THE GEMSTONE DATASET CODEBOOK

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This dataset is a part of a larger project to collect spatial and temporal data on natural resources throughout the world. We appreciate the financial support of the Centre for the Study of Civil War (CSCW) at PRIO and Norwegian Research Council. We are also thankful for the Department of Geography at NTNU for providing facilities to accomplish the data collection. We thank Nils Petter Gleditsch for his support throughout the project and Halvard Buhaug for comments and discussions. Annegret Flöter, who had the main responsibility for the data collection, had an affiliation as trainee at the Department of Geography when the data was collected.
1 INTRODUCTION

The GEMDATA dataset consists of spatial information for gemstone deposits throughout the world. The primary motivation for the data generation was to enable the researchers to study how the availability and location of gemstones may affect onset, type, location, and duration of armed civil conflict. It complements similar location datasets on diamond deposits, oil and gas reserves, and drug cultivation.¹

This codebook describes the data collection method and dataset structure, defines the variables used in the dataset, and shortly presents the known shortcomings of the dataset. We also include short note for each country in the dataset. This note contains information for the first discovery and production year for the country and, if relevant, other information that could not be assigned to a specific gemstone site.

The GEMDATA dataset consists of 1022 gemstone sites in 61 countries. It includes the following gemstones: ruby, sapphire, emerald, aquamarine, heliodor, morganite, goshenite, nephrite, jadeite, lapis lazuli, opal, tourmaline, periodit, topaz, pearl, garnet, zircon, spinel, amber, and quartz. It excludes diamonds. The individual gemstone sites are represented as points on a map. Each site is accompanied by the latitude and longitude coordinates, content of the deposits, information on discovery date, and when relevant, information on first production date. The point features are stored as ArcGIS shapefiles and the attribute table as dBase file format. ESRI software – or other GIS software that can read the shapefile format – is required to assess the point features, but the attribute table can easily be imported to other software such as Excel or SPSS.

In addition, 248 sites were assigned to an ERRATA dataset that comes as an Excel file. These sites have missing or insufficiently precise/accurate coordinates to be included in the main dataset.

In addition, GEMDATA comes in as a compact version. This dataset version merges together descriptive data for gemstone sites that are located less than 50 km from each other.² On the map each individual site location is preserved. The compact dataset contains 622 grouped observation with one or more sites.

The data for the dataset was collected 2004, and the data reflects the information that was available at that time.

² Sites across the international borders are not merged even if they are located less than 50 km from each other.
2 MAIN DATA SOURCES

2.1 Spatial Data on Gemstone Deposits

Shigley et al. (1990, 2000a, 2000b) provide extensive lists of gemstone and pearl localities for the 1980s and 1990s. In most cases, the lists also include name for the administrative region, even the name for the mining site or a nearby village. These lists also include information on which gemstones occur in the site. These three lists are used as the base for the sites included in the dataset. The location list was, however, supplemented and crosschecked from other sources as well.

Geographical coordinates (longitude and latitude) for each site were extracted from two main sources. The main reference was the Maps & Locations database supplied by Traveljournals.net (http://www.traveljournals.net) which includes co-ordinates for over 5 million locations. Another important source for the location coordinates was The Times Atlas of the World (1994).

In the cases in which it was impossible to set the coordinates for the exact location, coordinates for a larger region were used (these cases are indicated in the dataset). In the cases that there were ambiguity regarding the exact location of the gemstone site, and the difference was estimated to be larger than one arc degree, the site was assigned to an errata dataset. The errata dataset also contains the sites for which no spatial information was found, and sites for which only a high-level administrative unit was known.

2.2 Qualitative Data

We used two main sources for the qualitative data included in the dataset. Gemstone encyclopedia by Bariand & Poirot (2004) includes detailed description of each gemstone type, production history, mining methods, and main deposit sites. In many cases, it also includes brief history of specific sites or gemstone mining regions. For many sites, the data on the mining status and discovery and production dates were obtained from the book. The book was also used to crosscheck the lists provided by Shingley et al. (1990, 2000a, 2000b) and several sites were added to the dataset from the book.

Keller (1990) describes the nine major processes that form gemstones. For each geological process, Keller lists the relevant gemstone types and presents the most important deposits on a map. Keller also includes mining history for some specific sites. The maps were used to crosscheck the information obtained form other sources, and the case studies provided valuable
information on mining status, discovery date, and production information for many individual sites and regions with gemstone sites.

In addition, various Internet page were used to compile data for individual gemstone sites.

3 VARIABLE DEFINITIONS AND CODING STRUCTURE

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRIMKEY</td>
<td>Unique identifier for the site</td>
</tr>
<tr>
<td>2</td>
<td>COUNTRY</td>
<td>Country name</td>
</tr>
<tr>
<td>3</td>
<td>FIPS</td>
<td>FIPS code for the country</td>
</tr>
<tr>
<td>4</td>
<td>COWCODE</td>
<td>COW country code</td>
</tr>
<tr>
<td>6</td>
<td>SITENUM</td>
<td>Number of the site</td>
</tr>
<tr>
<td>7</td>
<td>NAME</td>
<td>Name of the site or region</td>
</tr>
<tr>
<td>8</td>
<td>LATITUDE</td>
<td>First component of the geographic coordinates for the site</td>
</tr>
<tr>
<td>9</td>
<td>LONGITUDE</td>
<td>Second component of the geographic coordinates</td>
</tr>
<tr>
<td>10</td>
<td>GEOSOURCE</td>
<td>Source of geographic coordinates</td>
</tr>
<tr>
<td>11</td>
<td>GEOCOM</td>
<td>Comment for geographic coordinates</td>
</tr>
<tr>
<td>12-32</td>
<td>GEMSTONE</td>
<td>Type of gemstones found at the site</td>
</tr>
<tr>
<td>33</td>
<td>LOCSOURCE</td>
<td>Reference for location</td>
</tr>
<tr>
<td>34</td>
<td>MINING</td>
<td>Mining status</td>
</tr>
<tr>
<td>35</td>
<td>DISC_Y</td>
<td>Year of the first discovery</td>
</tr>
<tr>
<td>36</td>
<td>DISC_P</td>
<td>Precision for DISC_Y</td>
</tr>
<tr>
<td>37</td>
<td>PRO_Y</td>
<td>Year of the first production</td>
</tr>
<tr>
<td>38</td>
<td>PRO_P</td>
<td>Precision for PRO_Y</td>
</tr>
<tr>
<td>39</td>
<td>COMMENT</td>
<td>Additional information</td>
</tr>
<tr>
<td>40</td>
<td>INFOSOURCE</td>
<td>References for descriptive data</td>
</tr>
</tbody>
</table>

*Primary key – PRIMKEY*
A unique primary key identifies each observation. It consists of the country code (FIPS), the number of the site (SITENUM) and the resource code (GEM). For example, the primary key AF001GEM defines the first observation of gemstone occurrence in Afghanistan.

*Country name – COUNTRY*
Each gemstone site is assigned to a country, which is represented by its name. The country name is based on the international borders in 2000.

**FIPS code – FIPS**
The FIPS (Federal Information Processing Standards) code consists of two descriptive character strings for each country or area. ESRI shapefiles frequently use the FIPS code as an identifier.

**Correlates of War code – COWCODE**
The COWCODE is obtained from the Correlates of War (COW) project.

**Site Number – SITENUM**
The site number (SITENUM) identifies each gemstone deposit in a country.

**Name of the site – NAME**
The name of the deposit site or the region.

**Geographic coordinates – LATITUDE and LONGITUDE**
The geographic coordinates indicate the location of gemstones deposits in decimal degrees. They are expressed by two decimal points. Southern latitudes and western longitudes are coded with negative values.

**Geographic Coordinate Source – GEOSOURCE**
Identifies the source(s) of the coordinates.

**Geographic Comment – GEOCOM**
Additional information on location.

**Gemstones**
For each gemstone, a separate column was generated. If a specific gemstone type occurs in the site, value 1 is coded. In the cases that we were able to identify the major gemstone type found in the site, we indicate the major type with value of 5. For many sites we were not able to make the distinction between major and minor gems.

**Source of Location – LOCSOURCE**
LOC SOURCE gives the reference for the source used in indentifying the deposit site.

**Mine Information – MINING**
For each observation the production status was recorded with the following values:

- 0 no production or production status unknown
- 1 confirmed production
**Year of Discovery – DISC_Y**

The year of the first discovery. 1945 is entered for discoveries that occurred before 1945. Missing information is indicated by 0.

**Discovery Precision – DISC_P**

Due to insufficient information, the discovery year is missing or unsure for many sites. This is indicated in the dataset:

0   year is unknown
1   conflicting information in different sources: the year assigned based on subjective judgement
2   year is precisely coded

**Year of Production Start – PRO_Y**

For the sites with production, the year of production start is coded in this field. 1945 is entered for production that started before 1945.

**Production Precision – PRO_P**

Due to insufficient information, the production year is missing or unsure for many sites. This is indicated in the dataset:

0   year is unknown
1   conflicting information in different sources: the year assigned based on subjective judgement
2   year is precisely coded

**Additional Information – COMMENT**

Any additional information and comments are registered in this field.

**INFOSOURCE**

This field lists the references for descriptive data. Internet pages are coded by URL and a number. Full references, both by URL number and author, are provided at the end of this document together with the other references used in the dataset.

4  THE COMPACT DATASET

The GEMDATA includes over 1000 gem sites. For 533 of them the mining status is known. Discovery date is available for 353 and of those with production; the first production date is recorded for 320.

In order to reduce the number of missing discovery and production dates in the dataset, and to facilitate the use of dataset, we have constructed a compact version of the GEMDATA. This dataset
merges together descriptive data for gemstone sites that are located less than 50 km from each other in a country. Sites across the international borders are not merged even if they are located less than 50 km from each other. On the map, each individual site location is preserved; it is only the attribute data that has been merged.

The compact dataset contains fewer records (622 grouped observations with one or more sites each). To further decrease the size of the dataset, the compact version also excludes other information such as the site name and the references used for the site information. Since the individual sites are preserved on the map, it is possible to check the full information for each site from the main dataset. In addition, the compact dataset provides the PRIMKEYs for all sites included in the merged record.

Below we outline how the compact dataset was generated.

4.1 Setting up the compact dataset

1) Buffering

A buffer with a 25 km radius was generated around each site. All points lying closer than 50 km from each other were then grouped.
To avoid grouping sites across the international borders, the buffer polygons were 'clipped' along the state boundaries and shorelines. The map on the left shows the buffer polygons for Kenya and Tanzania; the polygons have been clipped by the Kenya – Tanzania border and by the shoreline.

3) **Spatial Join**

By using the spatial join, a new variable, GROUPID, was added to the dataset. It assigns a unique identifier for each group. For example, the six gemstone sites in the polygon in the northeast Tanzania (towards the coast) were assigned the same GROUPID.

4) **Dissolve operation**

By using the group identifier and the GIS operation 'dissolve', all gemstone sites with the same GROUPID were aggregate to one record in the compact dataset. The result is a multipart feature that contains all the original gemstone sites but is represented by one record in the attribute table. For example, for the group in the northeast Tanzania, the six individual sites were preserved on the map but they now correspond to one row (record) in the attribute table instead of six.

### 4.2 Variables in the compact dataset

Aggregating the site information for the multipart feature is possible only for numbers and short strings (texts). The aggregating function only allows taking with the maximum, minimum or mean of the values or the first or last of the text fields. Therefore, most of the string fields have been excluded. These include NAME, SITENUM and References and Comments. Below we explain how each attribute in the compact dataset was treated.
The following aggregate functions are used for the following variables:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Aggregate function</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUNTRY</td>
<td>First</td>
</tr>
<tr>
<td>FIPS</td>
<td>First</td>
</tr>
<tr>
<td>COWCODE</td>
<td>Minimum</td>
</tr>
<tr>
<td>LATITUDE</td>
<td>Mean</td>
</tr>
<tr>
<td>LONGITUDE</td>
<td>Mean</td>
</tr>
<tr>
<td>GEO_P</td>
<td>Maximum</td>
</tr>
<tr>
<td>GEMSTONE</td>
<td>Maximum</td>
</tr>
<tr>
<td>MINING</td>
<td>Maximum</td>
</tr>
<tr>
<td>DISC_Y</td>
<td>Minimum</td>
</tr>
<tr>
<td>DISC_P</td>
<td>Maximum</td>
</tr>
<tr>
<td>PRO_Y</td>
<td>Minimum</td>
</tr>
<tr>
<td>PRO_P</td>
<td>Maximum</td>
</tr>
<tr>
<td>PRIMKEY</td>
<td>- na -</td>
</tr>
</tbody>
</table>

**COUNTRY, FIPS and COWCODE**
These do not change from full dataset to compact version since all sites belonging to a group are located in the same country.

**LATITUDE AND LONGITUDE**
Coordinates were preserved as arithmetic mean of the individual sites.

**GEMSTONE, MINING, DISC_P, PRO_P**
The maximum value is registered for these variables. If a specific gemstone or mining occurs at one site it is generalized for the whole group.

**DISC_Y, PRO_Y**
The minimum value is recorded for the discovery and production year, so that they represent the first discovery and production dates. Zeros (0) in the main dataset (noting missing information) have been replaced by 99999.

**PRIMKEYS**
This field lists PRIMKEYs for all sites that were grouped together.
5 COMPLETENESS AND RELIABILITY OF GEMDATA

Some gemstones localities are not defined accurately. For some sites the geographic coordinates differed up to 5 degrees (500 km) for one and the same deposit. To exclude sites that could not be located accurately, sites that had more than one degree difference in the alternative locations were assigned to an errata file (available as an Excel file together with the main dataset). For some regions, especially in Myanmar, Madagascar, Russia, Tanzania, India, the United States, and Canada, many locations were only given at a upper administrative level and therefore the location information could not be used and these sites were assign to the errata data set.

Some geographic coordinates were extracted from the maps in The Times Atlas of the World (1994). These geographic coordinates are not as exact as the others. The sites with coordinates from the Atlas are marked in the dataset.

Qualitative information was not available for many sites in the dataset. If qualitative data was available for larger regions, the information was used in the dataset and a note about aggregated information was entered in the COMMENT column. The qualitative information was especially missing for Brazil, China, India, Indonesia, Madagascar, Nigeria, Russia and the other former Soviet states, Tanzania, and French Polynesia. For countries and regions that are the largest gemstone producers there was more complete information available.

Most likely, there is a bias in the number of localities recorded for various countries and regions. For some areas, more information is available, for example, due to better documentation generated by commercial actors. Even though we are confident that the most important regions with gemstones are included in the dataset, we regard it incorrect to base any analysis on the number of sites in a region or a country.
6 COUNTRY PROFILES

Afghanistan
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: ruby, sapphire, beryl, tourmaline

The first gemstones were discovered and produced near Kabul and Badakhshan before 1945.

Australia
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: sapphire, opal, pearls

Austria
First gemstone discovery: before 1945
First production: before 1945
Main gemstone: emerald

In the Alps, near Salzburg emeralds were discovered and extracted before 1945. No recent mining activities.

Bolivia
First gemstone discovery: 1990
First production: 1990
Main gemstone: quartz

In the beginning of 1990s quartz was discovered in Rincon del Tigre in Santa Cruz (eastern Bolivia).

Brazil
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: beryl, tourmaline, quartz

Insufficient information for sites in Rio Grande do Norte, Bahia, and Ceará States. Mining activity in Espirito Santo was only ascertained for the administrative division.

Cambodia
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: ruby, sapphire, zircon, spinel, quartz

In Battamberg (Pailin) rubies and zircons were discovered and mined before 1945. Qualitative information for the three other deposits were not available.

Cameroon
First gemstone discovery: not available
First production: not available
Main gemstones: ruby, sapphire
Corundum (ruby and sapphire) occurs in Atrisan in the East Province of Cameroon. One deposit site is located on the Nigerian border (with production since 2000) but we were not able to locate exactly this site.

**Canada**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: nephrite, jadeite, beryl

**Chile**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstone: lapis lazuli

**China**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: sapphire, ruby, nephrite, pearls

It was impossible to find qualitative information for the most gemstone sites in China.

**Colombia**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: emerald, sapphire

**Czech Republic**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: garnet, sapphire, topaz, quartz

Gemstones were produced in the Bohemian Hills before 1945. No recent production.

**Dominican Republic**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstone: amber

**Egypt**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: emerald, periodit, pearls

**Eritrea**
- First gemstone discovery: not available
- First production: not available
- Main gemstone: garnet

The only gemstone deposit in the country is situated in Asmera in the north of Eritrea. No information about discovery or mining was available.
**Ethiopia**
- First gemstone discovery: not available
- First production: not available
- Main gemstones: periodit, garnet

Little information about gemstone deposits and mining.

**France**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: sapphire, zircon, quartz

**French Polynesia**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstone: pearl

We were able to find information on pearl only for the island of Tahiti.

**Germany**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: opal, garnet, quartz

Little mining now but there has been opal and garnet mining.

**Guatemala**
- First gemstone discovery: 1950
- First production: 1974
- Main gemstone: jadeite

The first discovery was made in Manzanal in the 1950s but we were not able to confirm whether there has been production. Production in Rio la Palmilla started in 1974.

**Honduras**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstone: opal

**India**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: ruby, sapphire, beryl, garnet

We were able to find good information for mining activities only for the Jammu/Kashmir region. For other states there is huge lack of qualitative information. The first production years in the Rajasthan and Orissa states refer only to this upper administrative unity. For the other five states with deposits no information was found. Consequently, 60 sites for India lack qualitative information.

**Indonesia**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstone: pearls
We were able to find information only for a few pearl sites in Indonesia.

**Italia**
- First gemstone discovery: before 1945
- First production: not available
- Main gemstones: amber

**Japan**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: pearl

**Kazakhstan**
- First gemstone discovery: before 1945
- First production: not available
- Main gemstones: sapphire, beryl

Little information available for Kazakhstan.

**Kenya**
- First gemstone discovery: 1970
- First production: 1970
- Main gemstones: ruby, sapphire, tourmaline, garnet

**Laos**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: ruby, sapphire, garnet

**Madagascar**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: ruby, sapphire, beryl, tourmaline, topaz, garnet

**Malawi**
- First gemstone discovery: 1958
- First production: 1960
- Main gemstones: ruby, sapphire, beryl

**Malaysia**
- First gemstone discovery: not available
- First production: not available
- Main gemstones: pearls

**Mali**
- First gemstone discovery: not available
- First production: 1990
- Main gemstones: opal, garnet

**Mexico**
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: opal, topaz, pearls

**Mozambique**
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: beryl, tourmaline, quartz

**Myanmar**
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: ruby, sapphire, beryle, jadeite

Myanmar is famous for its beautiful rubies and sapphires, especially from the Mogok region. The world’s finest jade is produced in Kachin – Hpakan.

**Namibia**
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: aquamarine, tourmaline, topaz, garnet, quartz

**Nepal**
First gemstone discovery: 1980
First production: 1980
Main gemstones: ruby, sapphire, beryls, tourmaline

**New Zealand**
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: nephrite, pearls

**Nigeria**
First gemstone discovery: 1984
First production: 1984
Main gemstones: sapphire, beryl, tourmaline

The most sites for Nigeria have many missing information. Therefore, it is possible that there has been both discoveries and production before 1984.

**Oman**
First gemstone discovery: not available
First production: not available
Main gemstones: opal

Oman’s only gemstone deposit is situated in Muskat.

**Pakistan**
First gemstone discovery: before 1945
First production: before 1945
Main gemstones: ruby, beryl, tourmaline, topaz, garnet
<table>
<thead>
<tr>
<th>Country</th>
<th>First gemstone discovery</th>
<th>First production</th>
<th>Main gemstones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papua New Guinea</td>
<td>not available</td>
<td>1960</td>
<td>pearls</td>
</tr>
<tr>
<td>Peru</td>
<td>before 1945</td>
<td>before 1945</td>
<td>opal</td>
</tr>
<tr>
<td>Philippines</td>
<td>before 1945</td>
<td>before 1945</td>
<td>pearls</td>
</tr>
<tr>
<td>Romania</td>
<td>before 1945</td>
<td>before 1945</td>
<td>amber</td>
</tr>
<tr>
<td>Russia</td>
<td>before 1945</td>
<td>before 1945</td>
<td>sapphire, beryl, periodit, topaz, garnet, zircon</td>
</tr>
<tr>
<td>Slovakia</td>
<td>before 1945</td>
<td>before 1945</td>
<td>opal</td>
</tr>
<tr>
<td>Somalia</td>
<td>not available</td>
<td>not available</td>
<td>emerald, aquamarine</td>
</tr>
<tr>
<td>South Africa</td>
<td>before 1945</td>
<td>before 1945</td>
<td>emerald, garnet</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>before 1945</td>
<td>before 1945</td>
<td>ruby, sapphire, beryl, tourmaline, opal, garnet, zircon, spinel, topaz, periodit</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>before 1945</td>
<td>before 1945</td>
<td></td>
</tr>
</tbody>
</table>
Main gemstones: ruby, sapphire, beryl, lapis lazuli, topaz

**Tanzania**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: ruby, sapphire, beryl, tourmaline, topaz, garnet, spinel

The first ruby site was discovered in Arusha – Longido before 1945. However, the most of the deposits were discovered in the 1980/90s.

**Thailand**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: ruby, sapphire

**Turkey**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: opal

**Ukraine**
- First gemstone discovery: 1966
- First production: 1966
- Main gemstones: beryl, topaz, quarz

Little information on discovery and production dates.

**United Kingdom**
- First gemstone discovery: not available
- First production: not available
- Main gemstones: amber

**United States**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: sapphire, beryl, tourmaline, topaz, garnet

**Uruguay**
- First gemstone discovery: before 1945
- First production: before 1945
- Main gemstones: quartz

**Vietnam**
- First gemstone discovery: 1980
- First production: 1980
- Main gemstones: ruby, sapphire, beryl

Gemstone discovery in Binh Tuanh – Ban Thiet was made in 1980. We are unsure whether this is the first discovery in the country.

**Zambia**
<table>
<thead>
<tr>
<th>Country</th>
<th>First gemstone discovery</th>
<th>First production</th>
<th>Main gemstones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe</td>
<td>before 1945</td>
<td>before 1945</td>
<td>beryl, tourmaline, garnet, quartz</td>
</tr>
<tr>
<td></td>
<td>1956</td>
<td>1956</td>
<td>emerald</td>
</tr>
</tbody>
</table>

**Zimbabwe**
REFERENCES:

Books and articles


7.2 Internet pages:

7.2.1 By ID reference (as used in the dataset)


7.2.2 By author


Government of Andhra Pradesh, YEAR UNKNOWN. State Profile of Andhra Pradesh - Natural Resources: Forest and Agriculture (http://www.bisnetworld.net/bisnet/states/ap2.htm, 06.01.2005).


NSW - Central West. YEAR UNKNOWN. Discovering Oberon (http://www.allthingsaus.com/centralwest/oberon.htm, 12.01.2005).


Pan African Mining Cooperation, YEAR UNKNOWN. Property and Project - Andramasina - History (http://www.panafrican.com/props_Andermasina_history.asp, 06.01.2005).


Secretariat of the African, Caribbean and Pacific Group of States (ACP Group), YEAR UNKNOWN. Ore deposit description - Berere (Tsarantanana).. Mining Data Bank (http://mines.acp.int/html/mine_MDG-00045_en.html, 07.01.2005).


