (district etc) or ***p-code*** (unique reference codes for individual communities).

It is useful to think about the types of maps you want to create; each map should be focused on a particular purpose to ensure clarity of information.

Data type		Sources	Examples of uses
Background data	Raster	• Topographic maps (scanned) • Satellite imagery • Aerial photos	• Analysing damage and flood-ing • Identifying flat land for IDP camp locations • Contextual Information
	Vector	• Virtual Map of the World (VMAP) • GAUL admin boundaries dataset • National mapping agencies' digitised data holdings	• Identifying roads and routes • Classifying urban areas and settlements with population figures • Base maps of districts and communities to plan assess-ment missions
Situational data		• GPS points and tracks • Assessment report data	• Number of people affected, casualties • Programme planning maps • Logistics maps

4.3.1 Raster data

Raster data in GIS consists of matrices of discrete cells that represent features on, above or below the earth's surface. Each cell in the raster grid is the same size, and cells are usually square, but can be rectangular in *MapWindow GIS*.

Typical raster datasets include remote sensing data such as aerial photography or satellite imagery and modelled data such as an elevation matrix. In the case of true geo-referenced imagery, such as true colour land photography (as might be obtained in GeoTIFF format), the data of the cells of the raster image is not accessible in the normal manner of grids, but instead it is displayed simply as an image with whatever RGB values are stored within it normally. Unlike vector data, raster data typically do not have an associated database record for each cell.

4.3.2 Vector data

MapWindow supports three different types of **ESRI Shapefiles**: each GIS data set will be added to the map project as a single layer.

Layer	Description	Examples
Polygon	Composed of solid shapes made up of interconnected vertices; anchor points about which a line turns.	Large urban areas, flooded areas, no-go zones, minefields
Line	Composed of line segments that may be interconnected. Can have vertices.	Roads, boundaries
Point	Individual points	Small villages, clinics, camp locations

4.3.3 Adding data to your project

How might I use this

This section will show you how to add and display data. It is useful to have an image underneath your mapped data to give it some context. To help locate important features for example rivers, roads and large areas of open space for possible camps and urban settlements.

Add raster data

Click > *Add Data* Icon
Or
Veiw > *Add Layer*

Add vector data

Click >*Add Data* Icon 
Or
View > *Add Layer* > Navigate to *File* > *Open*

The layer will be added to your project and is visible in the Legend.

Tip: Hold down the Control key and click multiple items to add many layers at one time

4.4 Navigate MapWindow

How might I use this?

When working with a map it will often be necessary to zoom in to view an area in more detail, or zoom out to see a larger area.

4.4.1 Zoom in and out

Icon Toolbar > Click the *Zoom in* or *Zoom Out* icon buttons

Move the mouse over the map and click to zoom in or out around a point.

To zoom in to a specific area

Click and hold the left mouse button. Move the mouse to drag a rectangle around the area you wish to zoom to. Release the mouse button.

If your mouse has a scroll wheel on top, it can be used to zoom in or out by rolling it forward or backwards.

Supported raster formats

- Utah State University Binary Grid (*.bgd)
- Arc/Info Binary Grid (sta.adf)
- Arc/Info ASCII Grid (*.asc)
- Arc/Info FLT grid (*.flt)
- GeoTIFF (*.tif)
- USGS ASCII DEM (*.dem)
- Spatial Data Transfer Standard Grids (with some limitations) (*.ddf)
- PAux (PCI .aux labelled)
- PIX (PCIDSK Database) (*.pix)
- DTED Elevation Raster (*.dhm or *.dt0 or *.dt1)
- ECW Enhanced Compression Wavelet (*.ecw)
- Erdas Imagine images (*.img)
- Arc/Info Grid images (*.grd or hdr.adf)
- Arc/Info HDR/BIL images (*.bil)
- MrSID images (*.sid)
- Bitmap images (*.bmp)
- GIF images (*.gif)
- JPEG/JPEG2000 images (*.jpg or *.jp2)
- Portable Network Graphics images (*.pgm, *.pnm, *.png, *.ppm)
- TIF images (*.tif)
- Windows Metafile (*.wmf)

4.4.2 Zooming to Full Extent

Zooming to full extent resets the map view to see every feature of every layer.

Icon Toolbar> Click >  > Select *Full Extents*

4.4.3 Zooming to previous or next extent

Zooming to previous extent 

Zooming to next extent 

4.4.4 Zoom to layer extent

Zooming to a layer's extent will display an area showing every feature in the selected layer(s).

Click  > *Layer> Zoom to Layer*

4.4.5 Docking and Undocking Views

How might I use this?

You may find it easier to have different windows bigger or smaller or not visible at all.

To customize your information windows click and pull on the top of the window. Hold down the left mouse key and drag the window to desired location.

4.4.6 Panning

Panning allows the user to move the map display around to show areas outside of the current viewing area without changing the scale of the map.

Click  > Move mouse over map> Click and hold left mouse button

The map will move with the mouse until released.

4.4.7 Map overview

How might I use this?

This allows the user to quickly determine which area of the map the user is currently viewing. The map overview area provides a full extent view of layers added to it, the red rectangle shows the current map extent.

Update the Overview Map

Right-click *Overview Map > Update Using Current Extent*
Or
Standard Toolbar > Edit > Preview Map > Using Current Extent

Clear overview map

Right-click *Overview Map > Clear*
Or
Edit > Preview Map > Clear

4.5 Using the legend to control the layers

How might I use this?

The legend is a graphical representation of all the map layers in the current project. Each line represents a layer of data that is in the main view. You can change a layer's symbology or the order of display for the layers. For example, a layer may be given a colouring scheme indicating varying affected population.

To turn a layer on or off click the check box next to it. The image to the right tells you the type of layer and its present symbology. The layer will have a plus (+) or minus (-) sign next to it to indicate they are collapsible or expandable.

4.5.1 Changing the layer name

Changing the name of a layer does not affect the underlying data, only the layer in that particular project.

Double-click on the layer in the legend for the Legend Editor.

Locate> *Display Name* and change to desired text. Click the ***X*** to close the Layer Properties dialog.

Tip: If you set up a dynamic visibility, and then unselect the layer in the legend, it will reset the dynamic visibility to disabled, you will have to reset it

4.5.2 Changing the drawing order

The layers are drawn from bottom up so the first layer in the legend is the top layer of the map. It important to carefully order your map layers so that important data is not obscured by layers placed on top.

Click and drag a layer to the desired location.

4.5.3 Removing a layer from the map

Removing a layer does not remove or delete the underlying data.

Right-click *Layer* > *Remove Layer*
Or
Select *Layer* > *View* > *Remove Layer*

To remove all layers:

Right-click *Layer* > *Clear Layers*

4.5.4 Making the layer scalable

This allows layers to be set up so that they dynamically turn on and off as the scale of the project changes.

Zoom to desired scale of layer and double click the layer in the legend window to bring up the *Legend Editor*.

Dynamic Visibility > Click *Disabled* > Check *Use Dynamic Visibility* > Click *Use Current Extents* > Close Editor.

4.5.5 Map layer symbolisation

When adding a new map layer to the user's project, a default symbol will be automatically generated. You can re-set this to your preferred symbology.

Open Legend Editor by double clicking on layer in the legend

Colouring scheme

Click *Colouring Scheme* > Click to open *Colour Scheme Editor*

You can choose a ***field*** in the shape's attribute table to calculate the colour and assign the number format of it.

The easiest way is to use the pre-defined colour scheme. The Legend Editor will also allow the user to:

- Change display properties like point/line colour, width, and style.
- Change layer dynamic visibility
- Change legend properties (expand picture)
- Change map bitmap and transparent colour

4.5.6 Adding a label to a layer

Labels are an easy way to add dynamic textual labels to geometric features on the map. MapWindow GIS will extract a user-defined field from the map data to be used as the label text. Labels may be added to raster datasets programmatically, but not directly from within MapWindow GIS.

Open *Legend Editor* > Click *Label Setup* > Click [...]

A new window *Shapefile Labeler* will open

Click ▾ *Label Field for First Line* and chose the field you want to label on your map

Choose Properties >*Apply* > *OK*

To remove the labeling for a layer change the label field to *None*. Click *OK* .

Activity One

Find a selection of vector data shapefiles for the area in which you are working: for example from a partner organization that uses GIS. Import them into MapWindow. Set up a series of data layers and set the symbols to create a working base map (see Chapter 1 for hints on cartography). Navigate the extents of the data and practice zooming to areas of interest.

4.5.7 Information on map features

How Might I Use This?

This is useful to identify features on your map while you are viewing it on the screen. Clicking the Identifier will activate the Identifier plug-in, and set the mouse cursor into identifier mode.

If a raster layer is selected, the identifier window will be put into Raster mode. If a shapefile layer is selected, the identifier window will be put into Shapefile mode.

Shapefile

Raster

The identifier can be used to select a shape in a shape layer or a cell or group of cells from a raster and show information on them.

Setup for querying map features

Select the layer to query in the legend.

Click 

Move the mouse over the map and click on the feature to be identified. The Feature Identifier dialog will be displayed with the available information.

4.5.8 Selecting features by rectangle

Select by Rectangle allows the user to select features on the map by drawing a rectangle. Any features of the active layer that fall within the selection tolerance of the rectangle will be selected.

Select layer by clicking in the legend or using the tool bar icon 

Move the mouse over the map and click and hold the mouse button. This click will represent the first corner of the rectangle. Keeping the mouse button held down draw the rectangle required.

Release the mouse button. Features of the active layer that fall within the rectangle will be selected and drawn.

By holding down the control key, the user can draw additional rectangles and add the selection to the original selected data.

Viewing attribute data of selected features

Click  to Open *Attribute Table Editor*

The Attribute Table data for the selections will be shown.

To create a new shapefile consisting only of these selected features:

Click *Selection* > *Export Selected Features* > Navigate to desired location and assign a File Name > *Save*

It will ask you if you want to load the shapefile. Click *Yes* > Close window.

The new layer will be added to your map.

4.6 Data creating and editing

How might I use this?

Create new layers to display your situational data. You may have data on transport routes, areas of refugees and important locations that you need to view spatially and put on your maps.

4.6.1 Open Shapefile Editor

Toolbar > Plug-Ins > ShapeFile Editor

The ShapeFile Editor Toolbar will appear at the top of your screen.

New layer

To create a new layer for editing click on the icon 

Navigate to the folder you want it saved and assign a name.

Choose the type of layer: point, line, or polygon. For more information see chapter 4.3.

Click *OK*.

A warning message may appear

You can choose to give the layer the default projection assigned by MapWindow. This will be in coordination with any existing layers in your legend.

Do Nothing will add the layer to the map without a projection, this can be altered later.

If you do not want to add the layer, *Abort.*

Click *OK*

Another warning message may appear

This remind you to be sure that when adding data to the map to use as a reference, to ensure the data you draw is in the correct spatial area (the correct extents).

Your shapefile will appear in the legend under Data Layers.

Draw layer

Click the plus shape icon 

Move the cursor to the start point, click to add points (vertices).

In the case of lines or polygons continue adding points and right click to finish.

> **Tip: Before performing any edits, always make a backup of the dataset you are about to edit. Key files to copy when backing up a shapefile include any files ending in .prj, .dbf, .shp, and .shx**

4.6.2 Editing a layer using Shapefile Editor

How might I use this?

MapWindow GIS has basic capabilities for editing spatial (vector) data that is held in Shapefiles. The shapefile has two main components: the **geometry** (the points, lines or polygons) and the **attribute table** that describes what the geometric shapes represent (for example, that particular point features represents a village called Mufindi with certain other characteristics. In this section we will look at ways to edit the geometry of the features.

Once you have created your shape you can select and modify the features should the situation data change and find data within the shape, for example a specific geographic location. You can add regular shapes, merge shapes and delete underlying data.

To edit an existing layer, highlight the layer in the legend.

To add another shape

Click 

and move the curser to the point the shape is to be added.

Enter x, y values by left clicking on the location where a point or vertex should be added.

To move a vertex

A **vertex** is a point itself, or mid-or end-point on a line, or a turning point on a polygon boundary.

Click  then select the point to be moved by left-clicking on it. Drag the selected point to the correct location and release the mouse button.

If the feature being created is a polygon or a line, you can add or remove a vertex from the existing shapefile.

To delete a shape from the shapefile

Select shape it will change colour to indicate selected.

Click

Hold CTRL to delete multiple shapes.

A warning message will ask for confirmation. Click *OK*

To delete data

To erase data from the layer beneath the selected shape Click

To erase the current layer at the selected shape Click

To undo a command

Click to undo last change made

Merge shapes

Click and select the shapes you want to merge holding CTRL Click *OK*.

The attribute data of the new merged shape will match the shape first selected.

Add a regular shape

To add a regular shape to the current shapfile you are editing Click

You can then choose from adding a Polygon, Circle, Rectangle or Ellipse.

Click on the map and the shape will be drawn with your chosen dimensions centred on that point.

Resize a shape

Select shape and click

A new window will appear. You can expand or shrink the shape by changing the percentage in the new window and checking the appropriate box or by map units.

To check the result Click *Resize*

Once completed Click *Done*

Rotate shape

Select the shape and click

A new window will appear. You can choose to rotate around the centre or another point by typing in the coordinates or clicking the relevant location on the map.

Type> *Rotation Angle* > Click *Rotate* > *Done*

Check a shapefile

To remove any vertices within a shapefile that are duplicates or within a certain distance of each other. Click

A new window will appear. Type in *0* for removing duplicates or specify the map unit distance. Any two shapes within this distance of each other will have one deleted.

Click > *OK*

4.7 Editing the attribute data

How might I use this?

In the last section we looked at ways to edit the geometry of the features in a shapefile - for example to adjust the shape of a district boundary which has changed. Each feature (point, line or polygon) has a record in the **attribute table** of the shapefile: for example a 'districts' shapefile might have attributes of the baseline population for each district.

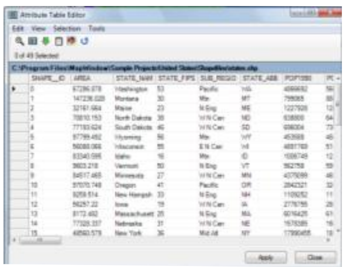
Using such a shapefile as a starting point, you might want to add data on affected families for each district. This tool allows you to build, change and add fields to the attribute table, the table of information which sits in the background of a layer.

4.7.1 Add and remove fields

Select the layer in the legend. Click to open the attribute table

Or

Right Click layer >*View Attribute Table Editor*



To add a field

Edit > Add Field

Choose name of field from one of the following:

- **Integer**: will allow you to enter a number without decimal places
- **Double**: the precision, or places to the right of the decimal point, is enabled
- **String**: this is used for text content fields

Click > *OK*

You can scroll to the end of the table to see your new field. Click on the field to enter data, once completed:

Click > *Apply* > *Close*

To remove a field

This will permanently delete the data contained within that field.

Edit > *Remove a Field* > Select field to be deleted > *OK*

To rename field

Edit > *Rename Field* > Select Field to be renamed > type new name > *OK*

4.7.2 Queries

If you need to find features that have similar attributes you can do this by building **queries**. A query is a set of instructions to select certain features in the shapefile to then perform actions on.

The features selected by the query will be highlighted in the attribute table.

Selection > Query

A new window will appear.

Build Query > *Apply*

You can then build the query 'string' (question) by choosing fields and operators. See the following Build a Query tips box on the following page.

Tip: Build a Query

The Query Builder dialogue box allows you to use standard Structured Query Language (SQL) commands to create a query of the shapefile attributes.

Boolean operators
AND, OR, NOT

Comparison operators
< >, <=, >=, <>, IN, LIKE

Numeric constants:
50 or 50.0 or 5E1 (can be represented as integers, floating point or in scientific notation)

String constants:
'Tenure' (String constants should be quoted with single quotes)

Arithmetic operators
+, -, *, /, %

String concatenation operator
+ (eg 'cat' + 'inhat' = 'catinhat')

Aggregate functions
Sum(), Avg(), Min(), Max(), StDev(), Var()

String manipulators
TRIM(Expression) removes leading and trailing blanks

To highlight the selected features on the map

Click > *View* >*Zoom to Selected Shapes*

4.7.3 Search and export data

How might I use this?

To find data you can use a search tool, the first feature with that search string will be selected.

Tools > *Find* > type in search > *OK*

Export the Selected Data

Selection > *Export Selected Features* >Navigate to folder >Choose name > *Save*

A new window will appear.

Load the New Shapefile > Click *Yes*

The shapefile will now be available in the legend.

4.7.4 To replace a value

How might I use this?

To replace a value in all locations regards of the column the value is found in.

Tools > *Replace* > Fill in values > *Replace* > Type replacement data > *Replace*

4.7.5 Calculate fields

How might I use this?

The field calculator allows you to build an expression and use the results to populate an attribute column.

Tools > *Field calculator Tool*

Or

Click > 

Build a query for calculations. More information on this can be found in Appendix 4C.

Select the Field name the results will be saved.

Click *OK*

Activity Two

Make a copy of any shapefile that you have available. Use the guidance in the above section to change the geometry of features and to delete some. Open the attribute table and try to add fields and calculate new field values based on the data you already have.

4.8 Raster data legend editor

How might I use this?

The properties associated with rasters are edited via the layer properties including transparent colour, dynamic visibility, and a legend picture,. Ability to alter these properties will for example allow you to see data on layers underneath for context.

Access the editor by double-clicking on a layer item in the legend
Or
Right Click Layer > *Properties*

4.8.1 Display of raster

If the raster properties being viewed are for a **raster grid**, then it is possible to alter the way in which that raster is displayed and coloured.

Right Click > *Properties* > *Symbology*

Transparency

For partial transparency of the grids you need to choose a transparency colour and then set transparency to true. This will make all cells of that colour completely transparent.

Dynamic visibility

Set the viewing extents at which a layer is displayed or hidden.

Zoom to desired scale > *Layer Editor* > *Dynamic Visibility* > Check *Use Dynamic Visibility* > Click *Use Current Extent*

To reverse the process uncheck the *Dynamic Visibility* Option.

Change Name and Display of Raster

Name
Open *Legend Editor*> Select *Display Name* > Change to desired text

Icon
Open Legend Editor > Legend Picture > Click [...] >Browse for file (ending *jco)> Open

4.9 Core plug-ins

How might I use this?

A plug-in is a computer program that interacts with a host application (a web browser or an email client) to provide a certain function on demand. You can download and install extra plug-ins to add functionality to MapWindow.

www.mapwindow.org/download.php

The plug-in tool is the manager for all plug-ins. This tool allows the user to turn on and off plug-ins as they are needed.

4.9.1 Load and review plug-ins

Toolbar > *Plug-In* > *Edit Plug-In*

To activate or deactivate **plug-ins** check in the box next to their name

Refreshing plug-in list > Click *Refresh List*

View Plug-in details by highlighting a plug-in and then looking at the box at the bottom.

To close the window Click OK

4.9.2 Scripts

How might I use this?

The scripting system allows the user to set up custom actions or build the user's own plug-in, without needing a programming environment such as Visual Studio.

A simple example script is displayed by default but you can change this as required. Compiling a plug-in will prompt the user to save a .dll file, which is added to the plug-in menu.

4.9.3 Archive project tool

This provides the ability to archive, compress and restore MapWindow projects.

Toolbar > Plug-In > Archive Project Tool

Toolbar > File > Archive/Restore Project

A new window will appear.

Make any notes to further clarify this archive.

Check *Preserve original file locations in archive*

Click *Archive Project*

A new window will appear.

Navigate to file location > Identify project name > *Save*

An .mwa file will be generated

Click *OK* in *Finished* box

To retrieve a project archive

Toolbar > File > Archive/Restore Project

Navigate to archived location > Select file > Select location to put retrieved file > Click *Restore Project*

4.9.4 CSV to shapefile converter

How Might I Use This?

This plug-in converts comma-separated value (csv) text files which contain geographic coordinates, into shapefiles. CSV files can be created in Excel and have as many columns (fields) of data as you require.

Toolbar > Plug-In > CSV to ShapeFile Converter

Toolbar > Converters > CSV to Shapefile

A new window will appear.

Browse for Input File.CSV > *Open*

Choose the **Field Delimiter** symbol used to separate values in your file.

Click *Open File*

Select the columns/fields that are used for X and Y fields (more information can be located about coordinates in chapter 1).

Check the box *Add to map*

Click *Convert*

A new window will appear.

Navigate to where you want to save your file.

Click *Save*

Depending what selections made earlier in the project, the program may open the projection box and request that the user set a projection for this layer.

Click *OK > Close*

4.9.5 Document launcher

How might I use this?

This is a simple plug-in designed to provide a teaching framework for programming the plug-in interface. Most commonly, this is used to launch images or web pages associated with given shapes.

Main menu >Plug-ins > Document launcher

A new icon will appear on the icon toolbar 

This plug-in will function when a shape in a shapefile is selected

If the shapefile has an attribute entitled *File* or *URL* and the selected shape has text in that attribute column, then the plug-in will seek to launch that path as a file or a URL.

4.10 Raster grid operations

How might I use this?

This tool allows you to assign a projection to an image or grid that does not have an associated projection file with it.

4.10.1 Assign projection to raster grids

Assign projection to grids

Main menu > Plug-in> GIS Tools

Main menu > Raster > Assign projection To Grid

A new window will appear

Navigate to and select the **Grid File** to be assigned the projection

Click *OK*

A new window will appear

Assign the projection to be used (for more information see chapter 1)

Click *OK*

Reproject grid

This tool allows for the re-projection of an image or grid from one projection to another projection.

Main menu > Plug-in > GIS Tools

Main menu > Raster > Reproject Grid

A new window will appear.

Navigate to and select the **Grid File** to be re-projected.

Click *OK*

The program will state that the re-projection is finished and ask if it is to be added to the map.

Click *Yes*

Assign projection to images

This tool allows you to assign a projection to an image that does not have an associated **projection file** with it.

Main Menu > Plug-in> GIS Tools

Main Menu > Raster > Assign Projection To Images

Navigate to and select the image to be assigned the projection.

Click *OK*

Assign the projection to be used

Click *OK*

The GIS Tool will display a completed window

4.10.2 Change grid formats

How might I use this?

This tool allows you to generate different outputs including an ASCII grid file or a GeoTIFF file.

Main menu > Plug-in > GIS Tools

Raster > Change Grid Formats

A new window will appear. Navigate to and select the Grid File to have a new format.

Click *OK*

Select the *Output File Format* > Finish

The program will take a few minutes and then and the new file to the map.

4.10.3 Create grid images

How might I use this?

This tool allows you to take a ASCII or TIFF file and convert it into a BGD Binary file.

Main menu>Plug-In>GIS Tools

Main menu > Raster > Create Grid Image

Navigate to and select Grid File to be made into an image.

Click *Finish*

Select Colour scheme > Add Image to project

4.10.4 Resample grids

How might I use this?

This tool allows you to resample and change the grid size.

Main menu>Plug-In>GIS Tools

Main menu > Raster > Resample Grids

Navigate to and select the Grid File to be resampled

Click *OK*

Set *New Cell Size* > *OK* > Select *Output Format* > *Finish*

4.10.5 Merge grids

How might I use this?

This tool allows you to combine two or more grids into one grid.

Main menu > *Plug-in*> *GIS Tools*

Main menu > *Raster* > Merge Grids

A new window will appear.

Navigate to and select the Grid Files.

Click *OK*

Enter the *Output Name* > Select the *Output Format* >*Finish*

4.10.6 Clip grid with polygon

How might I use this?

This will allow you to clip part of a grid by using a polygon as a template.

Main menu > *Plug-in*> *GIS Tools*

Raster > Clip Grid With Polygon

A new window will appear.

Navigate to and select the grid to be clipped and shapefile to clip with.

Click *OK*

Select the polygon(s) to clip with > File location > OK

4.10.7 Creation of georeference image or raster

How might I use this?

This will allow you to give an image you are using a reference on the Earth's surface and allow you to use it as a GIS layer. Everything you then create on top will then be assigned that reference.

Main Menu > *Plug-ins* > *GIS Tools*

Main menu > *Raster* > *Georeference Image or Raster*

Load georeferenced data.

Load an image into the map.

Click three points on the image.

Click the corresponding points on the MapWindow map> *Georeference*

4.10.8 Generate a contour shapefile

How might I use this?

This tool can be used to enable you to see the heights of land and the shape of the terrain. This may be important in many aspects of mapping for humanitarian operations, for example to assess the best access routes into an affected area.

The tool will create a shapefile with contour lines showing the values in the input raster data file. These inputs are typically elevation but could be any value.

Main Menu > Plug-ins> GIS Tools

Main menu > Raster > Generate A Contour Shapefile

Select input raster: either an already loaded layer or an external file.

Select contour options: either contour intervals or fixed levels. Most topographic maps use contour intervals.

Check *Add Output* to add layer to the map.

4.10.9 Change NODATA value

This tool allows the user to change the colour value for **no data** cells

If the dataset is loaded into MapWindow, the layer must be removed and then re-added for the changes to take effect.

Main Menu > Plug-ins > GIS Tools
Main menu > Raster > Change No Data Value

Select raster files to use.

Enter new NODATA value.

Click *Change*

The program will display a success window.

4.11 Advanced vector data operations

4.11.1 Assign projection to shapefile

How might I use this?

This tool allows the user to create a projection file (.prj) for a shapefile if there is not an existing file. A new projection file can be created and can over-write an existing projection file. This does not re-project the data but rather assumes that the data is in the new projection. It does not check if a projection file already exists.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Assign projection to Shapefile

Select file that will be assigned projection.

Enter appropriate projection information > *OK*

4.11.2 Re-project shapefile

The tool re-projects a shapefile from one projection to a different projection.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Reproject Shapefile

Select file that will be re-projected.

Click *Open*

Enter appropriate projection information.

Click *OK*

Click *Yes* to add it to map.

4.11.3 Buffer shapes

How might I use this?

This tool creates buffer shapefiles at selected distances from the original features. This could be useful for example to depict distances from water resources.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Buffer Shapes

Select layer to buffer.

Decide if buffering is applied to all shapes or just selected ones.

If selecting features, click to select feature to buffer, or hold down control key and click on multiple features.

Select distance; remember it is the same units as the user's data, in this case decimal degrees.

Decide if you want to combine overlapping buffers.

Set name of resulting shapefile > *OK*

4.11.4 Calculate polygon areas

How might I use this?

This tool allows the calculation of the areas of a selected shapefile, for example for use in calculating the spatial area of a site for a proposed refugee camp, or the total area under various land uses for livelihood impact assessment.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Calculate Polygon Areas

If it can not detect the shapefile units > *OK* > Select the layer.

Set the shapefile units.

Set the units of the area you want to create.

Click *Calculate*. This will add a new column added in the attribute table, containing the areas of each feature.

4.11.5 Clipping shapefiles

How might I use this?

Shapefiles provided to you by another organisation may cover a large area, of which you are only interested in a small part. Clipping the shapefile to a smaller extent can make the file easier to handle.

Clip shapefile with a line

Locate:

- The input shapefile that you want to clip.
- A shapefile containing at least one polygon (or line) to clip with.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Clip Polygon with Line

Select the polygon to be clipped.

Select the clip file.

Name the result file.

Click *OK*

Clip shapefile with a polygon

You can clip a polygon by using a second polygon.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Clip Shapefile with Polygon

Select the shapefile you want to clip
or
Browse for one by clicking

Select polygon shapefile to clip with from the drop-down list or browse for one.

Click *Select Shapes* and select shapes from the map

Naviagte to file to save shapefile Click >*Done*

The number of shapes that  you selected will be displayed on the bottom of the form.

Click > *OK*

The outlines of your clipped shapes should now be displayed on the screen.

Clipping with lines

Select both the polygon to clip and the line to clip it with.

No projection needs to be set when using the clipping tools. They should work with whatever coordinates they are given.

4.11.6 Erase shapefile with polygon

How might I use this?

This tool creates 'holes' within a polygon area, so it is a reverse of clipping (see above).

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Erase Shapefile With Polygon

Select the shapefile to erase and the shapefile to erase with.

Name the result file.

Click *OK*

The new shapefile with an erased portion can be added to the legend as a separate layer.

4.11.7 Export selected shapes to a new shapefile

How might I use this?

This tool enables you to select a feature or set of features from one shapefile and export them into a new shapefile. This can be useful for creating a separate symbolisation for a certain area of your map.

Select the feature to be exported to new shapefile.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Export Selected Shapefile To New Shapefile

Enter name of new shapefile and click on *Save*

Query Box Click *Yes*

4.11.8 Export shapes to new shapefile by mask

How might I use this?

This tool uses one shapefile or its features as a mask to select features from a second shapefile and export them. It is a more powerful version of the clipping tools described above.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Export Shapes To New Shapefile By Mask

Select the shapefile that features are to extracted from and the shapefile to be used as mask.

Select feature or features within mask file to be used to for selection of the features exported shapefile.

4.11.9 Merge shapes

This tool allows the user to merge two or more shapefiles into one shapefile.

Main Menu > Plug-ins > GIS Tools

Main menu > Vector > Merge Shapefiles

Select the shapefiles to be merged.

Enter output file name and click *Merge Shapefile.*

4.12 Downloadable plug-ins

MapWindow can make use of a wide range of plug-ins in addition to the ones supplied with the main program. Some of the available plug-ins are described in this section—see also Appendix 4B which has a URL to obtain them, and details of further useful plug-ins.

4.12.1 Online data plug-in

The MapWindow 'Online Data' Plug-in is open-source and intended to allow easy access to online data sources, provided by **ArcIMS** or **OGC** compliant web servers. The tool may be used to access any WFS, WMS, or ArcXML data source. Example data sources are provided in the server drop-down list inside of the tool. A list of websites for WFS and WMS can be found in Appendix 4A.

Main Menu > Plug-In > Online Data Plug-In

Main Menu > On-Line Data > Browse Catalogue

4.12.2 Shape2Earth

How Might I Use This?
This Plug-in can grab imagery from Google Earth (GE) and allows you to convert your files to be compatible with GE by converting shapefiles to Keyhole Markup Language (KML) for viewing in GE. The only things needed are Shape2Earth, Google Earth (See Chapter 3 for more information), Microsofts .NET Framework 2.0 and MapWindow.

There are thousands of freely available shapefiles that can be downloaded and turned into KML using Shape2Earth. Shapefiles have become the standard for posting geospatial data on the Web. Nearly all geospatial applications can read and write shapefiles.

Download and install Shape2earth by following the on-line instructions available at:

http://www.shape2earth.com/

Shape2Earth will run in a fully functional evaluation mode for 14 days. After this, it will run in a degraded mode until is has been purchased and activated with a valid license key.

Tip: If you have any previous Shape2Earth beta versions, they should be un-installed prior to installing the latest version of Shape2Earth.

Export to KML

Select the layer you want to export

Main menu > Plug-ins > Shape2Earth

Main Menu > Shape2Earth > Export to KML

A window will appear, if you wish to purchase then *Register*, if not:

Click > *Run Unregistered*

If your shapefile has no projection a new window will appear asking you to define one.

Shape2Earth needs to know the projection of the shapefile in order to convert the coordinates to WGS84 for viewing in Google Earth. If your shapefile does not have a .prj file, you can try and see if there is any associated metadata that may help you set the appropriate projection. (See chapter 1 for more information).

A new window will appear: Shape2Earth Evaluation.

KML tab

Click *KML* tab.

Layer name will default to the base name of the Shapefile you can alter this by typing in the box.

Basic Polygon Height can be altered. Shape2Earth offers several options:

- *Clamped To Ground* - all data lays directly on the ground with no height values used.
- *Extruded Relative To Ground* - a height value of 5 meters will be extruded 5 meters above the ground at any given location.
- *Absolute* - height is the actual height regardless of the underlying terrain.

To use an attribute field in the GIS attribute data for the height value, set a single arbitrary height that will be applied to all features.

If height data is already present in the attribute table for the layer use the Z value.

GIS Data tab

To view attribute data from the Shapefile.

Click > *GIS Data* tab.

Layer Name Select the field that you would like to use as the name for each Placemark in Google Earth.

Select Attributes to Write to KML by checking the relevant boxes.

To sort all of the features so that they will be seen in alphabetical order in Google Earths table of contents:

Check *Order by Feature Name*

The selected attributes are written into the KML description tag as an HTML table, and are seen in the Google Earth balloons that pop-up when a feature is selected.

Properties tab

There are options for display when dealing with points, either as a point shapefile, or as centerpoints created for polygons.

Click *Properties* > Check *Create Labels*

To change the icon

Click on the icon button next to the Style label. 

A new window will appear.

Select the point you would like to use.

Click *OK*

Change the number next to the Icon text box.

If you do not want to see the point, but just the text, then change the number next to the Icon label to zero.

Additional point options

Check *Create Label Rollover*

The label rollover is a different icon and label that will be made visible when a user 'hovers' over the point in Google Earth. The options for the label rollover are the same as that for the Style Icon.

Query tab

You can look at your attribute data and search for specific information.

Click *Query Tab > Load Data*

Balloon tab

You can add information about your organisation

Click *Balloon tab*

Fill in the boxes required. For more information on HTML see Appendix 3C

Options tab

There are various options for exporting the file.

Click *Options tab*

Export All - Export everything in the selected layer
Export Selected—Export everything you have selected in *GIS Data*
Export Current View – Export the present image on your screen to KML

Click > *File > Export > Save as KML/KMZ*

Navigate to where you want to save the file.

Click > *Save*

It will automatically load the KML file in Google Earth after the KML has been saved, you can then continue editing the file as needed.

Quick map overlay

This allows you to save your present map view as a .bmp, .jpeg, .gif file.

Main Menu > Shape2Earth > Quick Map Overlay

Navigate to folder you want to save file and name it.

Click > *Save*

You can then open these directly into Google Earth. For more on using image overlays in Google Earth see chapter 3.

Get Image from Google Earth

This enables you to get a image from Google Earth.

Open Google Earth (For more information see chapter 3)

Main Menu > Get Image From GE

A new window will appear on your Google Earth 3D Viewer .

Use the navigation tools in GE to position the area you want data for in the 3D viewer.

Click > *Capture*

A new window will appear.

Navigate to where you want to save the file and name it.

Click > *Save*

This will create a .jpeg and .jpgw file (the geographic reference) for your area.

View > Add Layer > Navigate to file > *Open*

4.12.3 MapWindow shapefile to grid plug-in

How might I use this?

For the conversion of vector data to raster (grid) data. The raster representation is suitable for displaying continuous quantities such as rainfall, and elevation.

The plug-in requires MapWindow GIS software which can run on Microsoft Windows operating system (98, 2000, XP, Vista).

Download, install and unzip plug-in using the directions provided from:

www.mapwindow.org/download.php

File: *shapefiletogrid_v1.1.zip*

Copy the file *ShapefileToGrid.dll* to the *MapWindow\Plugins* directory. This directory is often located in C:\ProgramFiles\MapWindow\Plugins

Main Menu > Plug-ins > Edit Plug-ins > Refresh List

Check *Shapfile to Grid > Apply > OK*

Icon Toolbar 

Select vector layer:
Use a loaded layer: using the drop down menu select a layer from your map.
Use file from Disc: you can browse for a file

Choose a field:
Click on the drop down menu for *Select the attribute field for grid cell values*

A list of possible fields that contain data is displayed. Only numeric fields are shown. The values of the selected field will be used as the resulting grid values.

Click *Next*

A new window will appear: *Select grid properties*

You can specify how the result grid looks.

Grid cell size

This is the size of the grid square pixel. The grid cell size should be in the same units as the current map units. The current map units are specified by the current project projection.

Choose the grid cell size:

- *Same as an existing grid*. This option is only enabled if there is a grid layer loaded in MapWindow. Choose this option when you want to overlay the newly created grid with an existing grid in your future analysis.
- *As specified below*. Enter the cell size of the new grid. The cell (grid pixel) size should be in the map units of the current project.

Grid Extent

The grid extent is defined by the Y and Y coordinates of the upper right and lower left corner of the grid.

Choose the grid extent:

- *Same as an existing shapefile or grid*. If there is a shapefile of a grid layer loaded in MapWindow. The maximum and minimum X and Y values of the new grid will be the same as the maximum and minimum X and Y values of the selected grid or shapefile.

- *As specified below*. Enter the minimum X, maximum X, minimum Y and maximum Y of the new grid.

Grid data type

The selection of grid data type will affect the size of the resulting grid file.

- *ShortDataType*: Short integer
- *LongDataType*: Long integer
- *FloatDataType* : Floating-point precision
- *DoubleDataType*: Double precision

Grid file type

Supported output grid formats are ASCII Grid (text file), USU Binary grid and GeoTiff (binary files).

Grid file name

Click Navigate to folder and choose file name of the new grid.

Click *Finish*

A message showing selected result grid properties will be displayed.

Click OK and calculation will start.

A new window will appear: *Grid Calculation Finished*

Click *Yes*

If the new grid is later added to MapWindow using the shading is displayed by default causing incorrect display of grids created from line shapefiles.

To remove this error:
Right-click *layer* > *Properties* > *Colouring Scheme*
Uncheck *Compute Hillshade*

4.12.4 DXF to shapefile converter

This is a plugin to convert from AutoCad DXF (Data eXchange Format) files into ESRI Shapefiles

Download and uncompress the file *DXFtoShapefile-BinariesOnly.Zip*

www.mapwindow.org/download.php?show_details=13

Copy the file to the *MapWindow\Plugins* directory

This directory is often located in C:\ProgramFiles\MapWindow\Plugins

Toolbar > *Plug-ins* > *Edit Plug-ins* > *AutoCAD DFX Importer* > *Apply* > *OK*

Toolbar > *Plug-ins* > Check *AutoCAD DFX Importer*

DXF to Shapefile Converter

Toolbar > *Importers* > *Import AYTOCAD DXF File*

Browse for file and select output shapefile type. Click *Convert*

4.13 Export a map

How might I use this?

Although you can print maps directly from MapWindow, you can also export your maps into .jpeg , .bmp or .gif files. This allows you to share finished maps with people who do not have MapWindow or other GIS software, to email map outputs and add them to reports.

Edit > *Export* > *Map*

A new window will appear.

Navigate to file location, choose a name and specify file extension (.jpg, .bmp or .gif).

Click *OK*

Export map image with the geographic location

Edit > *Export* > Export a Geo-Referenced Map Image

A new window will appear.

Navigate to file location, choose a name and specify file extension (.jpg, .bmp or .gif).

This means that a file will be written along with the image file which specifies the geographic location of the image. This is useful if at a later stage you need to load the map image into any GIS software.

Export a scale bar

Edit > *Export* > *Scale Bar*

A new window will appear.

A new window will appear.

Navigate to file location, choose a name and specify file extension (.jpg, .bmp or .gif).

Export a north arrow

Edit > *Export* > *North Arrow*

This also will prompt you for a location to save the image.

Appendix 4A: WMS and WFS Links

Web Map Service (**WMS**) produces maps of spatially referenced data from geographic information. WMS-produced maps are generally rendered in a pictorial format such as PNG, GIF or JPEG. **Web Feature Service (WFS)** returns actual vector data.

The following are useful links to WMS and WFS servers.

http://www2.dmsolutions.ca

http://demo.cubewerx.com

http://www.geographynetwork.com

http://www.lifemapper.org/services

http://www.demis.nl/home/pages/wms/demiswms.htm

http://mapserv2.esrin.esa.it

http://terraservice.net

http://vision.edina.ac.uk

http://datamil.delaware.gov/geonetwork/srv/en/main.home

http://www.refractions.net

http://www.pcigeomatics.com

Appendix 4B: Additional downloadable plug-ins for MapWindow

There is a wide and ever-growing range of open-source plug-ins that can be used with MapWindow. In addition to those in section 4.12, here are some more that can be useful.

Download plug-ins using the directions provided from:
http://www.mapwindow.org/download.php

Waypoint+ to Shapefile

How might I use this?

To export a map image as a bitmap (.BMP) or graphic interchange file (.GIF) This is a standalone program to convert WayPoint + text format files to ESRI Shapefile format files. The program will optionally reproject the data from lat/long during conversion.

Georeferencing tool

How might I use this?

Allows you to georeference an image or raster data file by clicking three points on the image and providing the realworld coordinates for those points. The image can optionally be rectified such that north is straight up. The appropriate world file will then be written.

MonoComp

How might I use this?

A tool for georeferencing aerial photos and for digitising photo content into GIS shapefiles.

Text to Shapefile

How might I use this?

This Plugin allows you to create shape files from text files containing at least the x, y and key fields.

GPS and sampling tools

How might I use this?

The mwGPS plug-in is designed to allow any COM port enabled, NMEA-0183 protocol GPS unit to be used with MapWindow to display GPS location and information and log various information with it.

Appendix 4C: Field calculator table

The field calculator allows you to build an expression and use the results to populate an attribute column. The following table gives some functions that can be used.

Function	Description
+	Addition
-	Subtraction
*****	Multiplication
/	Division
%	Percentage
^	Raise to power
****	Integer division
abs(x)	Absolute value
“atn(x), atan(x)”	Inverse tangent
cos(x)	Cosine
sin(x)	Sin
exp(x)	Exponential
fix(x)	Integer part
int(x)	Integer part
dec(x)	Decimal part
“ln(x), log(x)”	Logarithm natural
“logN(x,n)”	N-base logarithm
rnd(x)	Random
sgn(x)	Sign
sqr(x)	Square root

Function	Description
cbr(x)	Cube root
tan(x)	Tangent
“root(x,n)”	n-th root (the same as x^
“mod(a,b)”	Division remainder
“mcm(a,b,...)”	Minimum common multi-
“gcd(a,b,...)”	Greatest common divisor
“lcm(a,b,...)”	Lowest common multiple
>	Greater than
>=	Equal or greater than
<	Less than
<=	Equal or less than
=	Equal
<>	Not equal
Month(d)	Month
Day(d)	Day
Hour(d)	Hour
Minute(d)	Minute
Second(d)	Second
“Sum(a,b,...)”	Sum
“Var(a,b,...)”	Variance
“Stdev(a,b,...)”	Standard deviation

Annex

Glossary

Admin areas. Boundaries of government-defined districts, sub-districts etc.

ArcGIS. Suites of GIS software published by ESRI Inc.

Attribute data. Data about features, apart from the **geometry** itself. For example, the populations of settlements.

Cartesian coordinate system. A system in which the **coordinates** of locations are given by reference to a flat grid; by contrast with angular systems such as latitude/ longitude.

Cartography. The 'art' of map design: selection of the best visualisation to suit the purpose of the map.

Coordinates and **coordinate systems**. Numeric descriptors of a location, for example its latitude and longitude, or X/Y coordinates in a **cartesian coordinate system.**

Data analysis. Using computer tools, the analysis of several sets of data to create new data sets.

Datum. This can mean a reference height, but in GIS usually refers to a 'geodetic model' that is used as a framework for accurate position measurement. See also **spheroid**. **WGS84** is commonly used as datum.

Desktop GIS. Software that runs on a desktop or laptop computer; as contrasted with web-based applications and Google Earth.

Digital elevation model (DEM). A computer model of the earth's terrain surface used in GIS. Google Earth has a built-in DEM that is based on **SRTM** data.

ESRI geodatabase. See **geodatabase**.

ESRI Shapefile. See **shapefile**.

Feature. In GIS a feature is an individual spatial component of a data set; for example a particular village (**point feature**), section of road (**line feature**), or lake (**polygon feature**).

Field. A field is a category of data within a database file. For example, the 'Name' field in a database of towns. The actual data are contained in **records**.

File format. Spatial data can be contained in a wide range of types of files. The file extension (.gpx, .shp) usually indicates the file format that has been used.

Free and open source software (FOSS). Any software that can be used and/or modified without charge; as contrasted with proprietary or commercial software.

Geodatabase. An ESRI format for spatial data, allowing the holding of many data types in a single database, and with special functions for data management.

Geometry. Refers to the 'locations' part of a spatial data set, particularly of a **shapefile**. When editing a shape (eg the line of a road) you are editing the geometry.

Geotags. Spatial references added to data to allow it to be mapped. For example, adding coordinate information to the header file of a photograph.

Georeferenced. Data that has been augmented to allow it to be used in a GIS. For example an aerial photo with a **worldfile** attached.

GIS viewer. A software package that allows you to view spatial data and assemble it into a simple map; however usually without the means to edit or analyse the data.

GIS editor. A software package that allow syou to manipulate and change your spatial data. For example, to add new locations to a data set of clinics, or to change a boundary line between two districts.

GIS analysis. Tools give the ability to 'answer questions' about the data and to create new outputs.

Global Positioning System (GPS). The satellite-based system operated by the US Government that allows users with suitable GPS receivers to locate and record their position.

Google Earth. A software tool and online global spatial database available free from Google. Google Earth is covered in detail in chapter 3 of this guide.

Grid type raster. See **raster grids**.

Keyhole Markup Language (KML). This is the file format used by Google Earth and increasingly by other GIS software. It is an XML-based format. When KML files are zipped with other data (such as photos) they become KMZ files.

Line feature. A **feature** representing a linear object, for example a segment of a road, railway or river. A line feature has a length, but no area. It may have several changes of direction at a number of **vertices**.

MapInfo. A suite of GIS software tools from a company of the same name.

Metadata. 'Data about the data'. In GIS this means a file of information for a particular spatial data set, containing details of where and when it was collected, by whom, and so on.

Mobile GIS. GIS tools that can be run on hand-held or other mobile devices and which can be used for field data collection. Both appropriate software and hardware are needed.

Open Geospatial Consortium (**OGC**). An international standards organisation focused on geospatial content and services, GIS data processing and data sharing.

P-code. A unique reference code to identify a specific settlement, that overcomes variant spellings and similar problems. P-code schemes are agreed at an inter-agency level in some humanitarian emergencies.

Placemark. A term used in Google Earth and some other GIS software to describe a **point feature** and its associated **attributes**.

Plug-in. A software tool that is ancilliary to the main program and which can be installed by the user to give extra functions. Some GIS software packages have extensive libraries of plug-ins available.

Point feature. A **feature** representing a singular object, for example a water well or the nominal centre of a village. A point feature has no dimensions so is described using a single set of coordinates.

Polygon feature. A **feature** representing an enclosed object, for example a lake or a government district. The area of a polygon feature can be calculated. It will be drawn as a boundary line with several changes of direction at a number of **vertices**.

Projection system. A projection system is a **coordinate system** that allows the data to be displayed on a flat surface such as a printed map or on a computer screen.

ProVention Consortium. An international coalition working on topics related to disaster risk reduction.

Raster data. Spatial data in which the earth's surface is depicted by an image. This can include a scanned map. The name raster comes from the type of scanning process used. A raster image is made up of many individual cells but discrete **features** are not contained in the file.

Raster grid. A rectangular grid of pixels, comprising a **raster data** set.

Spatial data. Data that contains references to positions, usually relative to the surface of the earth (see **georeferenced**).

Spatial Database Management Systems (DBMS). A database system sometimes used in conjunction with GIS software: in this case the DMBS is used mainly to store the data, but often also provides (limited) analysis and data manipulation functions.

SRTM. Shuttle Radar Topography Mission. A global dataset of height data acquired by the NASA Shuttle mission in Feb 2000. The data set is freely available for GIS use.

Symbology. Usually refers to the symbol set used to depict **features** on a map. GIS software allows the symbols to be changed depending on data variables: for example to display road segments with an **attribute** 'damaged' to a different colour.

Simple Cylindrical projection. A **projection system** used in Google Earth.

Shareware. Software that is typically issued as a 'trial version' for free use, with full-functioning versions available on a proprietary or commercial licence.

Shapefile. A format for **vector data** sets, published by the company ESRI. Shapefiles are used widely in a number of GIS software packages.

Spatial referencing system. A definition of the locational data structure of spatial data. This may include the **coordinate system**, **datum** and **projection system**.

Spheroid. A mathematical model that describes the shape of the earth. **Datums** used in GIS are based on a specific spheroid that give the 'best fit' to the shape of the earth for the area to be mapped.

Thematic map. A map displaying a particular type of data for a specific purpose: for example health facilities status, or emergency shelter needs. Contrast with a **topographic map**.

Topographic map. Also called a **topo sheet**. A general-purpose map that shows the landforms and terrain, but also usually physical features like roads and settlements. A topographic map may be used as a base for a **thematic map**.

UTM. Universal Transverse Mercator. A global **coordinate system** which is widely used. It divides the earth into UTM zones.

Vector data. Spatial data comprising **point, line, or polygon features**. Each **feature** can have its own **attributes** which allows manipulation and analysis. Contrast with **raster data** which does not have individual features.

Vertex (plural: **vertices**). A junction-point in a **line** or **polygon feature**. Vertices may be edited to change the shape or **geometry** of the feature.

Visualisation. The creation of maps using spatial data.

Vulnerability and capacity assessments (VCA). A structured field assessment methodology used in disaster risk reduction.

Waypoint. A **point feature** recorded using a GPS receiver. If imported into Google Earth, each waypoint is interpreted as a **placemark**.

Web Feature Service (WFS). A standard for exchanging spatial data at the level of individual **features**.

Web Map Service (WMS). A standard for the distribution of maps over the internet. WMS allows positional data to be attached to a map object.

WGS84. World Geodetic System 1984. A **datum** commonly used with GIS data sets and with Google Earth.

Worldfile. Data added to, typically, a satellite image containing **spatial referencing** information.

X and Y coordinates. In a **cartesian coordinate system** such as **UTM**, the latitude and longitude descriptors are replaced by X (northings) and Y (eastings) which are metres from a fixed origin. There is sometimes also a Z coordinate, which is height.

Useful websites

All In Diary: up to date humanitarian information and resources.
http://www.allindiary.org/

ASTER PAA: LANDSAT, ASTER and IKONOS images for protected areas.
http://www.ambiotek.com/paa

Digital Chart of the World: 1:1,000,000 vector data, global coverage, downloadable by country.
http://www.maproom.psu.edu/dcw/

Digital Map Archive: http://dma.jrc.it/

Geo4ngo: An exchange platform of information related to the use of geographical information by humanitarian organisations. www.geo4ngo.org

GIS Development: Aims to promote use of GIS in areas of development.
www.gisdevelopment.net

GLCF: Global Land Cover Facility, freely downloadable geographic data, including: Landsat, Modis, Aster and IUCN/UNEP Protected Areas Database.
http://glcf.umiacs.umd.edu/data/

Grass GIS: QGIS can be used as an interface to Grass GIS functions. Good raster analysis for flood prediction www.grass.itc.it.

gvSIG: www.gvsig.gva.es/

ILWIS: Open source GIS software, originally developed at ITC in the Netherlands www.ilwis.org

Linux operating system: preloaded with various open source GIS software.
http://www.sourcepole.com/2006/11/16/gis-knoppix-en

Manifold GIS: www.manifold.net

NGA Raster Roam: US National Geospatial-Intelligence Agency: global raster datasets, including SPOT mosaic, Vector Map of the World and scanned maps.
http://geoengine.nima.mil/geospatial/SW_TOOLS/NIMAMUSE/webinter/rast_roam.html

OpenJUMP GIS: Open source software, highly specialised on vector data editing and ease of use.
www.openjump.org

OS Geo Foundation: Support for custom functionality/programming
www.osgeo.org/search_profile

ProVention Consortium website:
http://www.proventionconsortium.org

Public Health Mapping: WHO is promoting the use of GIS to support decision-making for a wide range of infectious disease and public health programmes.
www.who.int/csr/mapping

Quantum GIS: www.qgis.org. Large user community, available functionality is a bit restricted.

***ReliefWeb* directory of websites related to GIS and mapping:**
www.reliefweb.int/w/contactDir.nsf/RelatedSites?OpenForm&Query=MAP2

Satellite Remote Sensing: Integrated CEOS European data Server
http://iceds.ge.ucl.ac.uk/

Satellite Remote Sensing: Global Land Cover Facility
http://glcf.umiacs.umd.edu/index.shtml

SavGIS: www.savgis.org/es. Maintained by an official body. Spanish language software

Spring GIS: www.dpi.inpe.br/spring/index.html Developed by the Brazilian Space Agency

SRTM: Shuttle Radar Topography Mission, global 90 m digital elevation model.
http://srtm.usgs.gov
ftp://edcsgs9.cr.usgs.gov/pub/data/srtm (near-complete, with 'holes' in data)
http://www.ambiotek.com/topoview (without holes, requires Google Earth)
http://srtm.csi.cgiar.org/

Tatuk GIS: www.tatukgis.com/products/Editor/Editor.aspx

The Geography Network: A global network of geographic information users and providers.
www.geographynetwork.com

The 'International Charter': Satellite images from www.disasterscharter.org

UNGIWG: A humanitarian symbol set from is available from:
http://www.ungiwg.org/map_prod.htm

Vulnerability and capacity assessments (VCA) can be found on the **IFRC**'s website:
http://www.ifrc.org/what/disasters/resources/publications.asp

MapAction
Lime Farm Office
Little Missenden
Bucks HP7 0RQ

www.mapaction.org