



■ **NEWS**  
page 2



■ **MINERALS FROM WASTE**  
Re-using mine tailings  
page 3

■ **SOCIALLY SUSTAINABLE DEVELOPMENT**  
Strategy for the minerals and energy sector pages 4 and 5

■ **MOUNTAIN HAZARDS**  
Research and mitigation of landslide and glacial hazards  
pages 6 and 7



■ **GEOSCIENCE METADATA**  
A self-help toolkit  
page 8

## World Mines Ministries Forum

*David Greenbaum, British Geological Survey*

The second bi-annual World Mines Ministries Forum (WMMF) was held in Toronto, Canada from 13 to 15 March 2002. The WMMF Advisory Board was co-chaired by the World Bank and the Ministry of Northern Development and Mines, Ontario and included various groups from across the public and private sectors. The DFID provided support to both the forum organisation and the attendance of delegates from developing countries. The three-day meeting attracted more than 300 people from governments and industry.

The forum addressed a range of topics relevant to sustainable mineral development practices. Six themes were covered in plenary and breakout sessions:

- mining and people
- creating a positive investment climate
- the role of geoscience in attracting investment
- governance issues and MMSD
- sustainable development: the road to the Johannesburg Summit 2002
- voluntary codes of conduct.

The workshop sessions focused on various matters related to the operation and impacts of mining in developing countries. Issues discussed included: partnerships between governments; mining companies and communities, small-scale and artisanal mining; the value of geoscience information in attracting investment; risks and benefits; and transparency in operating mining agreements. Mining operations in developing countries must interact more extensively

with the local community and consider long-term sustainable benefits. In terms of poverty alleviation there is a need to ensure that benefits flow to the level of the local community as well as benefiting national governments. To achieve sustainable development, the industry must recognise that mining is a temporary use of land and plans must be made from the outset for closure and long term community sustainability.

Small-scale and artisanal mining is a special case. The sector employs some 30 million people

worldwide and many more than this are dependent upon it. It is often a subsistence activity closely linked to poverty and consequently is receiving increasing attention by development institutes including the World Bank and DFID. The workshop recognised that there is a need to formalise this sector and support it through such actions as providing access to markets, education, advice on appropriate technologies, health and safety, protection of the environment, and extension services support. To promote and support such developments, a new website on *Communities and Small-scale Mining (CASM)* has just been released. Individuals concerned with this activity are invited to visit the site and register their interest. It may be found at: [www.casmsite.org](http://www.casmsite.org)



Delegates at the WMMF discuss 'people and mining'.

David Greenbaum, BGS © NERC

## Morocco hosts Geological Society of Africa (GSAf) colloquium

*John Bennett*

The 19th GSAf Colloquium of African Geology (CAG19) was held at the Chouaib Doukkali University, El Jadida, Morocco, from 19 to 22 March 2002.

This was the first GSAf colloquium to be held in North Africa and was attended by well over 200 participants from some 22 countries. Besides Morocco, Algeria and Egypt, other African countries represented were: Burkina Faso, Cameroon, Senegal, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. In addition, geoscientists from nine European countries and the USA also attended. Most of the participants were from academia and, to a lesser

extent, geological survey organisations. Direct representation from the international minerals and petroleum sectors was, however, disappointing — arguably this was the industry's loss, as the colloquium offered a wealth of information and expertise of value to explorationists.

The colloquium focused on the science and covered a wide range of topics including continental construction, fragmentation and correlation, mineral, energy and water resources and environmental geology, and the applications of structural geology, stratigraphy, sedimentology, palaeontology and geophysics to these disciplines. Particular emphasis was

placed on the evolution of the 2000 million year old West African Craton and its marginal mobile belts (Morocco is positioned on the northern margin of the craton).

The meeting was organised by an energetic local steering committee comprised largely of staff from the University's Faculty of Sciences. The organisers received generous local sponsorship and support. GSAf benefited also from the valuable financial assistance provided by both DFID and Rio Tinto Mining and Exploration Ltd, UK. This sponsorship enabled six participants to attend, five of these from sub-Saharan countries.

As a result of the colloquium, geoscience in Morocco is now more prominently established internationally. Some 40 new members joined the Society during the event. New members and supporters are always welcome. Please contact the writer for more information.

[jdb@jdbennett17.freeserve.co.uk](mailto:jdb@jdbennett17.freeserve.co.uk)

## From waste to wealth

David Harrison, British Geological Survey, Project R7416

**M**ine and quarry wastes from the extraction and processing of minerals, ores and rocks commonly occur in substantial volumes in waste piles or tailing heaps. Fine grained waste especially creates problems in its containment and disposal, and usually remains at the site after mining has long since ceased. There is an obvious environmental benefit in reducing or removing a waste pile. There can also be a socio-economic advantage in terms of the production of a saleable mineral product from the waste which can provide employment and help sustain the local population.

The *Minerals from Waste* project aims to improve the sustainability of current and former mining and quarrying activities by developing ways to utilise mineral waste as a source of construction and industrial minerals. Since the first report on *Minerals from Waste* (Earthworks, November 1999), at which time the project had been running for only a few months, a multidisciplinary team of researchers has been carrying out investigations in Costa Rica and Namibia. The project activities have been led by the British Geological Survey with specialist input from the Camborne School of Mines (University of Exeter) and the Corporate Citizenship Unit at the University of Warwick. Overseas partners are the Instituto Costarricense de Electricidad in Costa Rica and the Ministry of Mines and Energy in Namibia.

The first part of the project involved a scoping study to review the potential of mine and quarry wastes and the economic, environmental and social issues involved in their utilisation. The principal materials studied were waste from aggregate extraction (both hard rock and alluvial sand and gravel),

waste from dimension stone quarrying, slate waste, colliery spoil, waste from various other types of industrial mineral operation (such as kaolin, silica sand and talc), and waste from metal mining. The scoping study report, published in 2001, uses a fact sheet approach for each type of mineral waste, including descriptions of their likely volumes, compositions and technical properties, their potential end uses and the general constraints on their usage. A methodology has been developed to assess the economic viability of developing industrial mineral products from mine waste and is extended to include small-scale mining. The various impacts involved in reworking mine waste are reviewed and best practice procedures for social impact assessment are presented. This initial research phase found that opportunities exist for the production of mineral products from mine waste.

In order to investigate further the potential for successful use of mine waste, a series of case studies

were undertaken at several former and current mining sites in Costa Rica and Namibia. The technical quality of the various mine wastes was investigated. They included: silica sand wastes from a site near Cartago, Costa Rica; pegmatite quarry wastes from Uis, Namibia; and lead/zinc waste from the Rosh Pinah mine in southern Namibia. Results are encouraging, particularly for the production of clay bricks and tiles from the silica sand waste and also for the recovery of feldspar raw materials from the pegmatite waste material. However, any product made from mining waste is only of value if there is a market. The approach used in the case studies also includes market surveys for a range of industrial products as well as detailed assessments of the environmental and social impacts of waste utilisation at each study site. The methodology developed is intended to be applicable to other regions and countries and will be of benefit to all miners, professionals and advisors involved in mine waste utilisation.

By Summer 2002, the research phase of the project will be completed and the dissemination phase will commence. Workshops will be held in Namibia in July 2002 and in Costa Rica in September 2002.



Coarse tailings at Uis pegmatite quarry, Namibia.



Silica sand wastes and tailings pond, Cartago, Costa Rica.

### For further information contact:

David Harrison,  
British Geological Survey, Keyworth,  
Nottingham, NG12 5GG, United Kingdom

Tel: +44 (0)115 936 3213  
E-mail: [djha@bgs.ac.uk](mailto:djha@bgs.ac.uk)

# Socially sustainable development strategy

Stephen Davis, CongGO Online, Project R8036

Major global resource development corporations agree that, whereas they need to develop their capacity to address social issues, appropriate tools to define a social strategy and manage its implementation throughout the life of a project are lacking. They recognise that only by integrating such a strategy into the corporate system will socially sustainable development become part of the corporate culture.

The social dimension of resource development has been limited almost entirely to conducting social impact assessment (SIA). The SIA has become locked into the feasibility stage of the project and is often measured by the percentage of predicted impacts that are realised. Whilst the SIA seeks to identify both the positive and negative potential impacts of an action, it is the negatives that have become commonly associated with the SIA process. Essentially, the SIA represents only one segment in the corporation's overall approach to the social dimension of project development. SIA is no longer a sufficient response to

community issues, nor an adequate means of engaging the community. The resource sector agrees that meaningful consultation with the community must commence before entry onto land, and must continue throughout the life of the project including project closure. This requires a 'whole-of-project-life' approach to social development. Corporations are expressing a need to develop policy positions which provide a corporate-wide framework within which to establish procedures that guide and direct community engagement, labour activity, reporting and standards.

Project R8036 was awarded to CongGO Online<sup>1</sup> to develop the Socially Sustainable Development Strategy (SSDS) in the minerals and energy sectors. The whole-of-project-life SSDS<sup>2</sup> is a framework and delivery mechanism for ensuring socially sustainable development with full stakeholder participation. It is an online tool that enables the Internet capture and query of all information necessary to maximise the opportunities for socially sustainable development.

The SSDS is one of the first tools to be developed

<sup>1</sup>ConGO Online is part of the ConGO international group of companies. ConGO provides social solutions for sustainable development. ConGO Online's business is the supply of information and business tools that support socially sustainable development. Further information is available at [www.congo\\_online.com](http://www.congo_online.com).

<sup>2</sup>A complete overview of the SSDS is available at [www.ssds.info](http://www.ssds.info).

that addresses social sustainability as part of the triple bottom line. More importantly, the SSDS identifies and integrates core principles and core processes into key social processes which constitute sustainable development, thereby assisting social sustainability to become embedded in the corporate culture.

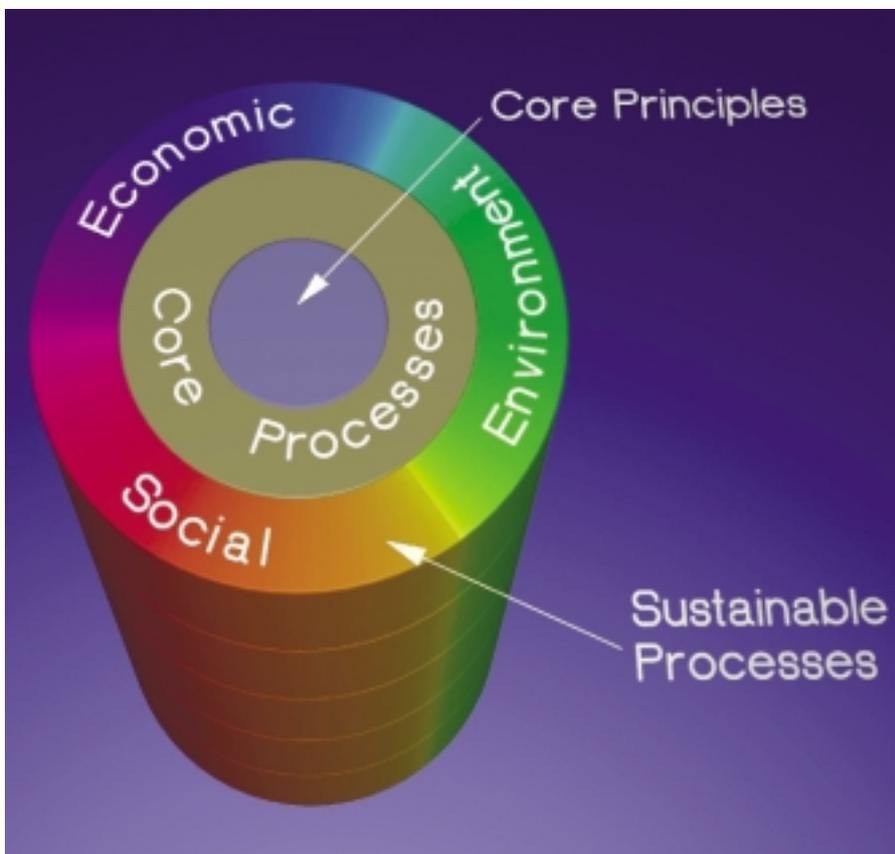
The key social processes initially identified as part of social sustainability in the resource sector include cultural heritage, conflict reduction, resettlement and community consultation. They are being process-mapped to enable them to be managed through core business processes such as planning, reporting and auditing. Underpinning and embedded throughout the key social processes and core business processes are the core principles such as truth, honesty, human rights and justice, which pervade every aspect of the organisation.

The SSDS aims to reduce poverty through the strategic development of natural resources. The principal means of achieving this are by:

- promoting local and national social responsibility and accountability in the development of natural resources
- promoting and supporting social and economic sustainability in communities affected by natural resources development, and
- building government, community and business capacity to support and sustain livelihood programmes. More generally the application of the SSDS will facilitate a positive investment climate, infrastructure development and reduced civil strife.

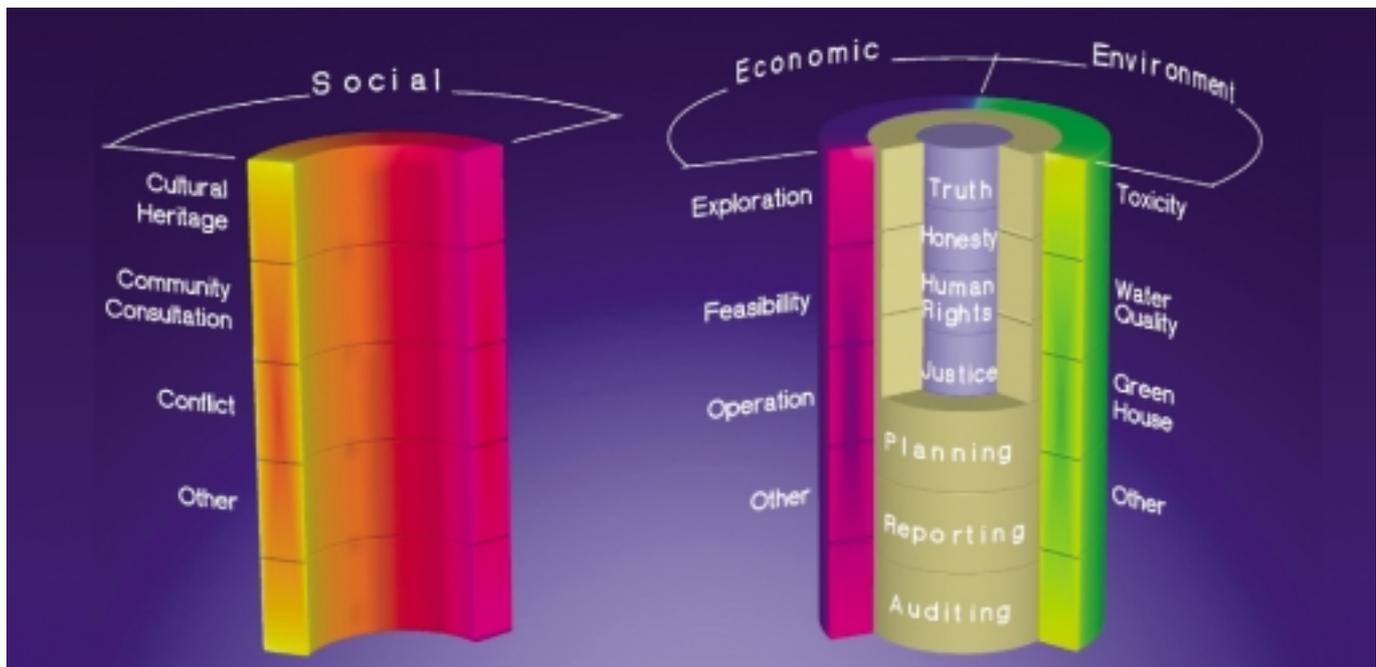
The SSDS focuses on:

- poverty relief
- capacity building
- community participation
- sustainable development
- providing a common base on which to develop partnerships between stakeholders
- multidisciplinary approaches
- linkages between policy and implementation
- standardising social auditing
- identifying key knowledge sets necessary to underpin sustainable social development, and
- improving access to and use of that knowledge.



© 2001 Copyright CongGO Online Ltd.

Principles and processes of sustainability.



Pillars of sustainability.

The DFID has committed funds to complete the development of the SSDS by late 2003. The project seeks to facilitate the development and availability of tools that would assist international investment in developing countries and eliminate poverty in line with the International Development Targets, DFID strategies and, in particular the White Paper 'Making Globalisation Work for the Poor' (see [www.dfid.gov.uk](http://www.dfid.gov.uk)).

### Project focus

The focus of the SSDS is the construction, application and widespread availability of a management tool that will assist the identification and engagement of stakeholders early in projects, continuing their active participation in every step of the project to deliver social sustainability and poverty elimination wherever possible.

The SSDS is being developed and populated with data that focuses on the international dimension of social issues specific to the resource sector, providing access to detailed information on international social instruments and protocols at each stage of project development. It has been designed to integrate the social management system with the user's existing environmental and financial management systems. The SSDS tool will promote transparency and public participation in the decision-making process, being accessible to governments, communities and companies, to act as a basis for open and participatory strategic project planning. The tool will allow a development project to absorb country and project specific information and processes, as well as allowing governments to update country specific data such as legislation and regulations via the Internet. Communities will be able to use the SSDS to monitor project

progress and to provide their voice in the planning process. The project is developing the SSDS for global application and will capture learning from pilot applications of the tool.

### Stakeholder participation

The project is consulting a wide range of stakeholders in civil society, industry and government. Discussions are proceeding with corporations in the minerals and energy sectors, a range of NGOs, governments and multilateral organisations to develop the concept and processes. The stakeholders involved in the development of the SSDS will vary throughout the life of the project. Formal involvement occurs through the Consultative Group, Expert Advisory groups, stakeholder meetings and project site application trials. Ad hoc and informal involvement will primarily occur through participation in online, hosted discussion fora.

The Consultative Group represents the interests of key stakeholders and provides high-level strategic advice on the direction of SSDS development. Whilst the overall direction of the SSDS has been considered in detail throughout 2000 and 2001, the Consultative Group will ensure the SSDS is integrated with other key initiatives currently active and those being planned. The Consultative Group is actively involved in selecting practitioners for membership of each Expert Advisory Group. The Consultative Group will consider which social processes should form part of the SSDS. The social processes currently under consideration are:

- cultural heritage
- resettlement
- conflict reduction and
- community consultation.

There is an Expert Advisory Group (EAG) for each social process. Each EAG provides information, advice and direction that will ensure, to the best possible degree, that the direction, form and content of the social processes addressed within the SSDS meet the needs of all stakeholders and will make a positive contribution to the elimination of poverty. The EAGs review the stages of each social process and advise on the accuracy, detail and relevance of each process. Not all EAGs will be operating at any one time. Each EAG is activated as its particular social process becomes the focus of SSDS activity. The first EAG to operate is the Cultural Heritage EAG. The second to be activated is the Resettlement EAG.

Interested parties are invited to participate in the development of the SSDS. The SSDS web site is constantly revised as the SSDS is developed. Information and tools generated by the SSDS are free online to all users. Participation and interaction facilities are available on the site at [www.ssds.info](http://www.ssds.info).

### For further information contact:

**Dr Stephen Davis,**  
**SSDS Project Director,**  
**ConGO Online,**  
**PO Box 1966,**  
**Midland, WA 6936, Australia**

**Tel: +61 8 9257 1859**  
**e-mail: [Stephen.Davis@Congogroup.com](mailto:Stephen.Davis@Congogroup.com)**  
**[www.ssds.info](http://www.ssds.info)**

# Mountain hazard research and mitigation

*Gareth Hearn, Scott Wilson Kirkpatrick & John Reynolds, Reynolds Geo-Sciences*

Landslides and floods cause extensive and repeated damage in many mountain areas. Landslides are predominantly triggered by heavy or prolonged seasonal rainfall, while floods are generated both by rainstorms and glacial activity at higher elevations. Evidence suggests that levels of risk associated with these hazards are increasing. Given this, the need for cost-effective hazard assessment and mitigation is unarguable, especially in developing countries where geo-environmental data and knowledge are often limited, and rates of rural development are accelerated.

During the last 20 years it has become clear that, despite the large body of literature on methods of landslide and flood hazard assessment, and of associated risk, local development agencies and even international planners and engineering consultants are often forced to make decisions based on inadequate data. This leads to such problems as the construction of roads in areas prone to landslides or floods, resulting in frequent road blockage. Decisions made during the project design stage are therefore crucial to the success of the engineering solution, and this places increased emphasis on the methods of assessment used in the planning phase.

Glacial hazards are symptomatic of global climate change, and a marked shifting of hazard zones is expected within a scenario of accelerated future warming. There is thus a need for a set of unambiguous criteria by which to assess and monitor the risk from hazards such as glacial floods, ice avalanches, and related phenomena. Increased objectivity within scientific studies, combined with a greater understanding of the processes involved, would aid the development of appropriate mitigation strategies for planning and engineering applications.

## Landslide risk assessment project (Project R7815)

This project is being undertaken by Scott Wilson Kirkpatrick & Co Ltd in association with the University of Durham, UK. It is aimed at developing rapid and easy-to-apply methods of landslide hazard assessment for rural access planning. As part of the research the project team undertook a global review of satellite remote sensing and landslide hazard and risk mapping techniques, and from this developed an idealised approach to low-cost and rapid methods of assessment for planning and engineering applications in the Himalayas. The methods proposed have been tested in Nepal and Bhutan using a range of satellite

imagery for a total of five study areas. This has demonstrated that Landsat 7 ETM+ represents the most cost-effective imagery for route planning purposes, providing a good combination of spatial and spectral resolution, and affordability. Aerial photography offers considerably greater resolution in landslide identification and interpretation, but suffers from problems of scale distortion and the effects of shadows.

**The DFID is currently sponsoring two research projects aimed at improving and testing methods of landslide and glacial flood hazard and risk assessment for rural access development in mountain regions, focusing on less economically developed countries in which the problems are most critical. At an introductory seminar in Kathmandu in April 2001 the aims and research methodologies being adopted by the two projects were presented and discussed. In November 2002 a seminar will be held in Kathmandu to present the results of both projects, which by then will have finalised their research phases. In addition, invited national and international speakers will present and discuss the results of their own work.**

Based on five project areas in Nepal and Bhutan, the team used GIS to test the effectiveness of a range of landslide susceptibility mapping techniques against a database of landslide locations derived from remote sensing and field mapping. These schemes ranged from simple systems, based merely on slope and geology as input parameters, to multi-factor analysis incorporating data derived from remote sensing, terrain evaluation, assessments of structural geology,

*“... the project team is also developing guidelines for land use and engineering management in landslide areas, together with methods of assessing elevated landslide risk caused by man-made factors ...”*

and meteorological datasets. Perhaps surprisingly, it was found that schemes based simply on slope angle and geology perform best, with success rates for predicting landslide locations in excess of 70%. Using these simple models, and incorporating landslide frequencies and estimates of run-out lengths, prototype landslide hazard maps have been developed, and these have been combined with land use, infrastructure and population datasets to yield prototype risk maps.

In addition to the mapping elements, the project team is also developing guidelines for land use and engineering management in landslide areas, together with methods of assessing elevated landslide risk caused by man-made factors. Testing of the schemes and the guidelines being developed is being performed by the Ministry for Local Development in Nepal, and further analyses are planned in conjunction with the DFID Nepal Rural Access Programme.



Slope failure and loss of carriageway on the Prithvi Highway, Nepal.

## Seminar: Kathmandu, 18–22 November 2002

The November 2002 seminar in Kathmandu will include presentations and discussions on the Himalayas research projects, together with selected presentations from other researchers and practitioners. There is no fee for registration. Lunch and refreshments, together with introductory and closing dinners will be provided free of charge. Unfortunately, with one or two of the most deserving exceptions, delegate travel and accommodation cannot be provided. In order to stimulate detailed discussions the number of delegates is limited to a hundred. To avoid disappointment the organisers would be grateful if you would register your intention to attend as soon as possible, and provide a half page synopsis of any work that you would like to present. Please address this to: [gareth.hearn@scottwilson.com](mailto:gareth.hearn@scottwilson.com)

## Glacial risk assessment project (Project R7816)

This project is being undertaken by Reynolds Geo-Sciences Ltd. The aim is to develop improved methods of hazard and risk assessment as an aid to appropriate disaster preparedness for planning and engineering applications. Research has concentrated on developing analytical methods for the pilot project area in the upper Solukhumbu District of Nepal. The region, a popular tourist destination, displays a wide range of glacial environments and has a history of catastrophic lake outbursts. Global concepts and procedures of glacier inventory compilation have been reviewed and modified in order to be more appropriate for hazard studies. In common with findings from the DFID landslide risk assessment project, Landsat ETM+ data are seen as a very cost-effective resource for first order terrain assessments.

*“... glacial hazards are symptomatic of global climate change, and a marked shifting of hazard zones is expected within a scenario of accelerated future warming ...”*

Whilst visible and near infra-red satellite data provide important baseline information, alone they are insufficient for detailed hazard assessment. Complementary field methods were tested in the area of Imja Tsho, a 1.4 km long by 0.5 km wide lake that has developed on the composite terminus of Imja and Lhotse Shar Glaciers, just south of Mount Everest. Geomorphological mapping, applied glaciology, geo-



Sabal Tsho glacial lake burst in September 1998 discharging about 15 million cubic metres of water and debris into the Hinku Valley in N.E. Nepal. The flood route has been examined in order to consider empirical relationships between valley characteristics and flood damage as an aid to vulnerability mapping techniques.

Shaun Richardson © RGSL, 2000.

physics, geotechnical studies of materials and slopes, and supporting topographic surveys have been undertaken. An integrated hazard assessment of the Imja glacial system has resulted from this technique-orientated research. The final piece of the risk assessment 'jigsaw' includes an evaluation of the methods needed to determine the consequences of a glacial lake outburst or other glacier-related hazard. Engineering geological and geomorphological mapping schemes were reviewed; however, uncertainties remain over the prediction of flood behaviour for these relatively high magnitude and low frequency events.

The risk assessment procedures are being tested on glacial lake and ice-avalanche problems in the Cordillera Blanca region in Peru. Good practice guidelines are being developed and will be tested by the Natural Resources Institute (INRENA) in Peru, whilst strategy documents are to be considered in conjunction with the Civil Defence National Institute (INDECI).

## For further information contact:

**Dr Gareth Hearn,**  
Scott Wilson Kirkpatrick and Co. Ltd,  
Scott House, Basing View, Basingstoke,  
Hampshire RG21 4JG, UK  
Tel: +44 (0) 1256 461161  
E-mail: [Gareth.Hearn@scotwilson.com](mailto:Gareth.Hearn@scotwilson.com)  
[www.scott-wilson.com](http://www.scott-wilson.com)

**Dr John Reynolds,**  
Reynolds Geo-Sciences, 2 Long Barn,  
Pistyll Farm, Nercwys, Mold, Flintshire,  
CH7 4EW, UK  
Tel: +44 (0) 1352 756196  
E-mail: [rgsl@geologyuk.com](mailto:rgsl@geologyuk.com)  
[www.geologyuk.com](http://www.geologyuk.com)

# Self-help toolkit to construct a geoscience metadata system

John Laxton, British Geological Survey, Project R8035

A KaR project entitled *Self-help toolkit to construct a geoscience metadata system* has just been initiated, and is intended to run from December 2001 to November 2003.

The aim of the project is to develop a generic self-help 'toolkit' for compiling, digitising, managing and disseminating geoscientific metadata for use by geological surveys and external users. Our initial collaborators are the regional geoscience organisations and individual geological surveys in both south-east Asia and southern Africa, including the Geological Survey of Malawi, the Korea Institute of Geology, Mining & Materials, and CCOP. It is hoped that other organisations will also participate in the project.

One of the first activities undertaken under the project was participation in the *Symposium on Geoinformation via Internet* and the *International Workshop for CCOP Metadata* which were held back-to-back from 18th to 22nd at Tsukuba, Japan, hosted by the Geological Survey of Japan (GSJ). Attendees at these meetings included representatives from the geological survey organisations (GSOs) of most CCOP member countries, along with some European GSOs, and provided an excellent forum to discuss objectives and progress on disseminating geoscientific data over the internet.

Metadata is central to internet data dissemination and in recognition of this, CCOP is embarking on the development of a 'CCOP Metadata System'. This is intended to be web-based and in the first instance will concentrate on metadata concerned with the geological map holdings of the member countries. It was agreed that the DFID 'Metadata Toolkit' project would work closely with CCOP on this activity, with tools and procedures developed by the project being provided to CCOP for trialing and customisation within the CCOP context. This will enable the project to draw on the different experiences and requirements of a range of GSOs at different stages of IT development within one geographic region. The project hopes to apply the lessons learnt here to the requirements of other parts of the world, particularly southern Africa.

## UK Data Protection Act

We hold the Earthworks mailing list as a computer database. Unless we hear to the contrary we assume that all the named recipients of this newsletter have no objection to their details being recorded in this way.

## Current projects

R7354, G1 Mercury-free coal-gold agglomeration (CGA) process for gold. (Professor Michael Mingos, Imperial College of Science Technology and Medicine)

R7410, G1 Low-cost lime for small-scale farming (FARMLIME). (Clive Mitchell, British Geological Survey)

R7416, G1 Sustaining communities through mine waste reclamation. (David Harrison, British Geological Survey)

R7411, G2 Environmental controls in iodine deficiency disorders. (Chris Johnson, British Geological Survey)

R7815, G2 Landslide risk assessment in the rural access sector. (Gareth Hearn, Scott, Wilson Kirkpatrick & Co Ltd)

R7816, G5 Glacial hazard risk minimisation in rural environments. (John Reynolds, Reynolds Geo-Sciences Ltd)

R8035, G5 Self-help toolkit to construct a geoscience metadata system. (John Laxton, British Geological Survey)

R8036, G2 Socially sustainable development strategy. (Stephen Davis, Congo-Online Ltd)

## Recently approved projects

G1-02 Sustainable regeneration in mining areas of Goa, India. (Mr Sridharan, Tata Energy Research Institute, New Delhi)

G2-09 Enhancing volcanic hazard avoidance capacity in Central America through local remote sensing and improved risk communication. (Dr Wooster, Kings College, London)

## KaR website

For more information on KaR geoscience projects visit [www.bgs.ac.uk/dfid-kar-geoscience](http://www.bgs.ac.uk/dfid-kar-geoscience)

## Other DFID Newsletters in the same series

ENERGY

TRANSPORT

URBANISATION

WATER

## Contact addresses

Earthworks, David Greenbaum,  
British Geological Survey,  
Keyworth, Nottingham NG12 5GG, UK  
Tel. +44 (0) 115 936 3224  
Fax. +44 (0) 115 936 3474  
E-mail: [dgree@bgs.ac.uk](mailto:dgree@bgs.ac.uk)  
Web: [www.bgs.ac.uk/dfid-kar-geoscience](http://www.bgs.ac.uk/dfid-kar-geoscience)

Energy, Ms Gill Wilkins,  
Future Energy Solutions, AEA Technology  
Harwell, Didcot, Oxfordshire OX11 0QJ, UK  
Tel. +44 (0) 1235 433128  
Fax. +44 (0) 1235 432331  
E-mail: [gill.wilkins@aea.co.uk](mailto:gill.wilkins@aea.co.uk)  
Web: [www.etsu.com/dfid-kar-energy/](http://www.etsu.com/dfid-kar-energy/)

Transport, Linda Parsley,  
International Division, TRL Limited,  
Old Wokingham Road,  
Crowthorne, Berkshire RG45 6AU, UK  
Tel. +44 (0) 1344 770551  
Fax. +44 (0) 1344 770356  
E-mail: [international\\_enquiries@trl.co.uk](mailto:international_enquiries@trl.co.uk)  
Web: [www.transport-links.org/transport\\_links/newsletter/newsletter.asp](http://www.transport-links.org/transport_links/newsletter/newsletter.asp)

Urbanisation, Darren Saywell,  
Water, Engineering and Development Centre,  
Loughborough University of Technology,  
Loughborough, Leicestershire LE11 3TU, UK  
Tel. +44 (0) 1509 222885  
Fax. +44 (0) 1509 211079  
E-mail: [wedc@lboro.ac.uk](mailto:wedc@lboro.ac.uk)  
Web: [www.lboro.ac.uk/garnet/UrbanKaR/dfid-kar-urban.html](http://www.lboro.ac.uk/garnet/UrbanKaR/dfid-kar-urban.html)

Water, Geoff Pearce,  
HR Wallingford Limited,  
Howberry Park, Wallingford, Oxon OX10 8BA, UK  
Tel. +44 (0) 1491 822439  
Fax. +44 (0) 1491 826352  
E-mail: [g.pearce@hrwallingford.co.uk](mailto:g.pearce@hrwallingford.co.uk)  
Web: [www.hrwallingford.co.uk/projects/dfid-kar-water.html](http://www.hrwallingford.co.uk/projects/dfid-kar-water.html)

## Earthworks is published by:

The British Geological Survey on behalf of the Department for International Development.

The views expressed are not necessarily those of DFID.

Editor: David Greenbaum  
Sub Editor: Joanna Thomas  
Design: Adrian Minks  
Production: James Rayner  
Printed by: Hawthornes, Nottingham  
PRINTED ON RECYCLED PAPER