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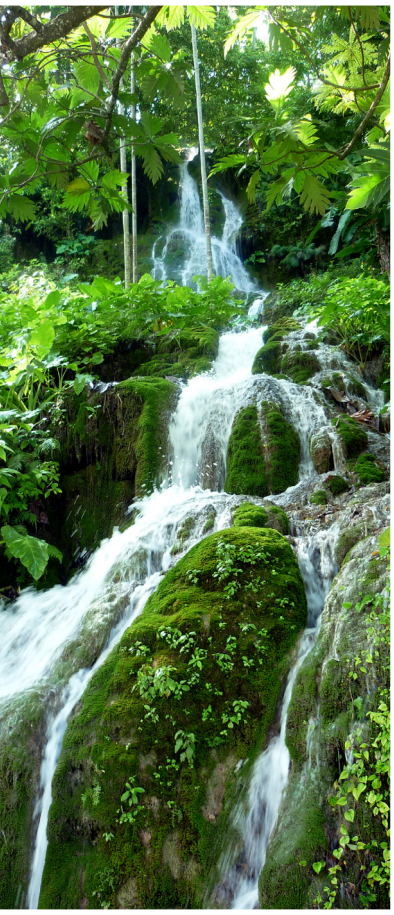

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Catalogue of Timor-Leste datasets and data records

Vulnerability assessment of climate change impacts on groundwater resources in Timor-Leste

Samantha Dawson, Luke Wallace and Baskaran Sundaram

Prepared for the Australian Government Department of Climate Change and Energy Efficiency **July 2012**

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Vulnerability assessment of climate change impacts on groundwater resources in Timor-Leste

PREPARED FOR THE AUSTRALIAN GOVERNMENT DEPARTMENT OF CLIMATE CHANGE AND ENERGY EFFICIENCY

BY GEOSCIENCE AUSTRALIA

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Contents

Datasets and Data Records

The aim of the '*Assessment of Climate Change Impacts on Groundwater in Timor-Leste Project'* is to build Timor-Leste water agencies' capacity for assessing, monitoring and managing groundwater resources in a changing climate. The project is an Australian Government initiative under the Pacific Adaptation Strategy Assistance Program. This program is being managed by the Australian Government Department of Climate Change and Energy Efficiency (DCCEE) and is part of the International Climate Change Adaptation Initiative. This report presents the datasets collected for the project, new metadata for these datasets and a process for the upkeep of datasets into the future.

Collation and interpretation of existing national datasets was essential to the assessment and understanding of Timor-Leste groundwater systems. Datasets were collected in Timor-Leste from a number of government departments. The Agriculture and Land Geographic Information System (ALGIS) section of the National Directorate of Policy and Planning, Ministry of Agriculture and Fisheries had the largest amount of data pertinent to this project. All of the datasets collected are relevant and important; however, much of the data came from past diverse foreign projects and there was no data catalogue present at any department, nor was any metadata attached to the datasets to identify what they were or 'readme' files in any of the project folders. This information needed to be created by Geoscience Australia before the data could be used in an effective manner (Figure 1) – the data catalogue, 'readme' files and an example metadata are attached.

Data was limited, including groundwater information, and of the data that was available the quality was often low. Firstly, the data available in Timor-Leste is limited due to the political history: 1) limited data is available from Portuguese times; 2) all data collected during the Indonesian government period has not been made available to the Timor-Leste government; and 3) of the data that has been collected since independence in 1999, a large proportion was lost in the 2006 riots. What data is left is largely sporadic and its usefulness is weakened by the lack of metadata or any information on how the data was made and/or collected. For example, although little to no groundwater monitoring has been done in Timor-Leste, there was an Asian Development Bank report, published in 2004, that assessed the water resources of the country, including groundwater. While copies of this report can still be found, all of the background data, numbers, equations and maps that went into this report were lost during the 2006 riots. Similarly, most of the datasets collected were incomplete and this created several issues when designing a methodology to investigate groundwater.

DATA DOCUMENTATION

Metadata

Metadata is essentially 'data on the data'; it incorporates such information as what the dataset is, when it was made and for what purpose, who the author was, how often it should be updated, when it was last updated, scale, accuracy, geographic projections, file formats and other useful information. In ArcGIS all shapefiles and rasters have an automatically generated metadata section attached to them, which can be found and updated in ArcCatalog. The importance of metadata cannot be overstated, especially when considering use of the data beyond the life of a project. For a GIS user the metadata is the first point of reference to assess if a dataset is useful, if the information that went into making it and the accuracy levels are acceptable, who the author was and therefore who to attribute the data to, whether this data can actually be used or if use is restricted and if the information is up-to-date or if new data will need to be collected. Therefore, if data is going to be useful after the initial project that made them has ended, it is essential that at least some amount of the metadata section of an ArcGIS file is completed.

None of the shapefiles and rasters collected had any information in the metadata section and we were largely unable to ascertain when the data was made, who by, what scale it was in and what purpose the data was originally made for.

Before the data could be analysed for this project, a data catalogue needed to be compiled and metadata for each file ascertained and documented as far as possible. Both of these tasks were time consuming and demanded a high level of attention to detail. Essentially it required examining and researching each of the 69 spatial datasets that were collected during the project, assigning them to a logical position in the data catalogue and inserting any relevant metadata that could be found or deduced from an examination of the file. Despite the large quantity of unknown details surrounding the datasets, these two tasks have now been completed to the highest standard possible under the circumstances. It should be noted that much of the metadata and data catalogue is derived from assumptions that we could draw from examination of the data. This throws doubt on some of the attributes inserted into both the data catalogue and the metadata, however it is the best attempt possible at this time.

Readme files

For datasets, 'readme' files are widely recognised within the GIS community as an extremely useful method of recording files and GIS methods used in a project. Essentially a 'readme' file is a text file that is found in each of the folders/category areas within a GIS project. These files generally contain a summary of what the folder contains and its purpose in the project, and it may also give descriptions of each file, where the data is from and the specific steps used to generate the data. This is useful both in the project lifetime and past it, especially if the GIS administrator records the methods used. There are multiple reasons for this but the most important ones are if any files, or the entire folder, are corrupted the folder or files can be re-built using the information in the 'readme' file.

Beyond the life of the project, having methods in the 'readme' files means that anyone else using the data can easily follow and replicate the steps that were taken to produce the outputs of the project. This is helpful in understanding the project more fully, applying methods to other similar projects and assessing the quality and usefulness of past projects for whatever the current project may be.

Having complete 'readme' files greatly enhances the usability and ease of use of GIS files within a project. For each of the categories used in the project, those discussed above and others developed specifically for the project, a 'readme' file has been created, including summary of the folders, file descriptions and explicit, step-by-step methods for how any data created was made.

The data catalogue, metadata sections and 'readme' files have been completed for the project thus far. The data catalogue (attachment 1) has been completed for all of the data collected in the country. There were 69 useable files all of which have been examined and assessed. The 'readme' files (attachment 2) are up to date for all folders, both those described above and the new folders that have been created as part of the project. This includes detailed methodology on the datasets created. Metadata sections have been completed for the entire project as of January 2011 and include both the collected files and the files produced by the project, in total over 100 files. Each metadata section is between 3 and 5 pages long (see attachment 3 for an example metadata section). The method used to achieve this is presented in Figure 1 below.

DATA CAPTURE

Despite the number of issues associated with data collection, sufficient data was collected so that the project could move forward. The data was categorised and documented in a data catalogue, which is essentially a list of data (or files) that contains information such as file name, file location, summary description of the data, accuracy levels, scales and projects the data was used for. This data

catalogue becomes a reference file and allows anyone to quickly and easily search for and locate data that is relevant to them.

The details of the various datasets collected during phase 1 of the project are presented in Attachment 1 and a brief summary is outlined below, divided into their respective categories within the data catalogue

Administration and infrastructure

This dataset is fairly complete. There is data for major roads, minor roads and tracks, major and minor towns and there are a number of shapefiles detailing the administration boundaries (national borders, districts, subdistricts, etc), although there is no cadastral data and several of the datasets conflict in the areas defined and standard naming systems. There is also a set of data which seems to be related to hospital and clinic management and resourcing, but as the names of these files have no particular meaning and there is no metadata, it is difficult to be sure.

Climate

The climatic data is sporadic and has only been collected for a short time. There is some climate data which has recently been collected by the National Directorate for Water Resources, but this data is stored in a format that was inaccessible by GA software .There is CMORPH/NOAA data, which holds raster maps of daily precipitation from 2003-2008 for the world at a scale of 0.25 degrees. This data may be useful, although on the Timor-Leste scale it would be fairly coarse and the time it would take to process this data would be immense. The Timor-Leste Ministry of Agriculture, Forests and Fisheries has an Agro-Meteorology Section which, from 2004 to 2009, kept a record of daily temperature minimum, maximum and mean, relative humidity minimum, maximum and mean, wind speed and evapotranspiration at 12 locations across the country. This would be a very valuable dataset but the recordings are sporadic, with some months having days missed, others with only one or two days recorded and others where months went by without a single recording. Also, the locations given for the monitoring stations are incorrect in at least three cases, casting doubts on the quality of the rest of the data. There are shapefiles of the average annual rainfall and temperature which are coarse contour maps, however due to the lack of metadata we don't know when these maps were made, what years they are the average for, or if, and by how much, the averages may have changed since they were made. Another dataset that could potentially be useful was a polygon map which, from examining the attribute table, may be a division of how water is used in areas across the country. As there is no metadata and no useful descriptive information in the dataset name or attributes the data could not be used by this project.

Earth observations and imagery

There are a large number of remote sensing images in this category. These include air photos of the whole country, a topographic map of the whole country, a space shuttle shaded relief which shows the relief of the country, satellite images covering around three quarters of the country and a LANDSAT image set which shows the country east of Dili. Some of these images are potentially very useful, but again there is no information on when the images were taken, by whom and for what purpose. As remote sensing analysis is beyond the scope of this project, this dataset is of limited use here.

Elevation

There was a reasonable amount of usable data collected for this category but without metadata, it is of unknown source and accuracy. Data collected includes contour lines, bathymetric lines, elevation raster (SRTM 3-second DEM –a reliable and standard dataset) for the whole of the country and surrounding area, polygon shapefiles dividing elevation and slope into high medium and low, a raster of erodible areas and a separate elevation raster with no information on its source. Of this the SRTM 3-second DEM (Digital Elevation Model) is probably the most useful as SRTM datasets are used worldwide, the source is known and therefore the dataset reliable.

Hydrogeology and groundwater

There were no datasets collected for this category, although it is believed that some work was done during the Indonesian period. An Asian Development Bank (ADB) report on water resources was completed in 2004, however all the background data and maps from this project are missing Previous to this project's work there was no hydrogeology map and, while there was some knowledge of the high yielding aquifers, the distribution and understanding of them was limited despite the high level of use and dependence on these resources in Timor-Leste.

Hydrology

There was a small amount of GIS data available in this category. Although the Norwegian government is currently working with the Timor-Leste Directorate of Water Resource Management on surface water resources and management, this project does not use GIS and hence there are no GIS files available. Data collected included a seamask (polygon depicting area of sea), polygons of the waterbodies, watersheds and braiding rivers (all of the major rivers in Timor-Leste are braiding rivers) and a polyline dataset showing the minor rivers.

Geology

There was a reasonable amount of data available in this category, which is fortunate as the lack of groundwater data means that geology data needs to be heavily relied upon. Although, there is still a lack of metadata, meaning that it is difficult to ascertain where the data came from, who it should be attributed to and what degree of confidence can be placed in it.

First, there is the 'ESCAP' map, which was published by the UN. This map exists as an undigitised picture as it was scanned in from a hardcopy belonging to the Timor-Leste directorate for geology department. There is a polygon shapefile titled 'geology' which was stored in several departments. Although it is coarse, this map has some detail in the attribute table and could be used, even though the source of the data is not known. This map appears to be a digitised version of the ESCAP map, as the polygons roughly match, although the legends use different classification systems.

Another geology polygon shapefile was collected. It has no information on who created it or what the information source was, but the level of detail is much greater than the other geology map. The attribute table is also much more descriptive. The finer detailed map is believed to be largely based on the work of Prof. Audley-Charles and Tobing, with a portion in the north being the work done by Berry. It is not known who compiled the digital version of this map or combined the work of the various sources, nor when or to what purpose this map was made.

Land information

There is a reasonable amount of data in this category. The files are all polygon datasets, except for a raster map depicting areas of high erodibility made by Nicholas in 2008. Of the polygon datasets there are files depicting areas of high fertility, a file which is either showing current land uses or potential future land uses, a file defining land covers, one showing areas where rice fields are, another dividing slopes into S, F or M (we assume this means Steep, Flat or Medium) and one on the soil orders, suborders and greater classifications. A number of datasets could not be deciphered as to their origin or purpose. While some of these datasets are important in helping depict and describe background information, their usefulness is decreased by the lack of metadata and information on what the datasets were meant for or where they are derived from.

Natural habitat

There are only a small number of datasets in this category, namely those that seem to have been created when designating national parks and identifying areas of environmental significance. Although there is again the problem of metadata, there are also issues surrounding ambiguous naming of files which makes their purpose and potential uses difficult to determine. The first data set is named "BVA" and it seems to show either protected areas or areas that could potentially be protected/are of high environmental importance. A second dataset, named "ESM", divides the

country into areas of very high, high, medium and low sensitivity, and we assume this means environmental sensitivity but that is not certain. A third file, named ImportantBirdArea, presumably depicts areas that are of high importance in terms or the amount or type of birdlife found there. The remaining two files located are “Landcover”, depicting landuse across the country, and “Timor Coastal Marine Habitats Nth”, which divides the northern coastline and the area off the coastline into marine habitats, for example, sand beach, mangrove forest and coral reef.

Non-georeferenced maps

We identified a number of images which can be displayed in ArcMap but have not been georeferenced (given co-ordinates so they can be displayed with other ArcGIS files). They appear to be scanned maps which have not been georeferenced. The most important of these is the geology ESCAP map which was scanned during the collection by Geoscience Australia in the current project from the geology department and has since been georeferenced. Other maps of less pertinence to this project include: agricultural areas also showing where sampling surveys were undertaken in 2008; agroclimatic zones; annual rainfall (which is the same as the GIS file described above); bathymetry of what appears to be the southern coastline; a map named forest_status which depicts areas of settlements, where forests are and what they are used for; soil taxonomy; subdistricts and a map named ‘Copy of steve_dunn’, but titled ‘The Proposed Refrigerator (cold chain) Locations by Sub District’ which shows basic locations with a few points identified. This last map illustrates why naming, metadata and data catalogues are all important – without these, this map loses usability and as we would not be able to tell what the map was depicting.

Attachment 1: Data catalogue for data collected in Timor-Leste

Category	Spatial Dataset Name	Location in department folders	Department/Branch/ Custodian	Dataset details	Duplicate datasets (under different name)	Year Last Modified/ possibly created	Metadata Y/N (prior to receiving)	Contact
Admin & Infrastructure	admin_district	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the districts of TL by name		2006	N	ALGIS - Maria or Domingos
	admin_jaco	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the sucos by suco name, subdistrict, district and has area of suco in hectares		2006	N	ALGIS - Maria or Domingos
	admin_subdistrict	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the subdistricts by name - different to the other subdistrict dataset, no way of telling which is correct one at the moment	Dataset called admin_subdistrict_Clip seems to be exactly the same but created in 2009	2006	N	ALGIS - Maria or Domingos
	admin_sucos	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the sucos by suco name, subdistrict, district and has area of suco in hectares	DNGRA has a copy but under the name 'admin'	2009	N	ALGIS - Maria or Domingos
	coastline and national boundary	ALGIS - Vector - Administrative	ALGIS (DNGRA also has a copy)	Polygon dataset - shows the four polygons/islands/areas of the TL national boundary, no names but does have area in hectares, sq kilometers and perimeter (not sure what in)		2005	N	ALGIS - Maria or Domingos
	oecusse	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the sucos of Oecussi by name, subdistrict, district and area in hectares		2006	N	ALGIS - Maria or Domingos
	oecusse_ocap	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the sucos of Oecussi by name, subdistrict, district and area in hectares but has less sucos than the oecusse dataset (above)		2006	N	ALGIS - Maria or Domingos
	old sucos 2001	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the sucos as they existed in 2001 by suco name, subdistrict, district and has area of sucos in degrees and hectares		2006	N	ALGIS - Maria or Domingos
	regions	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the regions of TL and they are numbered - not named		2005	N	ALGIS - Maria or Domingos
	subdistrict_no error	ALGIS - Vector - Administrative	ALGIS	Polygon dataset - shows the subdistricts by name but with some differences to the other subdistrict dataset - no way of telling which is correct one at the moment		2008	N	ALGIS - Maria or Domingos
	surroundings	ALGIS - Vector - Administrative	ALGIS (DNGRA also has a copy)	Polygon dataset - shows TL and the surrounding islands by name and area in hectares		2006	N	ALGIS - Maria or Domingos
	2002schools	ALGIS - Vector - Infrastructure	ALGIS (DNGRA also has a copy)	Point dataset - shows the school locations, names and types		2005	N	ALGIS - Maria or Domingos
	chc new	ALGIS - Vector - Infrastructure - Health Facilities - CHC New	ALGIS	Point dataset - CHC stands for Community Helath Centre which are not the same as hospitals, attribute table is very detailed inc staff numbers, morbidity rates, etc		2005	N	ALGIS - Maria or Domingos
	hamlets	ALGIS - Vector - Settlements	ALGIS (DNGRA and Land and Property also have a copy)	Point dataset - shows the loacation and name of hamlets across TL		2005	N	ALGIS - Maria or Domingos
	household_points2004	ALGIS - Vector - Settlements	ALGIS	Point dataset - shows the locations of houses and number of people in each, probably from 2004 census		2006	N	ALGIS - Maria or Domingos
	hp and mo neww	ALGIS - Vector - Infrastructure - Health Facilities - HP&MC	ALGIS	Point dataset - not sure what Hp & MC stand for but appears to be range or mayble all of TL health facilities, attribute table is detailed, inc owner, whether CHC certified (whether there is a Community Health Centre there), etc		2005	N	ALGIS - Maria or Domingos
	hpt and cl fix	ALGIS - Vector - Infrastructure - Health Facilities - HPT&CL	ALGIS	Point dataset - not sure what HPT and CL stand for but appears to be a range or maybe all of TL health facilities, attribute table is detailed inc name, owner, equipment (eg x-ray facilities, etc		2005	N	ALGIS - Maria or Domingos

	major towns	ALGIS - Vector - Settlements	ALGIS (DNGRA also has a copy)	Point dataset - shows the location and name of all major towns in TL	Land and Property have a copy of this dataset under the name of 'towns'	2005	N	ALGIS - Maria or Domingos
	minor towns	ALGIS - Vector - Settlements	ALGIS (DNGRA and Land and Property also have a copy)	Point dataset - shows the location, name and the name of the subdistrict and district it is in for all minor towns in TL		2005	N	ALGIS - Maria or Domingos
	OverallRoadScore	ALGIS - Raster - Shapefiles	ALGIS	Line dataset - shows the major roads for whole of country defines by where they link from and to		2009	N	ALGIS - Maria or Domingos
	roads and tracks	ALGIS - Vector - Infrastructure	ALGIS (DNGRA also has a copy)	Line dataset - shows all of the roads and tracks from whole of country, attributes include length (in degrees) and defines roads from two laned sealed road down to foot tracks		2005	N	ALGIS - Maria or Domingos
Climate	CMORPH Folder	ALGIS - Vector - Weather station dt	ALGIS	Raster datasets (in zipped folders - to access just unzip) - has the world precipition map for every day between 2003 and 2008 (and weekly precipitation map for 2008). Created by John Janowiak and Tim Love from NOAA for a global project they were working on. Any use of this data should recognise NOAA		2006 - 2008	Y	John Janowiak or Tim Love from NOOAA
	Agriculture_WeatherStation	ALGIS - Vector - Weather station dt	ALGIS	Point dataset - shows the location and name of agricultural weather stations in TL - no indication whether these are still active/when they were functioning		2009	N	ALGIS - Maria or Domingos
	annual rainfall	ALGIS - Vector - Climate	ALGIS	Contour map - basic contour map of rainfall for TL - assume it is average, no info on which years it is averaging/when measurements taken		2005	N	ALGIS - Maria or Domingos
	average temp	ALGIS - Vector - Climate	ALGIS	Contour map - basic contour map of average temperature for TL - no indication of what years it is averaging		2005	N	ALGIS - Maria or Domingos
	Meteorologi_WeatherStation	ALGIS - Vector - Weather station dt	ALGIS	Point dataset - shows the location and name of meteorlogical weather stations in TL - no indication whether these are still active/when they were functioning		2009	N	ALGIS - Maria or Domingos
	wat6_3	ALGIS - Nicholas'08	ALGIS	Polygon dataset - divides TL into a range of small polygons (roughly suco size) and then has a large number of attributes attached. Possibly a water balance map but need to get into contact with Nicholas'08 to confirm		2008	N	Nicholas '08 or ALGIS
Earth Observation & Imagery	Aerial Folder	DNGRA	DNGRA	Raster datasets - this folder contains a large number or raster files which show aerial photography of the whole country, inc. Oecussi and island, to a reasonably fine extent, very similar to or the same as the airphotos from ALGIS		2005	N	DNGRA
	Airphot ecw1	ALGIS - Raster	ALGIS	Raster datasets - this folder contains a large number or raster files which show aerial photography of the whole country, inc. Oecussi and island, to a reasonably fine extent, very similar to or the same as the airphotos from DNGRA	digo airphoto index - ALGIS - Raster, appears to be the index shapefile for this map	2003	N	ALGIS - Maria or Domingos
	ECW Rupabumi Folder	ALGIS - Raster	ALGIS	Raster dataset - this folder contains a large number of raster files which show a topographic map of the whole country, inc. Oecussi and island	rupabumi and ecw index - ALGIS - Raster, appears to be the index shapefile for this map	2005	N	ALGIS - Maria or Domingos
	satellite Folder	ALGIS - satellite	ALGIS	Raster datasets - various satellite pictures of eith all or parts of TL, if the word 'box' is in file name than it only covers a poportion of the country, all other cover 3/4 or whole of country, different satellite photographing techniques used		2003-2008	N	ALGIS - Maria or Domingos

	georef space shuttle shaded relief	ALGIS - Raster - Space Shuttle	ALGIS (DNGRA also has a copy)	Raster dataset - relief picture of whole country (no values attached)		2005	N	ALGIS - Maria or Domingos
	LANDSAT_742mosaic Folder	ALGIS	ALGIS	Raster dataset - landsat raster to a fairly coarse resolution - shows the country to the East of Dili but no further west than the western outskirts of Dili. Also shows landsat for region to the East of mainland Timor including PNG and islands further east than PNG		2002	N	ALGIS - Maria or Domingos
Elevation	100 m countours	ALGIS - Vector - Elevation	ALGIS (DNGRA also has a copy)	Contour dataset - contour map of elevation in 100m hieght intervals for whole country		2005	N	ALGIS - Maria or Domingos
	bath_timor	ALGIS - Vector - TL	ALGIS	Contour dataset - contour map of bathymetrics around whole of TL and region, contours are at depth (m) intervals of 0, 100, 200, 500, 1000 and then every 500m to 4500		2008	N	ALGIS - Maria or Domingos
	Bathymetry_Sandwell	ALGIS - SRTM	ALGIS	Raster Dataset - bathymetric map of whole world		2008-2009	N	ALGIS - Maria or Domingos
	elevation	ALGIS - Vector - Elevation	ALGIS (DNGRA also has a copy)	Polygon dataset - polygon map which divides elevation inot 7 categories - assuming lowes to hightes but no information on size of categories/division of heights		2005	N	ALGIS - Maria or Domingos
	erodible2	ALGIS - Nicholas'08	ALGIS	Polygon dataset - country divided into two types of polygon; hgih erodibility and no data, no info on how this was made or using what datasets		2008	N	ALGIS - Maria or Domingos
	slopes	ALGIS - Vector - Elevation	ALGIS	Polygon dataset - map of whole country, divides areas into a slope fo S, F or M (assuming steep, flat or medium) polygons are large and coarse		2005	N	ALGIS - Maria or Domingos
	SRTM_Elevation	ALGIS - SRTM	ALGIS	Raster dataset - srtm elevation raster for whole country		2008	N	ALGIS - Maria or Domingos
	timor2	ALGIS - Nicholas'08	ALGIS	Raster dataset - raster elevation dataset for the whole of country, not sure of source/accuracy to a fairly fine resolution		2008	N	ALGIS - Maria or Domingos
Hydrology	braiding riverbeds	ALGIS - Vector - hydrology	ALGIS (DNGRA also has a copy)	Polygon dataset - polgyons of riverbed of braided rivers for whole of country - almost all major rivers in TL are braided rivers - no river names attached		2005	N	ALGIS - Maria or Domingos
	rivers	ALGIS - Vector - hydrology	ALGIS (DNGRA also has a copy)	Line dataset - shows river courses for whole of country, almost all of these rivers feed into the braided rivers, no river names attached		2005	N	ALGIS - Maria or Domingos
	seamask	ALGIS - Vector - hydrology	ALGIS	Polygon dataset - one polygon outlining sea areas for whole of country/region		2005	N	ALGIS - Maria or Domingos
	waterbodies	ALGIS - Vector - hydrology	ALGIS (DNGRA also has a copy)	Polgyon dataset - polygons of the waterbodies (there are not many water bodies in TL) no features named		2005	N	ALGIS - Maria or Domingos
	watersheds	ALGIS - Vector - hydrology	ALGIS	Polygon dataset - polygons of thw wtersheds in TL, covers whole of country, attributes include catchment name, size in hectares and class (eg small catchment, aggregate catchment, etc.		2005	N	ALGIS - Maria or Domingos
Interpretive Geology	AO	Mining and Natural Resources	Mining and Natural Resources	UNDIGITISED MAP this map is essentially a scanned image of a hard copy map that belongs to the Department of Mining and Natural Resource, it is a more detailed map than the other geology map for the whole of country and also has cross sections of the geology for some areas. It is a combination of three maps that were made in the 1990s. There may have been an outside group making a digitised copy but unsure if they have succeeded		1994-1996	N	Mining and Natural Resources

	ETGeolv10LL	DNGRA - timor aerial-topo - geology	DNGRA	Polygon map - most detailed geology map available, would seem to be a combination of three other geology maps: Audley-Charles, Berry and Tobing plus some other field observations. Has a fine detail and more accurate classifications, attributes include Geolgoy unit, age, group, formation, lithology and geol codes, which is similar to others but this has many more, and more descriptive classes, including dividing the recent alluvial into alluviam, beach sands, flood plain, lacustrine and river terrace		2003	N	DNGRA
	geology	ALGIS - Vector - Earth Sciences	ALGIS	Polygon map - geology map of the area (possibly Audley-Charles) to a reasonable level of detail. Attributes include formation name, age, facies, lthology, thickness, fossils and other remarks	geology - both ALGIS - Raster - Shapefiles (called GeoFormation) and Land and Property (same name) have copies of this geology map - same map with same attributes	2005	N	ALGIS - Maria or Domingos
	GeoStabilitlyZone	ALGIS - Raster - Shapefiles	ALGIS	Polygon map - same polygons as the geology/GeoFormation map but the attributes are based on the 'stability' of polygon - probably made to feed into the landslide map created by Nicholas '08		2009	N	ALGIS - Maria or Domingos
	soils	ALGIS - Vector - Earth Sciences	ALGIS	Polygon map - basic soil map covers whole country to a reasonable detail, divides soils into 'greatsoil' eg Calciustolls, 'suborder' eg Ustollsand 'orders' eg Mollisols		2005	N	ALGIS - Maria or Domingos
Land Information	high_fertility	ALGIS - Nicholas'08	ALGIS	Polygon map - a number of polygons covering some of the area for only mainland TL, polygons show areas of high fertility with low to medium sensitivity and gives other details on these areas like soil type, area, etc. presumable made by Nicholas '08		2008	N	ALGIS - Maria or Domingos
	land_plan_District	ALGIS - Nicholas'08	ALGIS	Polygon map - divides mainland TL into polygons which define the land management practices for that area (eg. Maintain as forest - community forest or convert to agrofrestry, agriculture only on terraces or improve water subbply and establish as permanent agriculture. It is believed that this is the final output of the Nicholas '08 project as other of his outputs maps seem to be incorporated into the attribute table, eg. erodibility, water type, landcover, landuse, rainfall amounts within watersheds, etc		2008	N	ALGIS - Maria or Domingos
	Landcover	ALGIS - Raster - Shapefiles (also in ALGIS - Vector - Land cover)	ALGIS	Polygon map - divides whole country into polygons based on landuse, shows what land is being used for eg forest, agriculture, urban, etc and agriculture subdivided into types eg. Types of commercial produce grown and then there are various observations and remarks on various aspects		2005	N	ALGIS - Maria or Domingos
	rice fields	ALGIS - Vector - Land cover	ALGIS (DNGRA also has a copy)	Polygon map - polygons cover various areas for whole of country where rice is grown, differentiates between rainfed and irrigated rice fields/areas		2005	N	ALGIS - Maria or Domingos

	wat6_3	ALGIS - Nicholas'08	ALGIS	Polygon map - divideds whole of country into polygonsto a fairly detailed level, the attribute table would appear to have a lot of important information but the titles are too ambiguos to be understood. At best guess this is a water balance map that was used as one of the inputs to the land management map that Nicholas '08 created and it was used to ascertain available amounts of water in any given area		2008	N	ALGIS - Maria or Domingos
	lum_w	ALGIS - Nicholas'08	ALGIS	Polygon map - divides mainland TL into polygons which divide into areas of Agriculture, Agroforestry/grazing, Forest/Agroforestry and no data (for areas outside mainland TL)		2008	N	ALGIS - Maria or Domingos
Natural Habitat	BVA	ALGIS - Raster - Shapefiles	ALGIS	Polygon map - polygons cover various areas of country, unsure of exact meaning but seems to be either protected areas or potential protected areas or areas of high biodiversity		2009	N	ALGIS - Maria or Domingos
	ESM	ALGIS - Raster - Shapefiles	ALGIS	Poygon map - divides the whole country into low, medium, high and very high sensitivity areas, no other information but assume sensitivity refers to the likeliness of damage to that area due to changes in land management, use, etc.		2009	N	ALGIS - Maria or Domingos
	ImportantBirdArea	ALGIS - Raster - Shaperfiles	ALGIS	Poygon map - polygons cover various areas of country, in attribute table each of these areas is named and judging from title of dataset shows areas which are of importance to birdlife in terms of either the number of species or the status of species (ie if endemic/endangered bird species are found there) found there		2009	N	ALGIS - Maria or Domingos
	Timor_Coastal_Marine_Habitats_Nth	ALGIS - Timor_Coastal_Marine_Habitats_Nth	ALGIS	Polygon map - polygons cover a short distance inland and offshor for the entire northern coast of mainland TL. Areas are divided into land type/marine habitats, eg. Sand beach, mangrove forests, dryland forests, seagrass forests, deep water areas with coral in shallow areas, etc		2009	N	ALGIS - Maria or Domingos
Non-digitised maps	afp sample survey 2007	ALGIS	ALGIS	Basic land use map that was used to show sites that were selected for a survey - unsure of survey type or purpose		2007	N	ALGIS - Maria or Domingos
	agroclimatic_zones edit2	ALGIS	ALGIS	Divides country into twelve categories based on combinations of highland, slopes and lowland with low, moderate, high and highest rainfall		2007	N	ALGIS - Maria or Domingos
	annual_rainfall	ALGIS	ALGIS	Basic contour rainfall map, same contours as the ALGIS annual rainfall shapefile, neither give an indiction of the range of years this shapefile is averaged from		2002	N	ALGIS - Maria or Domingos
	bathymetric	ALGIS	ALGIS	Contour map of bathymetricdepths for some of the south coast		2002	N	ALGIS - Maria or Domingos
	copy of steve_dunn	ALGIS	ALGIS	Titled 'The Proposed Refrigerator (cold chain) Locations by Sub District' basic topographic map with major towns, roads and districts with a few points identified which, presumably, are the proprosed refrigerator locations		2005	N	ALGIS - Maria or Domingos

	forest_status	ALGIS	ALGIS	Shows the areas of whole country classified into regions of urban and rural settlement and then divides forested areas into nature reserve, protection/ed forests, convertible production forest, wildlife reserve or recreation park		2002	N	ALGIS - Maria or Domingos
	soil_taxonomy	ALGIS	ALGIS	Shows the soil categories/groups for the whole country - we have a similar (but not sure if exactly the same) map in a digitised version		2002	N	ALGIS - Maria or Domingos
	tl-adim_subdist_a0	ALGIS	ALGIS	shows the sub-districts for the whole country and also has major towns and roads displaying		2005	N	ALGIS - Maria or Domingos

Attachment 2: 'Readme' files for the GA ArcGIS project

Files are arranged by alphabetical order of the file they are describing: These are the 'readme' files for the entire project as of January 2011. They were made at the beginning of the project and regularly updated.

README for 'admin&infra'

This folder contains all of the administrative files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

OverallRoadScore
ALGIS - Raster - Shapefiles, map of major roads for country

admin_districts folder
ALGIS - Vector - Administrative (DNGRA also has copy of some of these), admin and manage boundaries for country, e.g. districts, subdistricts, sucoscountry national boundary, etc. all polygons and a made map which is the boundary map for mainland Timor-Leste

chc new
ALGIS - Vector - Infrastructure - Health Facilities - CHC New, point data set, not sure what chc stands for but assuming list of new and/or existing hospitals, attribute table very detailed, includes. number of staff, specialities, morbidity numbers and reasons, issues for the hospital, etc.

hp and mo neww
ALGIS - Vector - Infrastructure - Health Facilities - HP&MC, point data set, not sure what hp and mo neww stands for but assuming it's a kind of health facility, attributes include name, district, owner and whether chc certified

hpt and cl fix
ALGIS - Vector - Infrastructure - Health Facilities - HPT&CL, point data set, not sure what hpt and cl fix stands for but assuming it's a kind of health facility, attributes include name, owner, staffing numbers and types and hospital equipment (eg. x-ray capabilities)

2002schools
ALGIS - Vector - Infrastructure (DNGRA also has copy), point data set, lists schools, names and types

roads and tracks
ALGIS - Vector - Infrastructure (DNGRA also has copy), line data set, shows all roads for TL - descriptions range from two lane sealed road down to foot tracks

hamlets
ALGIS - Vector - Settlements (DNGRA & Property and Justice also has copy), point data set, shows the place and name of hamlets across TL

househlold_points2004

ALGIS - Vector - Settlements, point data set presumably from the 2004 census, shows the locations of all the houses in TL and the number of people in each house

major towns
ALGIS - Vector - Settlements (DNGRA & Property and Justice also has copy), point data set, shows the place and name of all of the major towns in TL

minor towns
ALGIS - Vector - Settlements (DNGRA & Property and Justice also has copy), point data set, shows the place, name (names the subdistrict and district as well) of all of the minor towns in TL

PPJ_Atlas folder
Stats, THIS FOLDER CONTAINS NO GIS DATASETS, this folder has copies of the 2004 population census reports, but none of the gis datasets produced from the 2004 census. Statistics would prefer if we didn't use any of the 2004 data as they have just completed a more comprehensive 2010 census in July, the results of which we should be able to have access to by January or February 2011.

README for 'climate'

This folder contains all of the climate files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

wat6_3
From ALGIS - Nicholas'08, looks like some kind of water balance/run off polygon area need to check with
Luke, may be useful for recharge.

annual rainfall
ALGIS - Vector - Climate, basic rainfall contour map for whole of country - fairly large contours

average temp
ALGIS - Vector - Climate, basic temperature contour map for whole of country, again fairly large contours

CMORPH folder
ALGIS - Vector - Weather station dt, has raster maps of world precipitation for every data from 2003 to 2008 - the folder with the separate 2008 data also has averaged weekly world precipitation maps. These maps were created by John Janowiak and Tim Love of NOAA but unsure for what purpose. The files are all in zipped folders - to access, unzip and import into ArcMap (or other program that can read GRID format)

Agriculture_WeatherStation
Meteorologic_WeatherStation

(both) ALGIS - Vector - Weather station dt - WeatherStation, both are point data sets that show the location and name of various weather stations - no indication when this map was from or if they are still active.

100908 HYDATA
DNGRA, WILL NEED HYDATA PROGRAM TO ACCESS, shows river and rain gauge data that Norwegians have collected

Rainfall Data
DNGRA, EXCEL SPREADSHEETS, contains files on weather stations around country - each file shows every, or most, days of the month recording temp, precip, humidity, evaporation, etc. Years range from 2004 - 2009 BUT not all years/months are recorded at every station, some only have one or two years

rain_temp
Polygon Shapefile. Compiled/made by Samantha Dawson in December 2010 as part of the groundwater recharge site identification study. Map is based on both the annual rainfall and annual temperature maps. It is a combination of these two maps divided into each of the separate areas of temperature range and rainfall range.
To produce this map the following method was used:
First the average temperature shapefile was copied and split so that there were 5 separate shapefiles depicting each of the 5 temperature ranges - make a copy of the original shapefile, rename it to the temperature range for that shapefile, then in ArcMap
Open Attribute table (right click on shapefile name > select 'Open Attribute Table')
Then in attribute table - select 'Options' button > select 'Select by Attributes
In the window that opens double click on the title of the attribute that you are interested in (e.g. temperature range)
Then click the '=' sign once
Click the 'Get Unique Values' button then double click on the particular attribute that you want in the new file
Then click 'Apply'
This will select all of those attributes in the Attribute Table
Then Select the 'Options' button > select 'Switch Selection'
This will select everything but the attributes you are interested in
Then go to the Editor Toolbar (to add to ArcMap go to View > toolbars > select 'Editor') and select 'Start Editing'
Right click on the left hand column of the attribute table on any of the selected rows, then click 'Delete selected'
This will delete everything except the ones you are interested in
Go back to Editor Toolbar - select 'Save Edits' > select 'Stop Editing'
The shapefile will now only show the polygons that you are interested in (e.g. only the temperatures for that range)
Repeat this procedure for each of the 5 ranges.
Then, using each of the 5 temperature shapefiles in turn, clip the annual_rainfall shapefile - by clipping the annual rainfall file by each of the temperature ranges the areas are being divided up by rainfall range and temperature range. To clip the rainfall file the following steps were used:
In the toolbox (if not displayed then press the little red box in the options at the top of ArcMap or ArcCatalog)
Select Analysis Tools
Select Extract
Select Clip
In the window that opens in the Input Features put what you want clipped, in this case the annual_rainfall

In the Clip Features put what you are clipping by, in this each of the temperature range shapefiles (note: you can only do one of these shapefiles at a time)
In the Output Feature Class, type a name of the new file (in this case probably use a combination of rain and the temperature range
This procedure should produce 5 new shapefiles, each of which contain the annual_rainfall polygons that are within a certain temperature range.
Then for each of the polygons depicting a rainfall range within a certain temperature range, the temperature range needs to be added to the polygon. To achieve this use the following steps for each of these 5 shapefiles:
In the attribute table use the 'Options' menu, then select 'Add Field'
Then in the window that appear give a name for the new attribute (in this case 'temp.' or similar)
Note: keep the title of the fields the same for all 5 shapefiles
In type select 'Text'
Leave the default of others (if longer may need to increase length)
Click 'OK'
Then start and Edit session (Editor toolbar - Editor menu > select 'Start Editing'
Then in the attribute table right click on the heading of the field that was just made
Select 'Field Calculator'
In the window that appears, down the bottom in the box that is titled '(name of field) =' write the temperature range with inverted commas on each side (e.g. "25 - 27")
Once this is completed for each of the 5 shapefiles, you can merge the 5 shapefiles into one which will have one field/column in the attribute table which is rainfall range and another which is temperature range
To merge the shapefiles use the following method:
In the Toolbox:
Data Management Tools > General > Merge
In the window that appears - in the 'Input Datasets' select the 5 shapefiles (will have to select one at a time)
Then give a name for the Output Dataset give a name for the file (e.g. rain_temp)
In the Field Map section will be several field names but there should be only one for rainfall range and one for temperature range (if you have not used the same names to as titles in the attribute fields this will not be the case and you will have to go back and change them)
Once this is done select 'OK'
This output from this merge will be a map that is a combination of the rainfall and temperature maps.

README for ‘earth_obs_img’

This folder contains all of the earth observatory image files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

Airphoto ecw1 folder
ALGIS - Raster, airphotos of the whole country (inc. Oecussi and island) to a reasonably fine scale digo airphoto index ALGIS - Raster, index for the airphoto folder

ECW Rupabumi folder
ALGIS - Raster, topographic map of the whole country (inc Oecussi and island)
rupabumi and ecw index ALGIS - Raster, index for the ECW Rupabumi folder

georef space shuttle shaded relief
ALGIS - Raster - Space Shuttle (DNGRA also have copy), greyscale relief picture of whole country (no heights attached)

satellite folder
ALGIS - satellite, various satellite rasters of either all or parts TL. If 'box' in title only covers a small proportion of the country, others cover whole or 3/4 of country.

Aerial folder
DNGRA, airphotos of whole of country (inc. Oecussi and island) to a reasonably fine scale - seem to be the same or similar to airphotos from ALGIS

LANDSAT_742mosaic folder
ALGIS, Raster dataset - landsat raster to a fairly coarse resolution - shows the country to the East of Dili but no further west than the western outskirts of Dili. Also shows landsat for region to the East of mainland Timor including PNG and islands further east than PNG

README for ‘elevation’

This folder contains all of the elevation files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

erodible2
From ALGIS - Nicholas'08 folder, country divided into two types polygon; high erodibility and no data - could be used to identify areas of high run-off

timor2
From ALGIS - Nicholas'08 folder - elevation raster, not sure of source

Bathymetry_Sandwell
ALGIS - SRTM, Bathymetric raster map of the world, inc TL

SRTM_Elevation
ALGIS - SRTM, elevation raster of whole country - probably best one to use

slopes
ALGIS - Vector - Elevation, polygon map of whole country divides areas into a slope of S, F or M (assuming steep, flat or medium) polygons are large and coarse

elevation
ALGIS - Vector - Elevation (DNGRA also has copy), polygon map which divides elevation into 7 categories (presumably lowest to highest but no info on size of categories/division of heights)

100m contours
ALGIS - Vector - Elevation (DNGRA also has copy), contour map of elevation in 100m height intervals (whole country)

bath_timor
ALGIS - Vector - TL, contour map of bathymetry around whole of TL and region. Contours are at depth intervals of (m) 0, 100, 200, 500, 1000 and then every 500m to 4500

extract_srtm2
This raster is based on the SRTM_ Elevation.tif file. It contains the same information except it is clipped to the Timor-Leste mainland border (using the clip tool - Analysis Tools > Extract > Clip) and a file with the boundary to clip it. It is also in an ESRI grid format instead of .tif

MRVBF folder
This folder contains the extract_srtm2 (the SRTM_Elevation file but clipped to Timor Leste and in an ESRI grid) and the results (and ArcInfo tools) from a MrVBF script (Valley Bottom Flatness). This data will be used in the recharge analysis to help identify areas where there is high run off, or pooling that would be conducive to recharge. There are a number of rasters produced from MrVBF, which there is not room to go into here, however if you consult the literature (John Gallant, CSIRO) then it will be able to give more information.

README for ‘hydrogeology’

This folder contains all of the hydrogeology files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are the main outputs for the project. For more information on the project please see the fact sheet/reports in the Reports folder

The names and sources/methodology for creation are as follows:

hydgeo_1:
This is the first attempt at a hydrogeology map for East Timor. It uses the ETGeol10LL as a basis. From this, Dr. Luke Wallace assigned each of the types of geologic units in the attribute table an aquifer type (karst, sedimentary or fractured rock), a potential yield (high or low) and then gave a general rock type description.
These three attributes were then input into the hydgeo_1 attribute table using these steps in ArcMap:
In the editor toolbar click the drop down menu than start editing (select correct file)
Open the attribute table (right click on file name)
Use an SQL query (click options then 'select by attributes') then use this tool to select all of a particular geol unit (e.g. "GEOL_UNIT" = 'Edl' use the buttons and the 'get unique values' to select units)
Then use the field calculator (right click on column you want to add attributes to, select Field Calculator) to insert the attributes you want (e.g. in the 'aquifer' column to insert 'fractured rock' into all of the Pzlc Geol_Units). In the field calculator select Type: String then in the equation area write the words you want inserted into the column in quotation marks e.g. "fractured rock". Make sure the 'Calculate selected records only' is selected. Then click 'OK'.

When you are finished inserting attributes into the table make sure you go back to the editor toolbar and using the dropdown menu select 'save edits' and then 'stop editing'.

hydgeo_clip1:
This is the hydrogeology map except it has been 'clipped' to delete West Timor from the map (which was classified as 'NA') so that this hydrogeology map only shows the East Timor mainland. This was achieved using a shapefile that was the administrational boundary of East Timor and the Clip Tool as below:
In the Arc Toolbox select Analysis Tools > Extract > Clip. When the window opens use the drop down arrow or folder to select the hydgeo_1 map in the 'Input Features' box, then the same process to select the admin boundary in the 'Clip Features' box and then rename the file in the 'Output Feature Class' box to desired name (note: do not use the same name as any of the input files and try to keep at 10 letters or less). Click 'OK'.

hydgeo_2:
This is a revised version of the hydgeo_1. In this shapefile some of the original added attributes were changed and some new attributes were added. For example, the karst aquifers were changed to Fractured Rock, high yield aquifers and further attributes, such as amount descriptions, map symbol, lithology new, etc. these were added under instruction from Dr. Wallace who assigned these new attributes in an excel spreadsheet. The process was the same as for hydgeo_1

hydgeo_2_Dis
This shapefile is the same as the hydgeo_2 shapefile except it has been processed using the following tool.
Data Management Tools > Generalization > Dissolve **using the input and output files** were given names and then the fields to dissolve selected were aquifer_type pot_vol (potential volume). This tool then takes all polygons that have the same characteristics in those two fields and dissolves/takes away the lines between them. This means that when this map is displayed it can be done with boundaries around the edge that don't interfere with the internal polygon making the map clearer and more readily understandable.

hydgeo_2_ras
Raster Map. Based on the hydgeo_2 map, this is a raster of a field that was created that combined Aquifer with Potential Volume (add a field to the attribute table outside of an edit session then in an edit session use the field calculator to make the new column equal the sum of the two previous columns). It was created to input the hydrogeology map into 3D format in ArcScene. It was created using the convert features to raster in the spatial analyst toolbar (in the toolbar). To get this toolbar go to View > Toolbars > (tick) Spatial Analyst. When the toolbar appears click on the drop down menu > Convert > Features to raster. In the box that pops up select the input shapefiles/features and the Field (attribute column) that you want the raster to be based on (note: none of the other fields will be in the output) leave the Output cell size as default and change Output raster to the required name. This raster can then be added to an Arcscene map and use a DEM (such as SRTM) as the input base heights.

hydgeo_2_lith.lyr
Layer file based on hydgeo_2. Layer files are used to hold the colours/patterns of a shapefile that you have designated in ArcMap. In this case each of the lithologies (e.g. sedimentary, conglomerate, karst, etc) of the hydgeo shapefile were displayed in patterns according to the UN International Standards. These patterns overlay the hydgeo aquifer map. To save a shapefile to a layer file in ArcMap, first make sure the colours that you are displaying the shapefile in are correct. Then right click on the shapefile, select 'Save as Layer File', designate name (if different from default), select save.
A layer file only holds the display properties for that shapefile. It is not a shapefile in itself and does not store the locations/shapes. It references back to the original file for its information - the original file MUST stay in exactly the same folder or be moved in conjunction with the layer file or the layer file WILL NOT WORK.

If a layer file is not working you may need to re-set where the polygon is - follow the prompts and select the correct file. Layer files can also be used to colour other shapefiles the same way as the layer file. For example, if a shapefile has some of the same attributes as the layer file based shapefile has, you can use these attributes to display in the correct colours, rather than going back to the beginning and re-colouring all the attributes by hand.

hydgeo_2a.lyr
Layer file based on hydgeo_2. Layer file holding the correct colours to display the aquifers of Timor-Leste. For example - high sedimentary = dark blue, low sedimentary = light blue. Made using process descirbed in hydgeo_2_lith.lyr

aq_pot_ras
Raster map. Based on the aquifer potentiality map. Aquifer potentiality map is essentially hydgeo map but coloured light blue and dark blue. Light blue represents rocks that are aquifers but with low prospectivity, dark blue represents rocks that are aquifers with a high prospectivity. This was made into 3d using the same methods as the hydgeo_2_ras. It was made so that the raster produced could be used in ArcScene to display these polygons in 3d - draped over topography.

ETGeol_attributes_TL_Hydgeo_LW (,2,3)
These are the excel spreadsheets (updated in consecutive numbers) that have the information on how the geology was interpreted into geology for the standard map and into hydrogeology. The plain cells are the original information from ETGeol files, the cells coloured yellow are the information used in the geology file and the blue cells are the interpretation into hydrogeology files

Fissured
Polygon shapefile. Shows the Fissured rock aquifers (previously called karst aquifers) for the mainland of Timor-Leste only (not including SE corner).
Based on the hydgeol_4 map (most up to date as 12/01/11) uses the SQL and editing tools to delete the other polygons from the original shapefile. Instructions as follows:
In ArcCatalog make a copy of the base shapefile and rename the copy to desired name (e.g. Fissured)
Add new shapefile to ArcMap
Open Attribute table (right click on shapefile name > select 'Open Attribute Table')
Then in attribute table - select 'Options' button > select 'Select by Attributes
In the window that opens double click on the title of the attribute that you are interested in
Then click the '=' sign once
Click the 'Get Unique Values' button then double click on the particular attribute that you want in the new file
Then click 'Apply'
This will select all of those attributes in the Attribute Table
Then Select the 'Options' button > select 'Switch Selection'
This will select everything but the attributes you are interested in
Then go to the Editor Toolbar (to add to ArcMap go to View > toolbars > select 'Editor') and select 'Start Editing'
Right click on the left hand column of the attribute table on any of the selected rows, then click 'Delete selected'
This will delete everything except the ones you are interested in
Go back to Editor Toolbar - select 'Save Edits' > select 'Stop Editing'
The shapefile will now only show the polygons that you are interested in (e.g. only fissured aquifers)

Fissured_Oec_Ata3
Polygon shapefile. Shows the fissured rock (karst) aquifers of Oecussi and Atauro only. Made by the same process as Fissured.

Based on the hydgeo for Oecussi and Atauro, which was based on the geology for each island (see geology folder).

Fissured_whole2
Polygon shapefile. Shows the fissured rock aquifers (previously called karst aquifers) for whole of Timor-Leste, including Atauro and Oecussi and SE corner. Based on the Fissured and Fissured_Oec_Ata3 shapefiles (see above for shapefiles and how they were made). Made by merging the two shapefiles it was based on using following steps:
In ArcMap open/show the toolbox
Data Management Tools > General > Merge
In the window that opens select the two shapefiles you wish to merge
Give a name for the output dataset
Set other options as required (rest were default for this shapefile)
Select 'OK'

hydgeo_3 (shape and layer files)
Polygon shapefile and layer file based on this with aquifer colours. This shapefile is the progressed version 3 hydrogeology map from hydgeo_2. It is a hydrogeology map, based on the files and using the same processes as the hydgeo 2. As understanding of the Timor-Leste system and the manner in which the maps were going to be presented, the files were updated. Older files are kept so that they can be used a s a reference in the future. Please refer to hydgeo_2 for the steps involved in updating the hydrogeology maps as they are similar for hydgeo_3.

hydgeo_3_Dis
Polygon shapefile. Based on hydgeo_3 (version 3 of the hydrogeology map). This map shows the aquifer types but with the interior boundaries dissolved, making only one polygon for each of the aquifer types. The process to make this file was the same used for hydgeo_2_Dis. Please refer back to this file for the method used.

hydgeo_3_ras
Raster file. Based on hydgeo_3_Dis (version 3 of hydrogeology map). This map is the hydgeo_3_Dis shapefile but in a raster format. It was put in this format so that it could be displayed in ArcScene, draped over the topography.
For methods on how this was made please refer back to the hydgeo_2_ras details.

hydgeo_4 (shapefile and layer file)
Polygon shapefile and layer file based on this with aquifer colours. This shapefile is the progressed version 4 of the hydrogeology map. Based on hydgeo_3 but with changes made as understanding and knowledge increased. As well as changes to the attribute table and categorisation of the data there were two other major changes in this file: first there was the inclusion of Atauro, Oecussi and the SE corner - done by merging the new hydgeo with the files using the 'merge' tool as follows:
In ArcMap open/show the toolbox
Data Management Tools > General > Merge
In the window that opens select the shapefiles you wish to merge
Give a name for the output dataset
Set other options as required (rest were default for this shapefile)
Select 'OK'
The other major change was dividing sedimentary aquifers that were connected that should not have been. For example, some of the polygons that showed a high yielding, large sedimentary aquifer also had bits of the polygon that went higher up into the river valleys, meaning that some parts of the same polygon should be classed as high yielding sedimentary and others as low yielding sedimentary. To correct this based on a visual (over computer using ArcMap and

ArcScene) assessment of the parts of each polygon, taking into account width, predicted depth, steepness of slope, etc, the polygons were edited to divide them into the separate aquifer types, where necessary. For this editing the following steps were used:
Editor Toolbar - drop down menu
Select 'Start Editing'
Select 'Snapping'
In box that opens up, for the shapefile that you are working on, tick 'vertex' and 'edge' and 'end' - this means that if the mouse is near a vertex, edge or end of the shapefile you have selected it will automatically go to that point, this helps to ensure that the shapefile is correctly made and the polygons match exactly, it reduces human error significantly and reduces time spent editing.
In the 'Target:' window make sure the file you wish to edit is selected
Then use the select tool (arrow/mouse shape next to the Editor drop down menu)
Select the particular polygon you wish to edit - the edges will turn bright blue
In the 'Task:' window, under 'Modify Tasks', select 'Cut Polygon Features' - this will divide the polygon into two along the desired line exactly - with no gaps between the polygon - it is the quickest, most effective way to do this and produces the best results
Then select the pencil tool (next to the select tool)
When the mouse is on the map now it will look like a cross-hairs with a circle
Starting at one edge of the polygon (the tool should snap to it), draw a line across where you want the polygon to be split (Note: you do not have to trace the outside edge of the polygon, just draw a line where you want the split)
When you have got to the end of the line you want the split to go along, double click on the opposite edge of the polygon - this will place the final vertex and finish the drawing.
The polygon will then split into two
As both polygons are selected you can go in to the attribute table of the shapefile and make changes to it as necessary (e.g. change the 'high potential yield' attribute for the desired polygon to 'low potential yield'.
When finished use the Editor toolbar to select 'Save Edits' and then 'Stop Editing'
It is recommended that when making many edits to save the edits regularly in case of problems/system crash
The above steps are how the polygons in the hydrogeology map were edited.

hydgeo_4_dis
Polygon shapefile. Based on hydgeo_4 (4th version of the hydrogeology map) this essentially the same polygon dataset but with all of the internal boundaries of the aquifer types dissolved. See hydgeo_2_dis for further details and methods

hydgeo_4_lith.lyr
Layer file. Based on hydgeo_4 lithologies. This layer file holds the patterns for the lithologies of hydgeo_4 in the international standard format (changed a little from version 3). For details and methods on how this was made see hydgeo_2_lith.lyr

hydgeo_4_ras2
Raster file. Based on hydgeo_4_dis it is these polygon but in a raster format so that they can be displayed in ArcScene draped over topography. For details and methods see hydgeo_2_ras

hydgeo_clip1
Polygon shapefile. Based on the hydgeo 4 but also includes the SE corner of mainland Timor-Leste, which was not in hydgeo_3 due to lack of data. Made so that the hydrogeology of the SE corner could be added (merged with) the hydgeo_4 map. Made using the admin dataset of the mainland

hydgeo_SEcorner
Polygon shapefile. Based on the geology of the SE corner, which was taken from the same map as the Oecussi geology map, shows the hydrogeology of the SE corner that was later merged with the

hydgeo_4 shapefile so that the whole of the country was covered in the hydrogeology map. This geology file was not based on the ETgeol but another geology shapefile - see the geology_SEcorner shapefile for more details.

Intergran
Polygon shapefile. Shows the Intergranular aquifers (previously called sedimentary or alluvial) for mainland Timor-Leste only (not including SE corner).
Based on the hydgeol_4 map (most up to date as 12/01/11) uses the SQL and editing tools to delete the other polygons from the original shapefile. Details and methods/instructions are the same as were used in the Fissured shapefile

Intergran_Oec_Ata3
Polygon shapefile. Shows the intergranular aquifers (previously called sedimentary or alluvial) of Oecussi and Atauro only. Made by the same process as Fissured.
Based on the hydgeo for Oecussi and Atauro, which was based on the geology for each island (see geology folder).

Intergran_whole2
Polygon shapefile. Shows the intergranular aquifers (previously called sedimentary or alluvial) for whole of Timor-Leste, including Atauro and Oecussi and SE corner.
Based on the Intergran and Intergran_Oec_Ata3 shapefiles (see above for shapefiles and how they were made). Made by merging the two shapefiles it was based on using following steps:
In ArcMap open/show the toolbox
Data Management Tools > General > Merge
In the window that opens select the two shapefiles you wish to merge
Give a name for the output dataset
Set other options as required (rest were default for this shapefile)
Select 'OK'

Local_aquifer
Polygon shapefile. Shows the localised aquifers (previously called fractured rock) for mainland Timor-Leste only (not including SE corner).
Based on the hydgeol_4 map (most up to date as 12/01/11) uses the SQL and editing tools to delete the other polygons from the original shapefile. Details and methods/instructions are the same as were used in the Fissured shapefile

Local_aquifer_Oec_Ata3
Polygon shapefile. Shows the localised aquifers (previously called fractured rock) of Oecussi and Atauro only. Made by the same process as Fissured.
Based on the hydgeo for Oecussi and Atauro, which was based on the geology for each island (see geology folder).

Local_aquifer_whole2
Polygon shapefile. Shows the localised aquifers (previously called fractured rock) for whole of Timor-Leste, including Atauro and Oecussi and SE corner. Based on the Local_aquifer and Local_aquifer_Oec_Ata3
shapefiles (see above for shapefiles and how they were made). Made by merging the two shapefiles it was based on using following steps:
In ArcMap open/show the toolbox
Data Management Tools > General > Merge
In the window that opens select the two shapefiles you wish to merge
Give a name for the output dataset
Set other options as required (rest were default for this shapefile)
Select 'OK'

Local_confin
Polygon shapefile. Shows the localised confining layers/rock (previously called fractured rock) for mainland Timor-Leste only (not including SE corner).
Based on the hydgeol_4 map (most up to date as 12/01/11) uses the SQL and editing tools to delete the other polygons from the original shapefile. Details and methods/instructions are the same as were used in the Fissured shapefile

Local_confin_Oec_Ata3
Polygon shapefile. Shows the localised confining layers(previously called fractured rock) of Oecussi and Atauro only.
Made by the same process as Fissured.
Based on the hydgeo for Oecussi and Atauro, which was based on the geology for each island (see geology folder).

Local_confin_whole2
Polygon shapefile. Shows the localised confining layers (previously called fractured rock) for whole of Timor-Leste, including Atauro and Oecussi and SE corner. Based on the Local_confin, Local_confin_Oec_Ata3 and hydgeo_SEcorner shapefiles (see above for shapefiles and how they were made). The hydgeo_SEcorner only had this type of aquifer/confining layer so this was the only time it was used in the merge.
Made by merging the two shapefiles it was based on using following steps:
In ArcMap open/show the toolbox
Data Management Tools > General > Merge
In the window that opens select the two shapefiles you wish to merge
Give a name for the output dataset
Set other options as required (rest were default for this shapefile)
Select 'OK'

README for ‘hydrology’

This folder contains all of the hydrology files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

braiding riverbeds
ALGIS - Vector - hydrology (DNGRA also has copy), polygons (maybe need to see if a line version is required) of braided river beds (almost all major rivers in TL are braided rivers) - no rivers named

rivers
ALGIS - Vector - hydrology (DNGRA also has copy), lines of rivers, almost all feed into the braided river beds - no rivers named

seamask
ALGIS - Vector - hydrology, one polygon outlining sea areas for whole of country/region

waterbodies
ALGIS - Vector - hydrology (DNGRA also has copy), polygons of the waterbodies (there are few water bodies in TL) no waterbodies named

watersheds
ALGIS - Vector - hydrology, polygons of the watersheds in TL - covers whole of country, attributes include catchment name, size in hectares and class (eg small catchment, aggregate catchment)

README for 'interperative_geology'

This folder contains all of the interpretive geology/geology files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

GeoFormation:
ALGIS - Raster - Shapefiles, basic geology map, reasonable detail, several copies

GeoStabilityZone:
ALGIS - Raster - Shapefiles, same polygons as basic geology map but description based on 'stability' of polygon - probably made to feed into the landslide map

geology
ALGIS - Vector - Earth Sciences (Property and Justice also gave a copy) basic polygon geology map - descriptions on formation name, age, facies, lithology, thickness, fossils remarks and map symbols. Believed to based on the ESCAP maps as the polygons roughly match up and those geological units without information (e.g. have a map symbol but that map symbol is not in the key of the ESCAP map) are the same for both maps

soils
ALGIS - Vector - Earth Sciences, basic polygon soil map - divides soils into 'greatsoil' eg Calciustolls, 'suborder' eg Ustolls and 'orders' eg Mollisols

ETGeolv10LL
DNGRA - timor aerial-topo, best geology (polygon) map available, would seem to be a combination of four other geology maps; Audley-Charles, Berry, Tobing and MTA (not sure where MTA comes from yet - paper's from others all in references folder). It has much finer detail than other geology map, and what would seem to be much more accurate classifications and polygons. Attributes include Geol unit, age, group, formation, lithology and geol codes - which is similar to others but this has many more, and more descriptive classes, including dividing the recent alluvial into alluvium, beach sands, flood plain, lacustrine and river terrace. Believed to be a combination of mainly Audley-Charles work for the majority of the area, Berry's work for the northern metamorphosed areas and Tobings updates to Audley-Charles work. Possibly compiled by Tobing or another of his colleagues during Indonesian times.

ETGeol_clip
This is the ET geology map except it has been 'clipped' to delete West Timor from the map (which was classified as 'NA') so that this hydrogeology map only shows the East Timor mainland. This was achieved using a shapefile that was the administrational boundary of East Timor and the Clip Tool as below:
In the Arc Toolbox select Analysis Tools > Extract > Clip.
When the window opens use the drop down arrow or folder to select the hydgeo_1 map in the 'Input Features' box,
then the same process to select the admin boundary in the 'Clip Features' box and
then rename the file in the 'Output Feature Class' box to desired name (note: do not use the same name as any of the input files and try to keep at 10 letters or less).
Click 'OK'.

ETGeo_stcol
This is the ET geology map except that it has been put into international/Australian colours (or as close as it was possible to get to them. To do this, Dr. Wallace analysed the data and assigned map symbols, further geology descriptions.
These were then added to the attribute table using the 'Add Field' tool and then in an edit session using SQL queries to select relevant files and then the field calculator to insert the new attributes. The map symbols were then used as the display category and each map symbol was given a colour based on the Australian and international standards as advised by Alan Whittaker. To find the exact colours used please refer to the excel spreadsheet in this file. They are in RGB base.

ET_Geol_ras
Raster Map. Based on the EtGeo_stcol map this is a raster of the Map Symbols column. It was created to input the geology map into an 3D format in ArcScene. It was created using the convert features to raster in the spatial analyst toolbar (in the toolbar).
To get this toolbar go to View > Toolbars > (tick) Spatial Analyst.
When the toolbar appears click on the drop down menu > Convert > Features to raster.
In the box that pops up select the input shapefiles/features and the Field (attribute column) that you want the raster to be based on (note: none of the other fields will be in the output), leave the Output cell size as default and change Output raster to the required name.
This raster can then be added to an Arcscene map and use a DEM (such as SRTM) as the input base heights.

A0
Nat_Res, THIS MAP IS NOT DIGITISED, this is the map from Natural Resources where only hard copies exist.DSmeone from Perth (one person from a Uni and another from a company) took pictures of it and were going to try and digitise it (visited Natural Resources in Feb/March) but haven't heard back from them. Need to chase up to see if they were successful

ETGeo_stcol##.lyr
(1a,2,2a,2b,3)
Layer files based on ETGeo_stcol. These are layer files which house the different versions and colourings for the geology map of Timor-Leste. These maps are layer files, which means they do not hold any polygon data or information in the shapefile, they only hold the display properties (e.g. how it was displayed and what colours were used) of the ETGeo_stcol map. They refer back to the original file in order to display. If the original base file is removed the layer files will need to be redirected to refer back to it. The numbers in the title refer to the different versions of the map as colours, map symbols and understanding of the geology increased. The higher the number the more up to date the version is. The colours used in the layer file are also stored in RGB and shadeset numbers in the excel spreadsheet in this file. They are based on both the Australian and international

standards and were developed in consultation with Alan Whittaker, who was part of the team that made the Australian geology map.
To make a layer file display the base file in ArcMap > adjust the display setting and colours to where desired > right click on the title of the shapefile in the left hand box listing the files > click on 'Save as Layer
File' > give a name to the new file (or leave as default) > click 'Save'. This will create the new layer file. You can also, in the Properties, display window, use layer files to apply this symbology/display settings to other shapefiles with some of the same attributes (e.g. if you had a shapefile of West Timor geology and the rock types/map symbols used corresponded with those in Timor-Leste you could use these ETGeo_stcol layer files to display all of the rock types in the same colours so that the two different maps would match in display properties.

ETGeol_attributes_standard_colour.xlsx
Excel spreadsheet. This spreadsheet houses the attribute table from the original ETGeolv10LL file plus the coloured columns which are the interpretations, colours, changes made and the same for the extra units of the Atauro and Oecussi maps. The interpretations were made by Dr. Luke Wallace as part of this project and included assigning map symbols. The colours are in line with Australian and international standards, they are stored here as RGB and GA Shadeset values.
If the layer files are lost or corrupted this file can be used to source the correct colours for the map. The cells with a yellow background refer to geology and those with a blue background refer to hydrogeology interpretations. The cells with no background are from the original attribute table. Of the geology interpretation cells (yellow) the ones titled R, G, B and HP refer to the colours used in the layer files. Those called Solo R, Solo G, Solo B and Solo HP refer to a map where only some of the geology was displayed (to be specific the intergranular aquifer geology map), as the original colours given to these geology types was very light they needed to be darkened slightly, just for this one map, so that they would be visible on a white background map (GA standard for maps is a white background). This spreadsheet is the most up to date version as of January 2011.

geo_who2_ras (,2,3)
Raster files. These maps are based on the map symbols of the ETGeo_stcol most up to date shapefile. The numbers represent the detail in the map/cell size. The higher the number the more detailed the map and the smaller the cell size is. This was to find the best balance between computing time and display quality. Rasters of these shapefiles were made so that they could be displayed in ArcScene in a 3d Format and draped over the topography.
The process for making these maps is as follows:
It was created using the convert features to raster in the spatial analyst toolbar (in the toolbar).
To get this toolbar go to View > Toolbars > (tick) Spatial Analyst.
When the toolbar appears click on the drop down menu > Convert > Features to raster.
In the box that pops up select the input shapefiles/features and the Field (attribute column) that you want the raster to be based on (note: none of the other fields will be in the output).
In these versions the first file was with the output size left as the default and this cell size was then decreased with successive rasters. note: the colours of the shapefile do not get carried across to a raster and applying the layer file does not work so the colours need to be reassigned.

geology_Atauro
Polygon shapefile. This geology map is based on the geology map in the Atauro folder (see below for details). It is essentially a copy of this map but it has extra attributes added for the new map symbols (to match in with the ETGeo_stcol mainland map and, for new geological units, to match in with Australian and International standards) and for more information on how the geology was interpreted plus the hydrogeology information assigned to the various geological units. This map then provided the base for the input in the geology_whole2 map and the hydgeo_atauro (see hydrogeology file). The assigned attributes were based on the interpretations listed in the EtGeol_attributes_standard_colour.xlsx.

To insert this information into the attribute table a similar method was used as for the ETGeo_stcol map:
To do this Dr. Wallace analysed the data and assigned map symbols and further geology descriptions.
These were then added to the attribute table using the 'Add Field' tool and then in an edit session using SQL queries to select relevant files and then the field calculator to insert the new attributes.
The map symbols were then used as the display category and each map symbol was given a colour based on the Australian and international standards as advised by Alan Whittaker.
This geology map is for Atauro only but was used to merge with the other geology maps to make the whole of country geology map

geology_Oecussi
Polygon shapefile. Based on the geology shapefile (not sure of source of geolgoy shapefile). This shapefile was used as the ETGeolv10LL did not cover this area. This file was clipped from the geology shapefile using the Oecussi border polygon in the admin&infra folder (In the toolbox - Analysis tool > Extract > Clip). And then, similar to the ETGeo_stcol, the geological map units were assigned a new map symbol, differently formatted geology information and hydrogeological information. Note: some the geological units in this map did not have any information apart from age - these are the sections that are marked as 'Unknown's in the map - this is because it is believed that this map is based on the ESCAP map - which has some areas where the geological units are not defined. This is the most up-to-date version of geology for Oecussi that was possible to use. This shapefile was also used for the hydrogeology

geology_SEcorner
Polygon shapefile. The ETGeolv10LL (based on work done by Audley Charles and others) does not cover the SE corner of Timor-Leste (a roughly triangular shape 13km by 15km) Therefore this area also used the geology shapefile as a source of geology. To make it was a similar process to the geology _Oecussi and the same issues apply:
Based on the geology shapefile (not sure of source of geology shapefile). This shapefile was used as the ETGeolv10LL did not cover this area. This file was clipped from the geology shapefile using the Oecussi border polygon in the admin&infra folder (In the toolbox - Analysis tool > Extract > Clip). And then, similar to the ETGeo_stcol, the geological map units were assigned a new map symbol, differently formatted geology information and hydrogeological information. Note: some the geological units in this map did not have any information apart from age - these are the sections that are marked as 'Unknown's in the map - this is because it is believed that this map is based on the ESCAP map - which has some areas where the geological units are not defined. This is the most up-to-date version of geology for SE corner that was possible to use. This shapefile was also used for the hydrogeology.

geology_SEcornerMapSymbol
Polygon shapefile. Based on geology_SEcorner this is essnetially the same map except that the attribute table only contains the original and the new map symbols. This was created so that it could be easily merged with the other geology maps to make the whole of country map.

geology_whole2
Polygon shapefile. Based on ETGeo_stcol, geology_Atauro, goelogy_Oecussi and geology_SEcorner, this is a merged copy of all of those files. The only attributes it contains are the assigned map symbols and in the case of the Atauro, Oecussi and SEcorner there are the map symbols from the original files. These were included so that they are noted and where there are unknowns they can be easily differentiated from each other. In order to merge shapefiles the following steps were taken:
In the toolbox - Data Management Tools > General > Merge
then select all of the data sets you want to include
give the output dataset a name (or leave as the default)

In the 'Field Map' box all of the attribute column titles will appear - select only those attributes you want merged
(note - if there are columns of attributes in different shapefiles that need to be in the same column in the new shapefile then they will need to have the same name - either that or use the 'Field Calculator' to merge the two columns into a new third one once the new shapefile is made - but designating the same name from the beginning is easier to process and less complex and confusing later.
Then select 'OK'
In this case the output was a geology map that covers the whole of Timor-Leste, including Atauro, Oecussi, SEcorner.
This map also uses a consistent map symbol labelling (designated by the project). It is therefore used in the output of a new geology map for Timor-Leste. Maps previous to this are difficult to obtain, do not cover the whole area and in the case of GIS do not have metadata so no background information can be ascertained.

geology_whole2_fissured
Polygon shapefile. Based on the geology_whole2 shapefile, this map only has the geology for the areas that have been designated as being fissured aquifers (previously called karst). This shapefile was made for a map in the hydrogeology report to demonstrate the geological characteristics of the karst aquifers. This map was made by taking the geology_whole2 and then clipping it using the fissuerd_whole2 (see hydrogeology folder) as a the clip polygon.
Then all that was left were only those areas that were designated as fissured aquifers. To use the clip tool:
In the toolbox - Analysis Tools > Extract > Clip
In the window that opens select the file you want clipped (geology_whole2), then the clip features (fissured_whole2) then give an output name or leave default. For this project rest was left in default but can be adjusted as necessary.

geology_whole2_intergran
Polygon shapefile. Based on the geology_whole2 shapefile, this map only has the geology for the areas that have been designated as being intergranular aquifers (previously called sedimentary). This shapefile was made for a map in the hydrogeology report - to demonstrate the geological characteristics of the karst aquifers.
This map was made by taking the geology_whole2 and then clipping it using the Intergran_whole2 (see hydrogeology folder) as the clip polygon.
Then all that was left were only those areas that were designated as intergranular aquifers. To use the clip tool:
In the toolbox - Analysis Tools > Extract > Clip
In the window that opens select the file you want clipped (geology_whole2), then the clip features (intergran_whole2) then give an output name or leave default. For this project rest was left in default but can be adjusted as necessary.

geology_whole2_LocAquif
Polygon shapefile. Based on the geology_whole2 shapefile, this map only has the geology for the areas that have been designated as being localised aquifers (previously called fractured rock, high yield). This shapefile was made for a map in the hydrogeology report to demonstrate the geological characteristics of the karst aquifers.
This map was made by taking the geology_whole2 and then clipping it using the Local_aquifer_whole2 (see hydrogeology folder) as the clip polygon.
Then all that was left were only those areas that were designated as localised aquifers. To use the clip tool:
In the toolbox - Analysis Tools > Extract > Clip
In the window that opens select the file you want clipped (geology_whole2), then the clip features (local_aquifer_whole2) then give an output name or leave default. For this project, therest was left in default but can be adjusted as necessary.

geology_whole2_LocConfin
Polygon shapefile. Based on the geology_whole2 shapefile, this map only has the geology for the areas that have been designated as being localised aquifers (previously called fractured rock, low yield). This shapefile was made for a map in the hydrogeology report to demonstrate the geological characteristics of the karst aquifers.
This map was made by taking the geology_whole2 and then clipping it using the Local_confin_whole2 (see hydrogeology folder) as the clip polygon.
Then all that was left were only those areas that were designated as localised aquifers. To use the clip tool:
In the toolbox - Analysis Tools > Extract > Clip
In the window that opens, select the file you want clipped (geology_whole2), then the clip features (local_confin_whole2) then give an output name or leave default. For this project, the rest was left in default but can be adjusted as necessary.

ATAURO FOLDER:

This folder contains all of the data given to the GA project team by Kim Ely who did research on the geology of the island under Mike Saniford of University of Melbourne. It was sent to GA on the 7th Dec 2010. The most recent version of that map was at that time being prepared for publication in the journal of Earth sciences and it was based on work carried out from 2005 onwards (we believe). These files are for the map produced for this work and as there was no metadata attached to them are listed to the best of our current knowledge.

data1 Folder
This folder contains two other folders which contain three ArcMap files and one .pdf file, all of which are maps of Atauro geology. The ArcMap files source the shapefiles in the Atauro folder - if these maps are to be used they must be kept with the source data. Although when the data is transferred from computer to computer, ArcMap will have to be directed to the location on the new computer.

Alt_strong
Polygon shapefile and layer file. Sourced from Kim Ely, December 2010. Shows areas on Atauro of strong alteration. Alteration is a geological process that happens when the rock is underground, usually along fractures in a weathering-like way. For more information ask geologist. Polygon shapefile stores the areas and layer file stores the display properties chosen by Kim Ely for the map she was making. The files need to be kept together for the layer file to work.

Alt_weak
Polygon shapefile and layer file. Sourced from Kim Ely, December 2010. Shows areas on Atauro of weak alteration. Alteration is a geological process that happens when the rock is underground, usually along fractures in a weathering-like way. For more information ask geologist. Polygon shapefile stores the areas and layer file stores the display properties chosen by Kim Ely for the map she was making. The files need to be kept together for the layer file to work.

Atauro_samples
database (.dbf) and layer file. Presumably holds information on where samples were taken from when field work was being conducted on Atauro. Assuming Kim or one of her teams holds more info on the samples. Not necessary to find out more information on them for this project. If need more information in future contact Kim Ely or Mike Saniford. Database in windows explorer operates similar to, and can be viewed by, excel. In ArcGIS it is used as a reference table, similar to an attribute table but does not have shapefiles with it. Used to store large quantities of info and reference and/or cross reference different shapefiles. Layer file like others described here.

Atauro_towns
Point shapefile and layer file. Sourced from Kim Ely, December 2010. Depicts the points of the towns on Atauro.
Attribute table has names of towns. Point shapefiles houses locations and layer files houses the display properties selected by Kim Ely for map she was producing.

be_manas
Point shapefile and layer file. Sourced from Kim Ely, December 2010. Shows four points, no information in attribute table. After cross-referencing with the text on the map produced shows points where hot springs occur on Atauro. Unsure if be_manas is Tetun or Tetun derived word for hot springs. Point shapefiles houses locations and layer files houses the display properties selected by Kim Ely for map she was producing.

Bedding
Line shapefile. Sourced from Kim Ely, December 2010. Line shapes on Atauro that indicate the direction of bedding of rocks in some areas of Atauro. Used in map that was produced. Attribute table states whether the bedding is a strike, dip or flow direction. Line shapefile houses location and layer file houses the display properties selected by Kim Ely for the map she was producing.

Faults
Line shapefile and layer file. Sourced from Kim Ely, December 2010. Shows lines where faulting occurs on Atauro. This is needed on geology maps. Digitised during 2005 field trip. In attribute table there are two columns, one title 'sense' under this the polylines are either 'normal' or blank, the other column is titled 'confidence' in this the majority is blank but one polyline has 'inferred' written in. Line shapefile houses location and layer file houses the display properties selected by Kim Ely for the map she was producing.

Lithology
Layer file. Sourced from Kim Ely, December 2010. Based on the Pleistocene sediments-merge shapefile - see below. Houses the display properties for this shapefile. Used in the map produced by Kim Ely

Pleistocene sediments-merge
Polygon shapefile. Sourced from Kim Ely, December 2010. Polygons depicting the geology of Atauro as used for the map Kim Ely was producing. Has the geology for the entire island and attribute table only has one column - the map symbols that were used for this map. For more information on what the map symbols mean refer back to the final maps that were produced in the data1 folder (particularly the .pdf file). In the legend for this there is more information on each of the map symbols and what rock type they are referring back to.

topo_features
Point shapefile and layer file sourced from Kim Ely, December 2010. Shows three points depicting the mountains/ highest points of Atauro. Attribute table holds the names for the mountains. Point shapefile houses locations and layer file houses display properties as used in the map produced.

README for ‘land_info’

This folder contains all of the land information files for the GA TL project running from June 2010 to Dec 2011

The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

erodible2
From ALGIS - Nicholas'08 folder, country divided into two types polygon; high erodibility and no data - could be used to identify areas of high run-off

high_fertility
From ALGIS - Nicholas'08 folder, has a number of polygons showing areas of high fertility

land_plan_District
From ALGIS - Nicholas'08 folder, divides country into a range of polygons identifying both current uses and potential/planned future uses

wat6_3
From ALGIS - Nicholas'08 folder - need to check meaning with Luke

Landcover
ALGIS - Raster - Shapefiles, country divided into polygons based on land use, shows what land is being used for (eg. forest, agriculture, etc) and agriculture subdivided into types and then there are obs and comments on some of the land types

soils
ALGIS - Vector - Earth Sciences, basic polygon soil map - divides soils into 'greatsoil' eg Calciustolls, 'suborder' eg Ustolls and 'orders' eg Mollisols

slopes
ALGIS - Vector - Elevation, polygon map of whole country divides areas into a slope of S, F or M (assuming steep, flat or medium) polygons are large and coarse

rice fields
ALGIS - Vector - Land Cover (DNGRA also has copy), polygon map showing various areas where rice is grown in TL, divides between rainfed and irrigated rice - may be useful for calculating consumption/knowing irrigation areas

landcoverCopy
ALGIS - Vector - Land cover, exactly the same as other landcover map; country divided into polygons based on land use, shows what land is being used for (eg. forest, agriculture, etc) and agriculture subdivided into types and then there are obs and comments on some of the land types

lum_w
ALGIS - Nicholas '08, Polygon map - divides mainland TL into polygons which divide into areas of Agriculture, Agroforestry/grazing, Forest/Agroforestry and no data (for areas outside mainland TL)

README for ‘natural_habitat’

This folder contains all of the natural habitat files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

BVA
ALGIS - Raster - Shapefiles, seems to be either protected areas or potential protected areas/high biodiversity

ESM
ALGIS - Raster - Shapefiles, division of country into very high, high, med & low sensitivity (no other info)

ImportantBirdArea
ALGIS - Raster - Shapefiles, polygons of areas which are of high importance to birdlife

Landcover
ALGIS - Raster - Shapefiles, country divided into polygons based on land use, good detail on landuse, particularly agricultural sub-divisions

Timor_Coastal_Marine_Habitats_Nth
ALGIS - Timor_Coastal_Marine_Habitats_Nth, North coastline (and just off coastline) divided into marine habitats e.g. sand beach, mangrove forest, etc.

README for ‘non_dig_maps’

This folder contains all of the non digitised map files (rasters or jpegs of maps that only hard copies exist of also not geo-referenced) for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

ALGIS folder -
The maps in this folder are all from ALGIS. There were no other metadata attached to these maps. Names are generally self explanatory
(Copy on end is brought across from a sub-folder - need to check whether exact copy or not):

afp sample survey 2007 - basic agricultural map

agroclimatic_zones edit2 - divided based on lowland, slope, highland and low, mod high rainfall

annual_rainfall - basic contour rainfall map - same as shapefile from ALGIS (see climate folder)

bathymetric - only some of coastline bathymetric contours

Copy of steve_dunn - called 'The Proposed Refrigerator (cold chain) Locations by Sub District' basic map with major towns, roads and districts with a few points identified

forest_status - shows areas of settlement and where forest is nature reserve, protection forest, convertible production forest, wildlife reserve or recreation park

soil_taxonomy - shows soil categories/groups for whole of country - have similar digitised version

tl_admin_subdist_a0 - shows sub-districts, major towns and roads

A0
Nat_Res, THIS MAP IS NOT DIGITISED, this is the map from Natural Resources where only hard copies exist.DSmeone from Perth (one person from a Uni and another from a company) took pictures of it and were going to try and digitise it (visited Natural Resources in Feb/March) but haven't heard back from them. Need to chase up to see if they were successful

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README for 'recharge'

This folder contains all of the recharge files for the GA TL project running from June 2010 to Dec 2011
The files in this folder are either sourced from the TL government, various stakeholders or are outputs of the project. If outputs are present in this folder the methodology for creating them is also here.

The names and sources/methodology for creation are as follows:

Water_balance_method Folder:

This folder was created because using the water balance equation was one of the methods used in attempting to find recharge. This equation is as follows:
D = P - RO - ET - deltaW
where:
D = Deep drainage/recharge
P = Precipitation
RO = Run Off
ET = Evapotranspiration
delatW = change in water soil storage
For this equation we used the annual rainfall map from ALGIS, the ADB water report for Run Off and to get ET we used the Blanley-Criddle method using the ALGIS meteorological data to source the average temperature info.
The following method was used:
We based the test runs on the surface water catchments used in the Run Off report as there was no other way to apply the run off numbers. Made a copy of the surface water catchments shapefile from ALGIS and then deleting all other polygons except for the catchment we were working on to get boundary. Used this and the clip tool (Analysis Tools > Extract > Clip) to clip the rainfall shapefile to the catchment size. First the clipped file needed to be reprojected into a mercator format. Then in the new clipped file,in the attribute table added a new field called area (Options > add field).

Then in an edit session right click on the area field and click calculate geometry. In property select area and then select area and then in the units option select Square meters.
In an excel table (see the ones in the Laclo and Loes test runs) use the areas and the median for that rainfall range (in meters) times together to calculate annual rainfall in m3 (m2 for area and m deep for rainfall). Then the ADB run off report was used to find the annual run off for that catchment (in MCM - million cubic meters).
This then gave the P-RO by minus the RO number from the P number calculated. To find ET the Blanley-Criddle method was used. The equation is as follows:
ET = k * p * (0.46 * Ta + 8.13)
where:
k = plant consumptive coefficient - a number between 0.5 (orange trees) to 1.2 (dense natural vegetation) and represents the plant use of water, we used a k of 0.85 and then 0.65
p = percentage of daylight hours - in this case it was assumed there were 12 hour days as it is close to the equator so therefore the equation was p=(12*30)*100/(12*365) - although the 30 may change depending on how many days there were in that month
0.46 and 8.13 are constants
Ta = average temperature - sourced from the ALGIS meteorological data
This equation was first calculated in months averaged across the years we had data for and then these results were added together to give the annual ET in mm. This was then divided by 1000 to give the number in m and then multiplied by the area to give the annual ET in m3 which could then be put into the equation.
deltaW was not used in this instance as we were attempting to find out the annual average and it was not an event analysis.
Each of these numbers to put into the water balance equation were calculated in an excel spreadsheet and then the number was added under a field in the attribute table of the Run Off/boundary shapefiles. Then the a field titled recharge was added to the attribute table and (in an edit session) right click on the title of this field and then use the field calculator to produce the recharge figure.
The numbers produced from this procedure mostly gave a negative number namely due to the large ET because the calculation for ET produces potential ET which is not the same as actual ET which we do not have the means/data to calculate

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README for ‘working’

This folder contains all of the working files for the GA TL project running from June 2010 to Dec 2011 The files in this folder are the currently being worked on. For more information please see source files or ask Sam or Luke

Attachment 3: Example of a metadata record from the Timor-Leste project

This is an example of a metadata record that is attached to an ArcGIS file. This example is from one file, in this case the first draft of the hydrogeology map (made by the project). Metadata records have been completed for both the collected files and the files produced by the project, in total over 100 files.

(note: some of the unknowns are due to the original data not having metadata, ideally when the data is first created this information would be filled out and could then be used for datasets produced from this)

hydgeo_1

Location: file://\\Nas2\gemd\water\Projects\East_Timor_groundwater\Data\GIS_working\hydrogeology\hydgeo_1.shp

Coordinate system: GCS_WGS_1984

Theme keywords: GEOSCIENCES-Geology, BOUNDARIES-Biophysical, GEOSCIENCES-Hydrogeology, WATER-Groundwater, WATER-Supply

ISO and ESRI Metadata:

- Resource Information
- Spatial Representation Information
- Reference System Information
- Data Quality Information
- Distribution Information
- Metadata Information

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata.* Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Resource Information:

Title: hydgeo_1
Alternate title(s): hydgeo_1.shp

Abstract:
Polygon map - This is the first attempt at a hydrogeology map for East Timor. It uses the ETGeol10LL as a basis. From this Dr. Luke Wallace assigned each of the types of geologic units in the attribute table an aquifer type (karst, sedimentary or fractured rock), a potential yield (high or low) and then gave a general rock type description. These three attributes were then input into the hydgeo_1 attribute table using the steps in ArcMap as set out in the readme.txt in this folder.

This map was made by Samantha Dawson in October 2010 as part of the East Timor groundwater project at GA. Please see groundwater group for any queries or questions

Creation Date: 2010-10
Revision Date: 2010-10
***Presentation format:** digital map

Custodian Organisation: External Agency/Company
Contact's position: various

Contact information:
Phone:
Voice: see Metadata Contact
Fax: see Metadata Contact

Address:
Delivery point: see Metadata Contact
City: see Metadata Contact
Administrative area: see Metadata Contact
Postal code: see Metadata Contact
Country: see Metadata Contact
e-mail address: see Metadata Contact

Online resource:
Online Location: see Metadata Contact

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Themes or categories of the resource: inland waters

Theme keywords:
Keywords: GEOSCIENCES-Geology, BOUNDARIES-Biophysical, GEOSCIENCES-Hydrogeology, WATER-Groundwater, WATER-Supply

Thesaurus name:
Title: ANZLIC Search Words

Revision Date: 2008-05-15
Edition: Version 2.1
Edition date: 2008-05-15

***Dataset language:** English

Update Status: onGoing

Resource constraints:
Access constraints:
This dataset essentially belongs to the Timor Leste government, it was made by the GA Groundwater Group as part of a groundwater mapping project in 2010/11. It was made using data sourced from the Timor Leste government and will be given back to them along with the other project outputs. Although there were no restrictions given by the Timor Leste government on the use of their data or the datasets produced from this project the Timor

Leste government and Geoscience Australia should be recognised appropriately when using this map. For permission to use this map please contact Geoscience Australia.

Limitations of use:
This map is based on another map/s and/or data that was sourced from the Timor Leste government. For all of the original data there was no metadata or other information attached therefore it's fitness for use outside the 2010/11 Timor Leste groundwater mapping project by GA is questionable. We are uncertain as to data quality, resolution, creation date or methods. Therefore the use of this map in other project is not advisable unless no other alternative data can be used and the limitations/error factor of this data should be recognised.

***Spatial representation type:** vector

Spatial resolution:
Dataset's scale:
Scale denominator: unsure

Resource's bounding rectangle:
***Extent type:** Full extent in decimal degrees
***Extent contains the resource:** Yes
***West longitude:** 123.268126
***East longitude:** 127.343306
***North latitude:** -8.322121
***South latitude:** -10.371934

Dataset point of contact:
Organisation: Geoscience Australia - Groundwater Group, GEMD
Contact's position: Divisional Information Manager - GEMD

Contact information:
Phone:
Voice: 1800 800 173
Fax: (02) 6249 9999

Address:
Delivery point: GPO Box 378
City: Canberra
Administrative area: ACT
Postal code: 2601
Country: Australia
e-mail address: sales@ga.gov.au

Online resource:
Online Location: http://www.ga.gov.au/sales

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Spatial Representation - Vector:

***Level of topology for this dataset:** geometry only
Geometric objects:

*Name: hydgeo_1
*Object type: complexes
*Object count: 1922

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Reference System Information:

Reference system identifier:
*Value: GCS_WGS_1984

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Data Quality Information:

Lineage:

Polygon map - This is the first attempt at a hydrogeology map for East Timor. It uses the ETGeol10LL as a basis. From this Dr. Luke Wallace assigned each of the types of geologic units in the attribute table an aquifer type (karst, sedimentary or fractured rock), a potential yield (high or low) and then gave a general rock type description. These three attributes were then input into the hydgeo_1 attribute table using the steps in ArcMap as set out in the readme.txt in this folder.

This map was made by Samantha Dawson in October 2010 as part of the East Timor groundwater project at GA. Please see groundwater group for any queries or questions.

As this is the beginning of the project there will be modifications to this map in the near future. We are unable to say at the moment how often the dataset will be updated post-project.

Source data acknowledgements:

Data quality report - Absolute positional accuracy:

Unable to ascertain

Data quality report - Attribute accuracy:

Unable to ascertain

Data quality report - Conceptual consistency:

Unable to ascertain

Data quality report - Completeness:

Unable to ascertain

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Distribution Information:

Distributor's name: Geoscience Australia
Contact's position: Sales Office

Contact information:
Phone:
Voice: +61 2 6249 9966
Fax: +61 2 6249 9960

Address:
Delivery point: GPO Box 378
City: Canberra
Administrative area: ACT
Postal code: 2601
Country: Australia
e-mail address: sales@ga.gov.au

Online resource:
Online Location: http://www.ga.gov.au/sales/

Distribution format:
Format name: ArcGIS layer file

Transfer options:
***Transfer size:** 20.745

***Online Location:**
file://\\Nas2\gemd\water\Projects\East_Timor_groundwater\Data\GIS_working\hydrogeology\hydgeo_1.shp
Available As: Departmental Data

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Metadata Information

***Metadata language:** English
***Metadata character set:** utf8 - 8 bit UCS Transfer Format

Last update: 2010-10-15

Metadata contact:
Organisation: Geoscience Australia - Groundwater Group, GEMD
Contact's position: Divisional Information Manager - GEMD

Contact information:
Phone:
Voice: 1800 800 173
Fax: (02) 6249 9999

Address:
Delivery point: GPO Box 378
City: Canberra

Administrative area: ACT
Postal code: 2601
Country: Australia
e-mail address: sales@ga.gov.au

Online resource:
Online Location: http://www.ga.gov.au/sales

***Scope of the data described by the metadata:** dataset
***Scope name:** dataset

Name of the metadata standard used: ANZLIC Metadata Profile
Version of the metadata standard: 1.1

Metadata identifier: 6BF06A72-12CE-473D-A431-6C7ADBB3B821

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