

Data information and methods

To create the maps contained in this report, Geographic Information Systems (GIS) were used to view and calculate information about a host of different spatial data layers.

These spatial layers included global landcover and forest information, world country boundaries and coal mining data – all obtained from various sources.

This document outlines the datasets that were used and any limitations associated with the data, plus it also details briefly the methods used.

If you're interested in knowing more about the processes involved or would like further information about the maps or data, please contact *Jess Neumann* at *GIS and Mapping Services*.

Global overview of forest cover, coal production and the level of mining data available

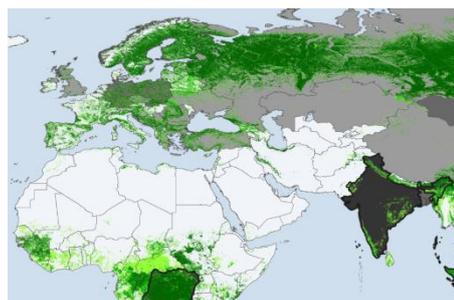
Datasets used:

1. Administrative boundaries - Global Administrative Areas Dataset (GADM) version 2.7 August 2015

What the data show on the map: world country boundaries (coloured to represent the level of coal mining data that is available for that country).

Sourced from: [GADM](#) - This dataset is freely available for academic and other non-commercial use. Redistribution, or commercial use is not allowed without prior permission.

Information: GADM is a spatial database of the location of the world's administrative areas (or administrative boundaries). For the global map, we used data at the administrative level of each country. On the interactive map you can identify individual countries by clicking a feature on the map – this will also provide information on the size (sq km) of the country.



2. Food and Agriculture Organisation of the United Nations (FAO) - Global Land Cover-SHARE of year 2014 - Beta-Release 1.0.

What the data show on the map: Global tree covered areas expressed as % tree cover per 1 km (< 25% cover, 25% - 50% cover, 50% - 75% cover and 75% - 100% cover).

Sourced from: Complete free and open access to the data and metadata products for non-commercial use are available at [FAO GeoNetwork](#)

Information:

“Global Land Cover-SHARE (GLC-SHARE) brings global land cover data under one roof for the first time and represents the most-reliable global view of planetary land cover assembled to-date. At the present date, all the data coming from the “best available databases” have been included. The database is produced with a resolution of 30 arc-second², (approximately 1 sq km)”¹.

“This new product collects previously scattered and unharmonized land cover information from around the globe into one centralized database, marking a major improvement in information regarding the physical characteristics of the Earth's surface”¹.

For the global map, we used the layer called ‘tree-covered areas’.

This layer of data shows any geographic area dominated by natural tree plants with a cover of 10% or more. Other types of plants (shrubs and/or herbs) can be present, even with a density higher than trees. Areas planted with trees for afforestation purposes and forest plantations are included in this class. This class includes areas seasonally or permanently flooded with fresh water. It excludes coastal mangroves.¹

Methods:

The world countries dataset (GADM) and tree covered areas (FAO GLC-SHARE) were added to the GIS.

A new layer of data was created highlighting coal producer countries that:

- Have **good available** coal mining data² (data provided in a polygon format that could be used to calculate areas where mining concessions and forests overlap).
- Have **limited** coal mining data³ (i.e. information about coal mines exists and can be downloaded but is only provided in a point format, not suitable for calculating areas where mines and forests overlap)
- Are known to be coal producers but for which **data is deficient / unavailable**.⁴

Countries with good available coal mining data are identified as the ‘focal producer countries’ on the map.

Individual maps of these countries have been / are to be created in both static (jpeg) and interactive web-based form.

¹. Further information about this data can be found in the pdf report *Global Land Cover SHARE (GLC-SHARE) database Beta-Release Version 1.0 - 2014* by Latham et al. (2014). This can be downloaded directly from the [FAO Global Land Cover Network](#) website.

². This data has been kindly provided by a wide spectrum of NGO's to whom we are very grateful (see Table 1 and Acknowledgements for further details.)

³. Point coal mining data was sourced from the [Global Energy Observatory](#)

⁴. The list of coal producing countries was obtained from [Key World Energy Statistics, 2014](#), International Energy Agency and the [2013 Statistical Review of World Energy](#).

Individual country maps showing coal mines and forests

Static (high resolution jpeg) maps are currently available for India, Australia, Indonesia and the USA.

Interactive web-based maps are up and running for India, Australia, Indonesia, Canada and the Democratic Republic of Congo.

As more data become available and are processed, new maps shall be designed for Colombia and New Zealand.

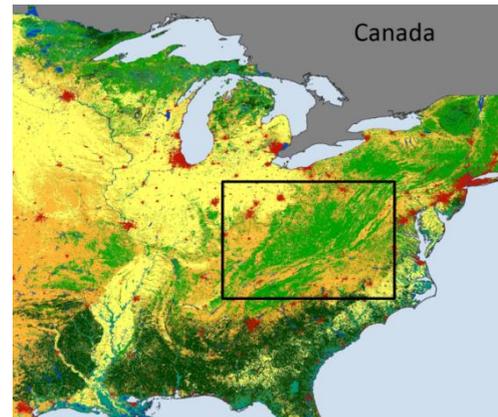
Datasets used for the individual country maps

1. Administrative boundaries - Global Administrative Areas Dataset (GADM) version 2.7 August 2015.

What the data show on the map: The boundaries of each country (and any neighbouring countries)

Sourced from: [GADM](#)

Information: See previous section.



2. European Space Agency (ESA) Climate Change Initiative (CCI) Global Landcover Map

What the data show: Landcover across each country (including forest cover specifically)

Sourced from: [ESA CCI Viewer](#)

Information: These are global land cover data at 300 m spatial resolution; the data used on the maps were 2008 – 2012 epoch (commonly referred to as a 2010 landcover dataset).⁵

Each pixel value corresponds to the label of a land cover class defined using UN-LCCS classifiers. This means that the colours and descriptions are compatible with the Global landcover Maps for 2000 and GlobCover datasets in 2005 and 2009.⁵

We used landcover data from the ESA CCI data to show the landcover across each country (in a subset map) and to derive forest cover for each country. Note that due to data loading times – the full landcover information is not provided on the interactive maps.

The ESA-CCI LC data was deemed to be the best available information for global forest cover - although the FAO GLC-SHARE data is for 2014, the 1 km resolution was deemed to be too great for accurate forest calculations at a scale relevant to mining concessions. It is anticipated that when the University of Maryland release a more up-to-date high resolution global forest dataset (as advised by Global Forest Watch) we will update our maps and calculations accordingly.

⁵. Further information about the ESA CCI Landcover datasets can be found in the supporting product user guide pdf document titled *ESACCI-LC-v2.4*. All documentation and the data can be downloaded from the [ESA/CCI Viewer](#).

3. Mining concession data – obtained from various sources for each country

Table 1: information about the coal mining concession data provided for analyses.

Country	Source of data	Number of layers of coal mining data
India	Greenpeace India	(1) coal fields, (2) coal blocks
Australia ⁶	Energy & Resource Insights ⁶	(1) coal mining leases, (2) coal exploration leases, (3) coal mining lease applications, (4) mineral exploration leases (includes coal)
Indonesia ⁷	JATAM (Mining Advocacy Network) ⁷	(1) coal mining leases, (2) coal exploration leases, (3) other coal leases
USA ⁸	Appalachian Voices ⁸	(1) coal surface mines, (2) coal underground mines
Canada ⁹	Natural Resources Canada / British Colombia Government ⁹	(1) coal leases, (2) coal licences, (3) coal licence applications
Colombia ¹⁰	Centro Internacional de Agricultura Tropical (CIAT) ¹⁰	(1) coal mining leases, (2) coal exploration leases, (3) other coal leases
DRC ¹¹	Centro Internacional de Agricultura Tropical / Global Forest Watch ¹¹	(1) coal mining leases, (2) coal exploration leases, (3) other coal leases
New Zealand ¹²	Coal Action Network / NZPAM ¹²	(1) coal mining leases, (2) coal exploration leases, (3) other coal leases

⁶ **Information about Australia’s coal mining data:** ‘Mineral exploration leases’ are areas that are being explored for minerals and opals (which include coal). On the maps and in the table on the static map they are coloured the same as ‘coal exploration leases’ as essentially they are the same thing.

‘Mining lease applications’ are areas that are imminently close to being given active coal mining status.

Note that no coal mining data was available for Western Australia or the Northern Territory.

⁷ **Information about Indonesia’s coal mining data:** ‘Other coal leases’ includes areas classified as being under construction, business feasibility studies and areas under general survey.

⁸ **Information about USA’s coal mining data:** **The data obtained (and the subsequent calculations of areas of threatened forest) are only for the Appalachian States (Kentucky, Virginia, West Virginia, Tennessee).** Wider coal mining data for the rest of the country was not available.

⁹ **Information about Canada's coal mining data:** The data obtained (and the subsequent calculations of areas of threatened forest) are only for the province of British Columbia. According to Natural Resources Canada, this accounts for approximately half of Canada's coal mining areas (there are 7 coal mines in Alberta and 2 in Saskatchewan provinces that we do not have data for).

The coal mining concession data for Canada was extracted from a larger dataset containing information about all mineral mining activity in British Columbia. All polygons in the dataset that listed coal as the mineral being mined, or which detailed coal permits specifically were extracted for analysis (other mineral polygons were not included).

¹⁰ **Information about Colombia's coal mining data:** 'Coal mining leases' includes all concession contracts and operating areas. 'Other coal leases' include contributions under contract, areas recognised as private property, areas under application for legalisation and areas listed as being subcontracted.

The shapefile data were prepared and compiled by Tierra Minada, a Colombian civil society group using the [Colombian Mining Registry](#)

¹¹ **Information about DRC's coal mining data:** 'Coal mining leases' include active coal mining areas and areas applying for renewal grants. 'Coal exploration leases' include active and non-active areas with permits to explore/ search. 'Other coal leases' represent geological research zones.

The coal mining concession data was extracted from a larger dataset containing information about all mineral mining activity in the DRC. All polygons in the dataset that listed coal (charbon) as the mineral being mined were extracted for analysis (other mineral polygons were not included).

¹² **Information about New Zealand's coal mining data:** 'Coal mining leases' includes ancillary coal mining licences, continental shelf mining and general coal mining licences. 'Other coal leases' include areas under application, prospecting permits and newly available acreage.

The coal mining concession data was extracted from a larger dataset containing information about all mineral mining activity in New Zealand. All polygons in the dataset that listed coal or lignite as the mineral being mined, or which detailed coal permits specifically were extracted for analysis (other mineral polygons were not included).

Methods used to create the individual country maps:

An outline of the focal country was created from the GADM world countries dataset.

ESA landcover for the focal country was input in raster (geotiff) format. This was clipped to the country outline and converted to a polygon shapefile.

A new shapefile layer detailing just the forest cover was created and saved using the ESA-CCI landcover data.¹³ The individual forest landcover polygons were aggregated together to reduce processing time.

Forest and mining data for each country were projected using a suitable equal-area projection to allow the area amount of forest threatened by mining activity to be calculated (this was advised by GIS specialists via [GIS Stack Exchange](#)).

Maps and tables were then created to visually display this information for use in the report.

¹³ Forest cover included any ESA-CCI LC categories that represented broadleaved, needleleaved or mixed tree cover. It did not include any categories that specified open (15% - 40%) canopy cover within these 3 tree cover classes. Other landcover types such as shrubland, herbaceous or natural vegetation categories were also not classified as forest cover.

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