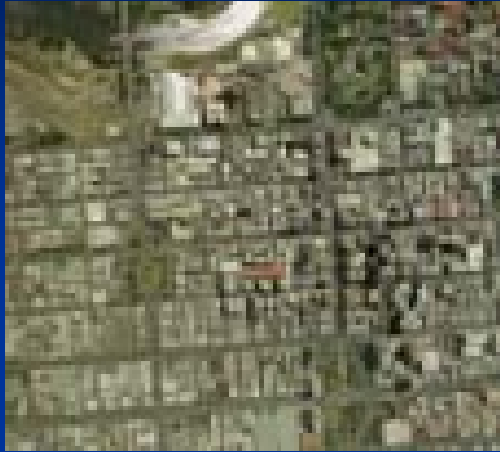


GIS AND SCIENCE WORKSHOP

AGTA CONFERENCE 2008



Putting the 'S' into the Science classroom
 Using GIS to develop spatial literacy in the science classroom

Course developed by Malcolm McInerney

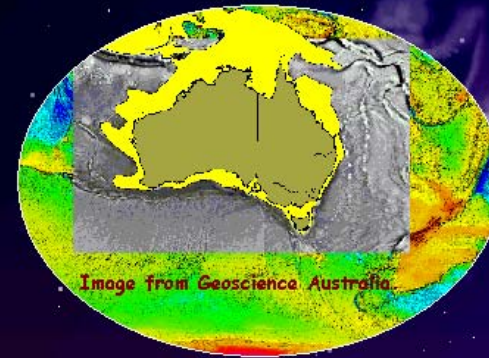


Image from Geoscience Australia

Incorporating the use of the ArcAustralia CD Rom from Geoscience Australia.

Enter the world of GIS and Science

Preface from TECHGEOG

How to use this CD

Acknowledgements

Conditions of use



TECHNOLOGY IN THE GEOGRAPHY CLASSROOM BRIDGING THE DIGITAL DIVIDE



TECHGEOG

USING SPATIAL TECHNOLOGY

WHAT IS TECHNOLOGY

DIGITAL GEOGRAPHY

TECHNOLOGY IN GEOGRAPHY PRESENTATION

GIS AND PHYSICAL GEOGRAPHY

STIMULUS AND DISCUSSIONS ON TECHNOLOGY

HISTORICAL GEOGRAPHY GIS

GIS SKILL DEVELOPMENT TRAINING MATERIALS

GIS AND TOURISM

DATA AND DOWNLOADS ON THIS CD



TECHNOLOGY APPLICATION SITES

Visit the GTASA website at www.gtasa.asn.au
 and register to receive regular spatial
 technology in the classroom updates



VIRTUAL VISUALS

3D VISUALISATIONS

INTERNET LINKS

TEACHING SUPPORT

10 TOP TIPS

RESOURCES AVAILABLE

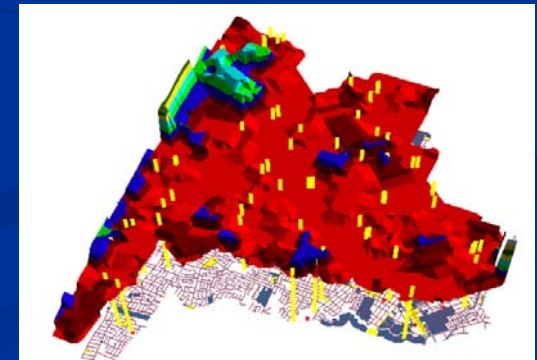
Exit

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Acknowledgements

Ausgeography website

Next



Malcolm McInerney: GTASA

- This workshop has been designed to provide an accessible and achievable approach for science teachers who are interested in introducing the technology of Geographic Information Systems into their teaching..
- GIS is a wonderful learning tool to enhance Science education, with the bonus outcome of making students aware of GIS technology and the related employment opportunities.

Background for those new to GIS

GIS stands for Geographic Information Systems. GIS involves the development of maps using a variety of attached data. In short, it involves the location of qualitative and quantitative data on the earth's surface. Most of the information we use in our everyday life and study has a geographical component!

The technology of GIS now allows the amateur ICT user to use a high level technological tool to map both simple and complex spatial representations and relationships.

- **The use of GIS by students could involve:**
 - Analyzing change in space over time.
 - Attaching sources/data/images to location.
 - Tracking movement and diffusion over space.
 - Searching databases over space.

Where to start? Keep it simple!

- As science teachers we are not GIS or computing teachers!!! However there are some basic GIS skills that can be acquired by students in a short time that can be applied to some historical GIS tasks. You may be lucky in your school and the students in your science class may have already acquired the required GIS skills in their Geography or History classes.

- **What skills are required to get going with GIS in science?**
- The GIS skill development process
- Adding data files to create a base map.
- Using scanned maps to create a base map.
- Thematic mapping.
- Creating original maps with points, lines and areas on pre-existing maps.
- Creating and customising data bases
- Digitising layers
- Summarising and charting spatial data
- Selection maps involving searching databases.
- Hotlinking source files to a map.
- Using GPS to plot features on a map.

- **ESRI GIS**

- This book uses the ESRI ArcView 3x GIS programme. For more information about ESRI products

- go to the ESRI website at <http://www.esri.com/>



- If you wish to purchase ESRI ArcView go to the K-12 section of the ESRI Australia website at <http://www.esriaustralia.com.au/>

- A new ESRI website <http://edcommunity.esri.com/>

Some achievable and practical examples to get started using GIS in the science classroom

The following examples use all of the skills listed above. They have been developed to show the potential of GIS in the teaching of science in the classroom and in no way attempt to provide a comprehensive guide to the use of GIS for students. In fact, the possibilities for the use of GIS in the science classroom is limitless, being dependent on the topic studied, GIS skills, data availability/collectability, analytical intellect, creativity and the curiosity of the students

The provided sample CD Rom gives an insight into the practical listed below.

ACHIEVABLE GIS IN SCIENCE STARTERS

- **An excuse to hug a tree: measuring green with Citygreen**
- **Water matters: mapping water quality**
- **Did the earth move? mapping world quakes**
- **Quakes alive: shaking all over**
- **Rock of the ages: rocks and deposits**
- **Rock and water: mapping landforms and aquifers**
- **Eureka underground! : mapping OZ minerals**
- **In deep water: Australia's unseen continent**
- **Nothing is the same: mapping microclimates**

GIS AND SCIENCE APPLICATION (EMPLOYMENT)



- 📁 Agriculture
 - Business GIS
- 📁 Geology
- 📁 Land Information System
- 📁 Natural Hazard Management
- 📁 Urban Planning
 - Miscellaneous
- 📁 Archaeology
- 📁 Environment
- 📁 Health
- 📁 Military
- 📁 Utility
- 📁 Natural Resource Management
 - Corporate Case Studies

GIS AND THE ENVIRONMENT INDUSTRY

Overview | Conservation & Monitoring | Planning & Policy | Wetland Management | Wildlife Management | Forest Management | Water Pollution | Air Pollution | Land | Climate Change | Relevant Links

Overview

1. The documentation of Egypt's Natural Heritage (Map Africa 2006)
Marwa Gamal El-Din Fahmy
2. Applications of GIS and Remote Sensing in the Analysis of the Environment of Bay of Bengal (Map Asia 2006)
Bal Krishna Patidar, Andrew Menezes
3. Remote Sensing of Humid to Arid Gradients in Asia: A Review (Map Asia 2006)
Maxim Shoshany
4. Expert System for the Operative Environmental Diagnostics (Map Asia 2006)
Mkrtchyan Ferdenant, Krapivin Vladimir
5. Application of Global Positioning system in Water Vapor Estimation (Map Asia 2006)
Prof. M.N. Kulkarni, Dr.S.S.Gedam, Rajiv G.Kurekar
6. Stepping forward for challenges in Health, Safety and Environment in GIS perspective (Map Middle East 2005)
Kashif Siddiqi, Prof. Graham Clarke

■ <http://www.gisdevelopment.net/application/environment/overview/index.htm>

GIS AND THE RESOURCE MANAGEMENT INDUSTRY

Overview | Mountain | Water Resources | Ocean | Coastal Zone Management

Overview

1. Evaluating Open Source GIS software for environmental planning in developing countries (Map Middle East 2007)
Amit Jain
2. UAE Space Reconnaissance Center as a valuable imagery resource for monitoring the environment; an investigation on sand movement (Map Middle East 2007)
Major Ali M. Alshehhi and Ghassan A. Abdelhamid
3. Surface Deformation Monitoring-Part of Geophysical Reservoir Monitoring Technologies Applied in Enhance Oil Recovery (EOR) Projects (Map Middle East 2007)
Issa AL-Quseimi
4. Coastal Spatial Data Infrastructure (CSDI): African requirements and responses
Louis Celliers ,Mika Odido, Roger Longhorn, Kate Lance (Map Africa 2006)
5. [Mapping for change in Western Africa: the case of the Regional W Park \(Benin, Burkina Faso, Niger\)](#)
Federica Burini (Map Africa 2006)

■ <http://www.gisdevelopment.net/application/nrm/overview/index.htm>

GIS AND THE AGRICULTURE INDUSTRY

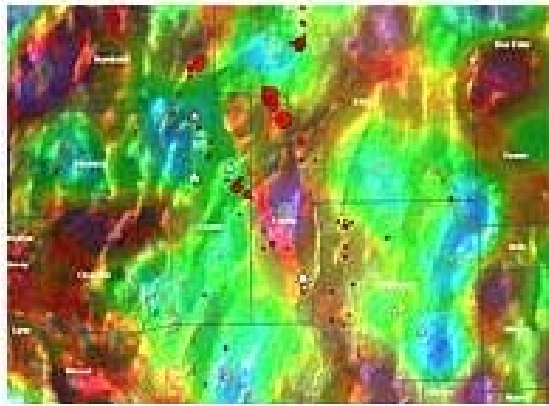
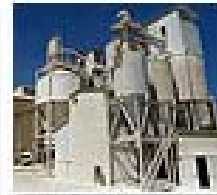
[Overview](#) | [Crop Production](#) | [Crop Pattern](#) | [Crop Yield](#) | [Irrigation](#) | [Soil Management](#) | [Precision Farming](#) | [Relevant Products](#) | [Relevant Links](#)

Overview

1. [Agricultural Geo-referenced Information System – Natural Resource Atlas 2006](#) (Map Africa 2006)
Dirk Craigie
2. [Development of a model for dam irrigation management based on GIS network models](#) (Map Asia 2006)
Abolghasem Chehreghani, Saadi Mesgari, Mohammad Karimi, Ahmad Seyfi Mastan
3. [Studying Effective factors in selection of understory farming lands and there effects on forest stands using GIS](#) (Map Asia 2006)
Rahim maleknia, M. namiranian, J.fegghi
4. [Assessing Agricultural Sustainability in Watersheds in India using Geomatics](#) (Map Asia 2006)
Dr. Kausalya Ramachandran, Dr. K.L.Sharma, T. Srinivas, M. Shankar Rao, M. Gayatri & V. Bhaskar
5. [THEOS, a Tool to Support Agricultural Policy in Thailand and in Neighbouring Countries](#) (Map Asia 2006)
Patrick Houdry , Dr. Darasri, Pr. Visham, Khun Tanittha, Khun Walaipom, Khun Charin, Asset Capitalisation Bureau

■ <http://www.gisdevelopment.net/application/agriculture/overview/index.htm>

GIS AND THE MINING INDUSTRY



Exploration

GIS is ideal for integrating various datasets to deliver meaningful outcomes.

- Various types of geologic datasets, such as geophysical images, geochemistry, geologic maps, radiometric, boreholes, and mineral deposits, can be displayed, interrogated, and analyzed simultaneously using GIS.

[Home](#) > [Geospatial Application Papers](#) > [Geology](#)[Mineral & Mining](#) | [Geomorphology](#) | [Relevant Links](#)**Mineral & Mining**

1. Spectral Differentiation of Asbestos Minerals in South Africa for Potential Use in Pollution Monitoring (Map Africa 2006)
Brilliant M. Petja, Yaw A. Twumasi, George T. Tengbeh, Phila C. Sibandze, Leon Croukamp
2. Establishing A Solid Mineral Database for A Part of Southwestern Nigeria (Map Africa 2006)
A.Y.B. ANIFOWOSE, O.A. BAMISAYE, I.B. ODEYEMI
3. Surface Weathering Degree Mapping for Granite Using Reflectance Spectroscopy (Map Asia 2006)
Chang-Uk Hyun, Hyeong-Dong Park
4. Using Principal techniques on ETM+ 2002 for arid and semi-arid environment Central Iran (Map Asia 2006)
Gholamreza Mirzavand, Gholamreza Mirzavand
5. A comparative approach on TIR and VNIR-SWIR datasets of ASTER instrument for lithological mapping in Neyriz ophiolite zone, SW Iran (Map Asia 2006)
Majid H. Tangestani
6. Separation of Carbonates by Using PCA on ASTER Bands (July 2004)
Shahab Poursaleh
7. Comparison of ASTER and ETM+ data for exploration of porphyry copper mineralization: A case study of Sar Cheshmeh areas, Kerman, Iran (Map Asia 2003)
H. Ranjbar, H. Shahriari, M. Honarmand

- Geoscience Australia data available
- In this workshop a taster practical using Geoscience Australia data will be undertaken to show the potential of GIS in science teaching. The practical uses Geoscience Australia earthquake data but if you want to get more Geoscience data for science go to the Geoscience website at <http://www.ga.gov.au/>.
- To make the provision of data easier and more accessible, ESRI Australia and Geoscience Australia have put together a 2 CD pack called ArcAustralia containing the following great data for GIS. This package is free and can be obtained from Mick Law at ESRI Australia (mlaw@esriaustralia.com.au) if you send away the form at the end of this paper.

- Contents of ArcAustralia Disk 1:

- BATHYMETRY
- LAND_TENURE
- MARITIME_BNDS
- DEPTH TO BASEMENT
- GEOLOGY
- GEOLOGICAL REGIONS
- GRAVITY
- MAGNETIC
- REGOLITH

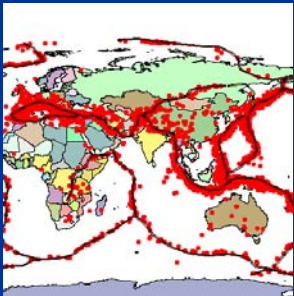
- Contents of ArcAustralia Disk 2:

- AUSTRALIAN GEOGRAPHY
- Roads, Railways, Main Towns, Towns , Rivers, lakes. Reservoirs, Coastline
- EARTHQUAKE EPICENTRES
- GEOLOGY_5MIL
- GRATICULES
- HYDROGEOLOGY
- LANDSLIDES
- MINERAL DEPOSITS
- MINERAL OCCURENCES
- OIL AND GAS
- SURFICAL GEOLOGY

EXAMPLES OF USING GIS IN THE SCIENCE CLASSROOM

- For the purpose of this presentation we will focus on the use of spatial technology to demonstrate the creative enquiry approach.

Spatial is defined as 'pertaining to or involving or having the nature of space' and spatial relation as the 'spatial property of a place where or the way in which something is situated'. Further to these definitions, Spatial Technology involves the use of information technology, the Internet, computer mapping hardware, remote sensing and mapping software to aid the examination and analysis of space and the associated spatial patterns and relationships. Such technology includes the use of Geographical Information Systems, Global Positioning Systems, 3D visualizations, remote sensing technology and aerial imagery.



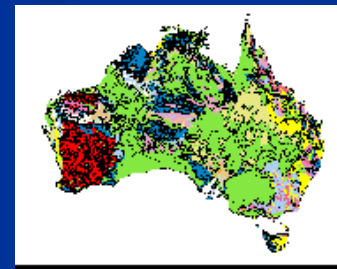
Earthquakes



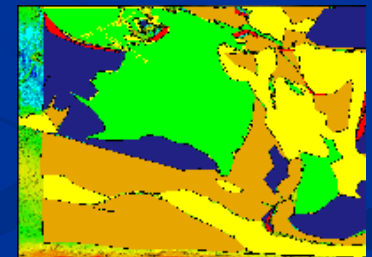
Micro climates and surfaces



CityGreen



Rocks and deposits



Ocean floor

LET'S CHECK OUT THE TECH SCENE WHAT'S AVAILABLE?

The image shows a menu interface for a CD-ROM. At the top, a green banner reads "TECHNOLOGY IN THE GEOGRAPHY CLASSROOM BRIDGING THE DIGITAL DIVIDE" with a "TECHGEOG" logo. Below this are several categories of content:

- USING SPATIAL TECHNOLOGY
- WHAT IS TECHNOLOGY
- TECHNOLOGY IN GEOGRAPHY PRESENTATION
- STIMULUS AND DISCUSSIONS ON TECHNOLOGY
- GIS SKILL DEVELOPMENT TRAINING MATERIALS
- DATA AND DOWNLOADS ON THIS CD (with ESRI Australia logo)
- Visit the GTASA website at www.gtasa.asn.au and register to receive regular spatial technology in the classroom updates (with GTASA logo)
- 10 TOP TIPS
- RESOURCES AVAILABLE

On the right side, there is a vertical list of topics:

- DIGITAL GEOGRAPHY
- GIS AND PHYSICAL GEOGRAPHY
- HISTORICAL GEOGRAPHY GIS
- GIS AND TOURISM
- COMMUNICATION IDEAS
- TECHNOLOGY APPLICATION SITES
- VIRTUAL VISUALS
- 3D VISUALISATIONS
- INTERNET LINKS
- TEACHING SUPPORT

At the bottom, there are navigation buttons: Exit, Conditions of use, Acknowledgements, Ausgeography website, and Next.

CD provided at the conference for individual teacher use.

Available as school license for network installation and copying.

