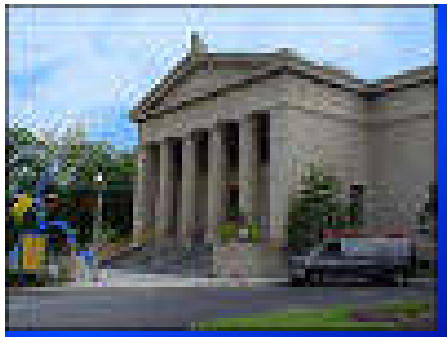
LIMESTONE MINING

Threats and Mitigation

No endangered species such as elephants or tigers are found on the hill, so there is no reason not to destroy it.



Basics

- Limestone is a source of cement, stone, and lime
- Quarrying is a one-time, non-sustainable use
- Karst landscapes attract tourists (revenues)
- Intrinsic values usually not considered or is severely undervalued
- Proper planning of limestone exploitation areas and their biodiversity is a wise way to ensure the durability and health of ecosystems on which human (and other) populations depend.

Limestone Quarrying Impacts

- Impacts local but frequently extensive
- Some impacts reach far beyond the actual boundaries of the quarry
- Much quarrying is uncontrolled
- Areas which until a decade ago were fine limestone landscapes are now noisy and dusty, impoverished, and have silted rivers
- Complete hills may be consumed with the total obliteration of all plant and animal life in just a few years

Main Impacts

- **Limestone dust**. Spreads during dry weather, leaches into the soil during storms and harmful effects on the flora and fauna. Under control in modern factories.
- **Blasting to break up the rock**. Sets off vibrations, cause stalagmites and stalactites to break off, cave roofs to crack or collapse. New cave cracks can alter environmental conditions

Main Impacts (2)

- **Changes in hydrology**. Caves with underground streams opened up in the quarry face may empty into the quarry instead. Detrimental effects on the ecological communities downstream.
- **Water pollution**. Large amounts of silt, and other effluents of quarries (waste, fuel, oil).

Main Impacts (3)

- **Collateral damage**. Quarry workers: fishing, hunting, using water for household purposes, improper waste disposal, collecting fuel-wood, etc.
- **Loss of natural habitat**. This occurs either as a direct result of the removal of the rock or as a result of fuelwood collecting, fire, etc.

Changes in hydrology

- Excessive extraction of water may cause the drying up of above-ground and underground systems in limestone areas
- Quantity of water and the availability of nutrients change
- Can lead to possible collapse as flooded cavities become air-filled
- Alterations of flow patterns can lead to the extinction of whole communities

Changes in hydrology (2)

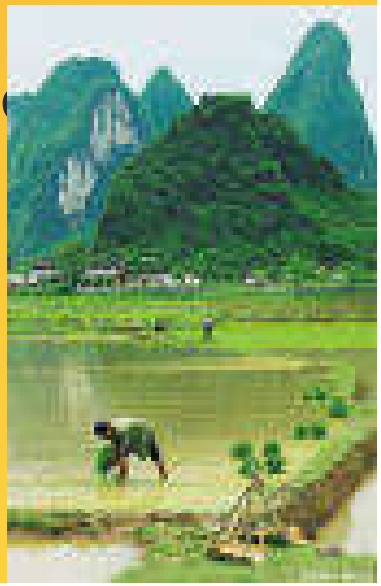
- Small water bodies, which may be inhabited by small-size, site-endemic fish species and snails, will disappear, and with them the species
- Longitudinal movements and migrations of fish interrupted

Fire and Other Disturbances to the Vegetation Cover

Limestone bedrock retains very little rainwater, so vegetation tends to dry out seasonally

Burning more frequent as agriculture extends towards the borders of a limestone area - fires started by farmers to clear land

Burns upwards, consumes the vegetation top of the hill.



Impacts of Fire

- Limestone vegetation under seasonal or *dry* climates have a natural resistance and may recover
- Limestone vegetation under *wet* climates has little or no resistance; a fire may destroy it (and the soil)
- All above-ground animal communities will be badly affected, and many will disappear
- Original forest tends to be replaced by grasses

Loss of Animals

- Without protection of a tree canopy, the damp and dark, conditions around the hill base are lost, together with most of the endemic species, plants and animals alike
- For arthropods a slight disturbance of the vegetation may lead to a temporary depletion of the local biodiversity
- But many invertebrate species depend on one plant species for food or propagation; these are eliminated when the native vegetation is entirely destroyed

Soil Loss and Impacts

Higher up a limestone hill most soil occurs in rock crevices, where it may be protected from burning. Good news?

No, subsequent exposure to the sun make these pockets inhospitable to much of the original fauna

Underground communities will also suffer

If the above-ground vegetation has been removed, the underground formation of stalactites and stalagmites may stop, the cave environment may dry out

Secondary/Indirect Impacts of Fire

- Impacts may be made worse by the filling up of rock crevices
- Mixture of clay, ashes, and burned remnants of vegetation fills fissures, preventing water and nutrients reaching caves/voids
- Swiftlet and bat populations can be drastically reduced in numbers by fires in the surroundings of their roosts, and by the smoke
- [Guano and nests]

Disturbance of Important Archaeological and Cultural Sites

Archaeological remains are non-renewable; once disturbed, restoration is impossible

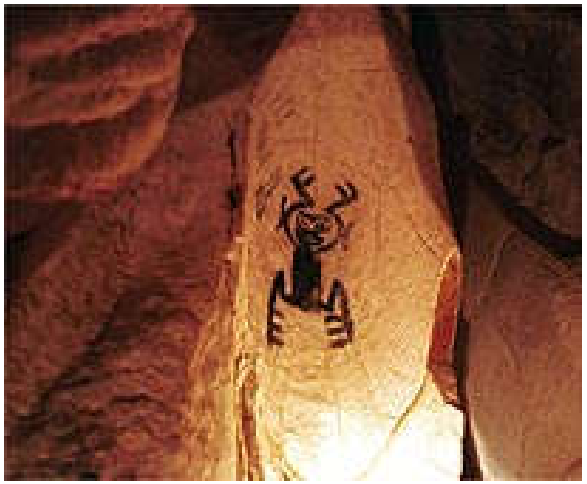
The archaeological record in the East Asian karst regions is seriously threatened by quarrying (also by the digging of guano piles for phosphates, and by tourist exploitation)

Archaeologically-important deposits are seldom recognised, and the ancient remains are annihilated or discarded as refuse

A finite source of information about our past is destroyed before it has been assessed and recorded

CNN.com

Ancient cave art threatened by mining in Dominican Republic



January 10, 2001
Web posted at: 12:48 p.m. EST (1748 GMT)

SAN CRISTOBAL, Dominican Republic (AP) -- Ancient drawings on cave walls, the work of a now-extinct people, are being threatened by modern man's need for concrete blocks and heartburn relief.

More than five centuries ago, Christopher Columbus landed on this island and set in motion events that would wipe out its Taino Indians. Now limestone mining threatens some of the last remaining evidence that Tainos ever lived here: thousands of drawings and carvings left in caves they considered a sacred site of the beginning of creation.

Here are copulating birds that themselves became extinct, a fish, lizards, cute figures that look like creatures from another planet -- drawings in charcoal that one could imagine influencing Picasso. Archaeologists believe the oldest drawings are up to 2,000 years old, but no one is certain because you would have to destroy them to carbon-date them.

"These caves have been compared to the pyramids of Egypt in terms of their importance to Caribbean native culture," says Domingo Abreu, who has been exploring the caves for more than 20 years and gives tours to students and tourists.

Impact Mitigation

Exploitation of limestone for industrial purposes throughout ASEAN has serious impacts on limestone and its biodiversity, aesthetic, cultural and archaeological values

BUT

NOT ALL IMPACTS INEVITABLE !!!

Regeneration after disturbance

The regeneration of animal biodiversity depends largely on the regeneration of the vegetation cover and the residual fauna

Can takes decades for limestone vegetation under a permanently wet tropical climate to recover to a degree where it will support significant populations of native species.

Determined in large part by the time required to develop a new soil layer.

Regeneration after disturbance (2)

- Typically, non-native community develops. Provides *some* shelter for the remnants of original soil fauna, but may displace local species
- Planting native trees may help regeneration of the original vegetation - restores soils and right conditions for plants to re-establish
- Monocultures of exotic trees are useless - do not offer the habitats/host plants of native forest

Recovery of Cave Fauna

Not (*totally*) impossible

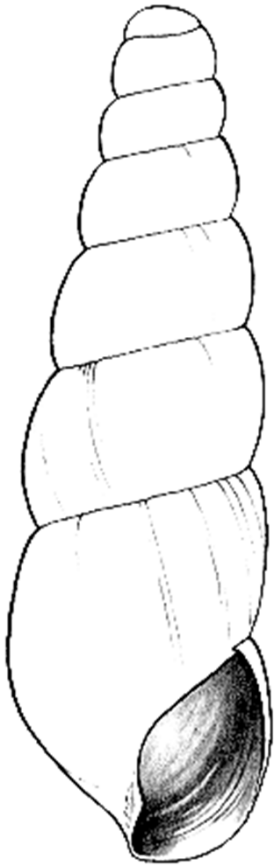
Depends on degree of disturbance and presence of remnant populations of the cave animals in small passages (not accessible to humans)

To assist recovery, the removal of pollutants is particularly important, and even the reconstruction of elements of the cave could be considered

- Capacity to re-colonise a site after disturbance differs for each species
- General rule: the most specialised species, which are the first to go will be the last to return
- Actively flying insects or wind-dispersed arthropods (some spiders for instance) may well be the first to arrive
- Wingless soil- and cave-restricted species will have to walk in – **SLOW**!

Crucial to a successful recovery are the last remnants of the original vegetation cover

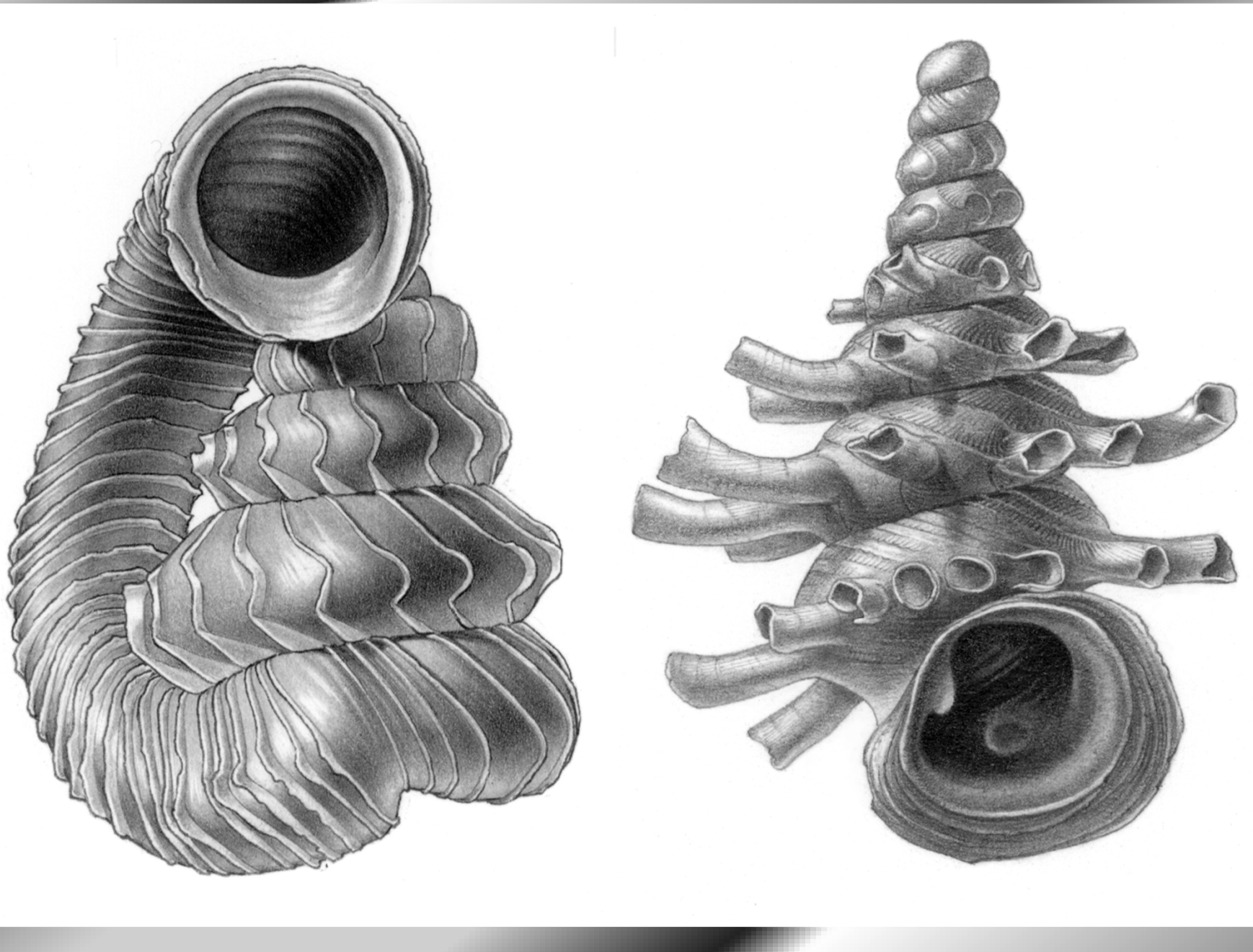
These serve as refuges for the fauna, and for rapid re-development of a cover of secondary growth, so that a moist microclimate is maintained.

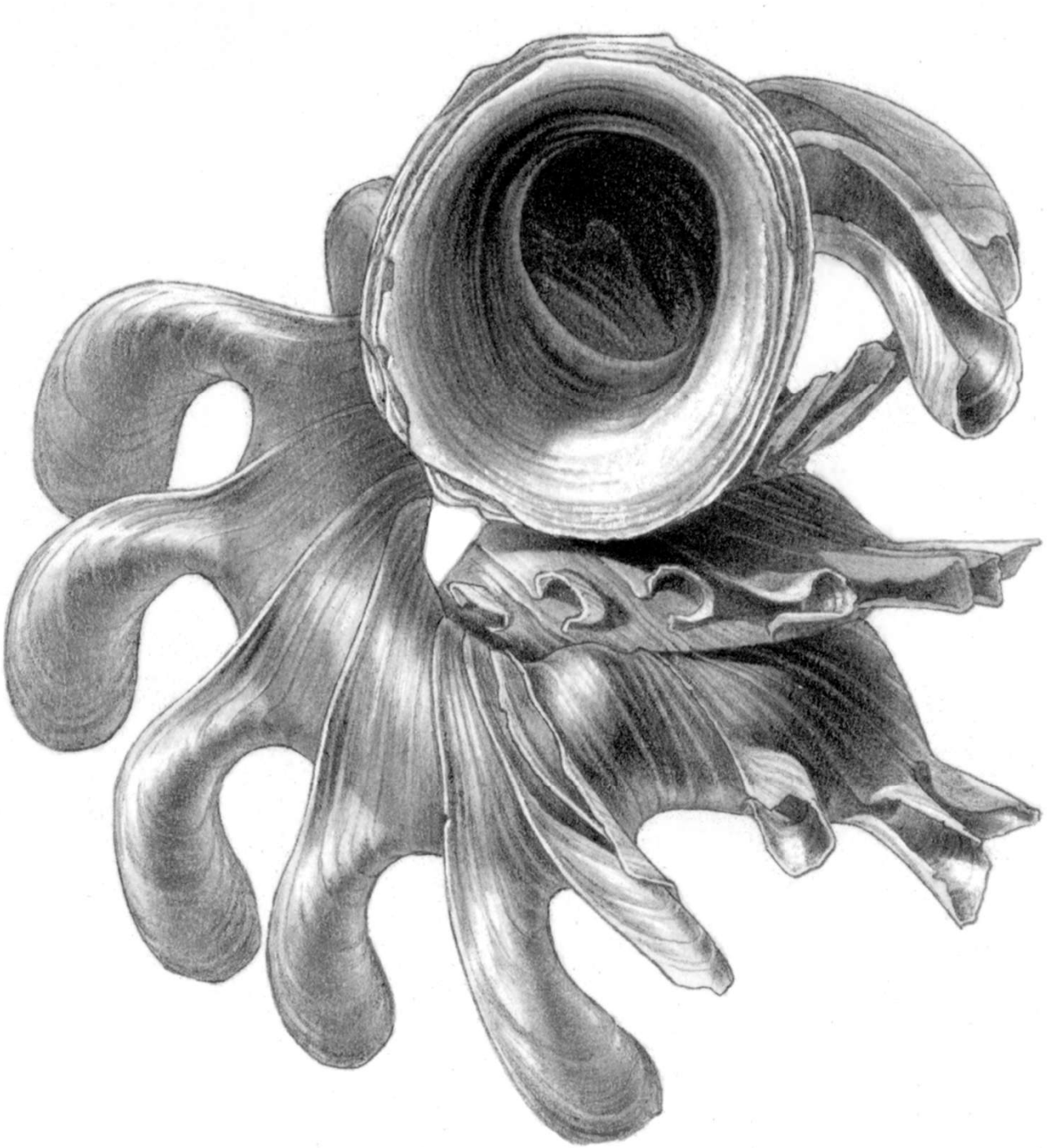


Dull, common, unattractive, gardens-to-mountains, invasive, ‘weed’

And now for something completely different …

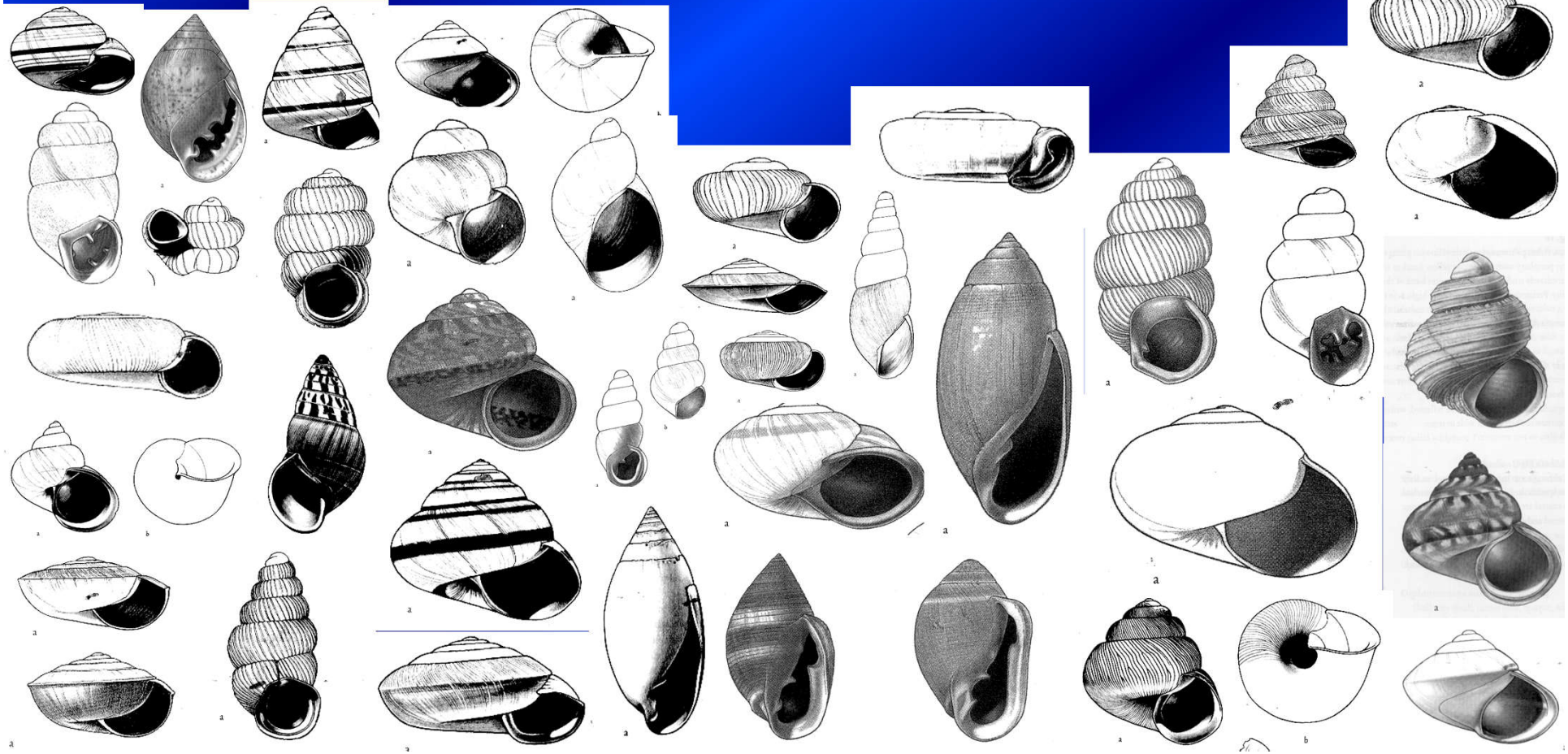
SNAILS





CUC PHUONG

WORLD RECORD: 93 species / bag




THE NEW YORKER
"I don't care if she is a tape dispenser. I love her."
SGROSS

Site Selection Principle

Select sites so that, after extraction of the stone, the total 'loss' is as low as possible

i.e. the lowest total of the lost economic value the loss of resources other than the amount of limestone extracted from the quarry), biological value (loss of biodiversity, loss of rare environments), scientific and cultural values (religious, historical, archaeological), and aesthetic values.

Selecting Sites for Exploitation

Assuming no alternative materials can be sourced, such as granite for road aggregate, consider:

A site should be in an area that has already been impacted in some way - limestone hills with a badly depleted vegetation cover, or with polluted cave systems, are to be preferred above good quality limestone hills

Wherever possible, dolomitic limestone should be exploited instead of high-calcium limestones (but dolomites may not meet criteria for specific industries)

.

Preferably …

- A quarry site should be located in the largest limestone areas.
- A site should never extend over the entire area, but always leave a substantial part of it untouched
- In large limestone areas, species may well occur that are endemic to the area as a whole, but species endemic to just a small portion of it are unlikely
- A well-contained and well-managed quarry in a part of a large limestone area is least likely to lead to the extinction of species.

Avoid …

Isolated limestone hills -

The most isolated limestone hills tend to host the largest numbers of site-endemic species

Also avoid…

- Small quarries where one large quarry in the same block is possible
- Exploitation from top down - *when exploitation ceases, recolonization by plants etc. easiest if remnants occur above scars*
- Sites with numerous caves
- Sites with many small voids (millimetres to centimetres wide)
- Sites in areas with underground streams and springs

And avoid too much blasting

- Techniques available to reduce shock waves
- If bat or swiftlet colonies are present, blasting should be interrupted at the time when the animals fly out to feed, or return to their roost
- Blasting should not take place at the entrance of caves, or in a position so that the sound is directed at the opening of the cave.
- Blocking of cave passages to protect the inside environment, should be temporary - *long-term blocking could result in serious changes in the cave environment*

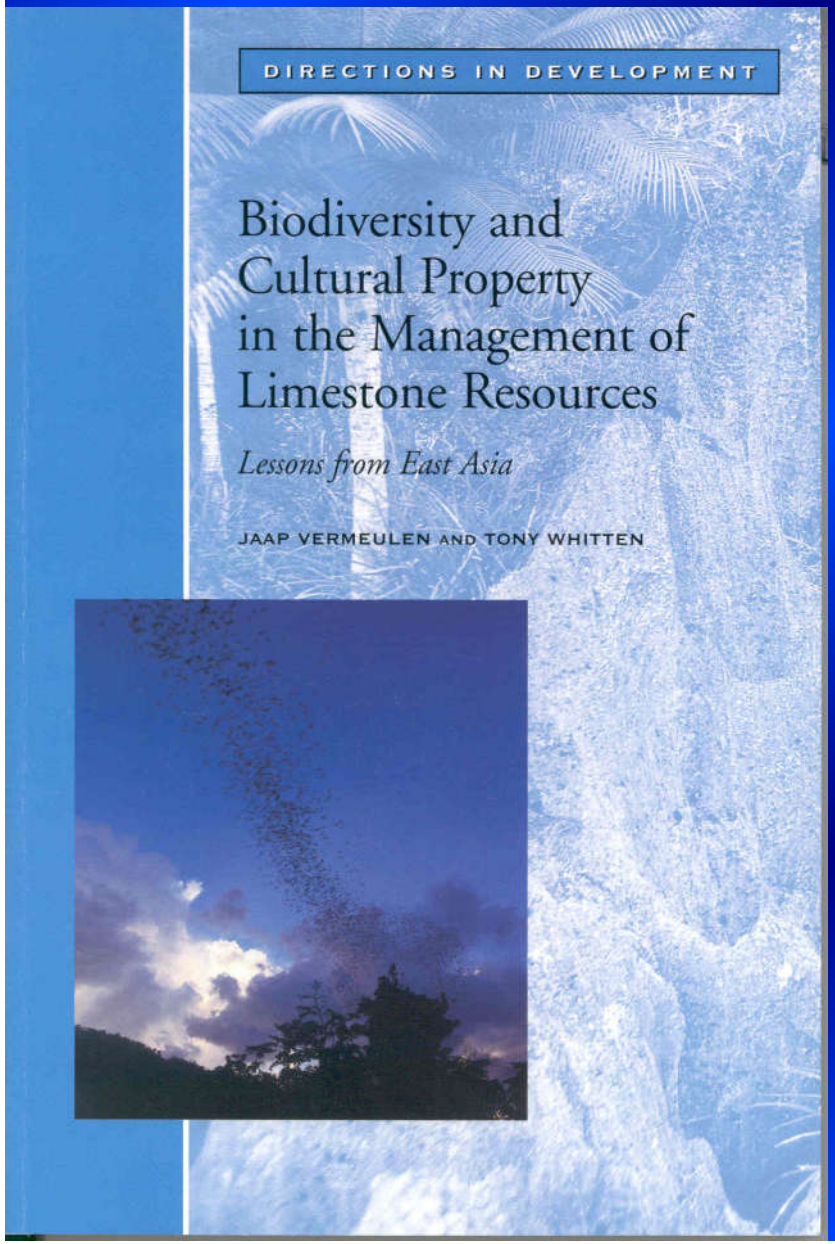
Consultants/Manpower

Assessment needs ***competent*** consultants for each subject:

- good reputation and experience,
- good regional knowledge,
- proven ability to translate scientific information into practical recommendations
- knowledgeable on cave/karst biodiversity/cultural issues

Elements for consultant Terms of Reference

Download from
www.worldbank.org/biodiversity
click: Publications



REMEMBER!

- The degraded state of a habitat does not automatically justify further conversion
- All natural habitats may have a high biodiversity value, as well as a high ecological/cultural significance
- Biodiversity assessments should address the context in which the project is located
- A biodiversity analysis should not be based on a single group of organisms

Damage should be reduced by a *less wasteful use of cement*, so that less is needed - by using bricks (of mud and laterite), other rock types for road aggregate, and products from sustainably-managed plantation forests wherever possible

Emergency collecting and *ex situ* conservation

- *If* destruction of important biodiversity or archaeological sites is inevitable even after a careful search for alternative sites, steps must be taken to safeguard relevant information
- A team of appropriate specialists should sample the biodiversity/archaeology of the site
- The samples should be distributed over a range of museums/institutions inside and outside the country for storage
- Descriptions of the samples should be published, and their whereabouts stated

Ex Situ

Ex-situ conservation of plants

Attempts to lure colonies of bats and swiftlets to artificially-made roosting places have been successful in several occasions (old, disused underground mines have be made suitable for inhabitation by bats)

Ex situ actions are *additional*, not *alternatives*

Reconstruction

- Disused quarries may develop into a hazard for visitors and the local population because of collapsing rock faces, or because of stagnant pools in which the vectors of various diseases to humans and cattle may flourish
- 'Terminal blast' before abandoning the quarry to reduce these risks wherever necessary should be part of each project.
- Quarries leave long-lasting scars in landscapes
- Slopes can be re-modelled to replicate the surrounding landscape
- Colonization by plants and animals can be facilitated

Restoration Blasting

Before ….. After

Other Uses

Converted into town parks

Exploited as fish ponds

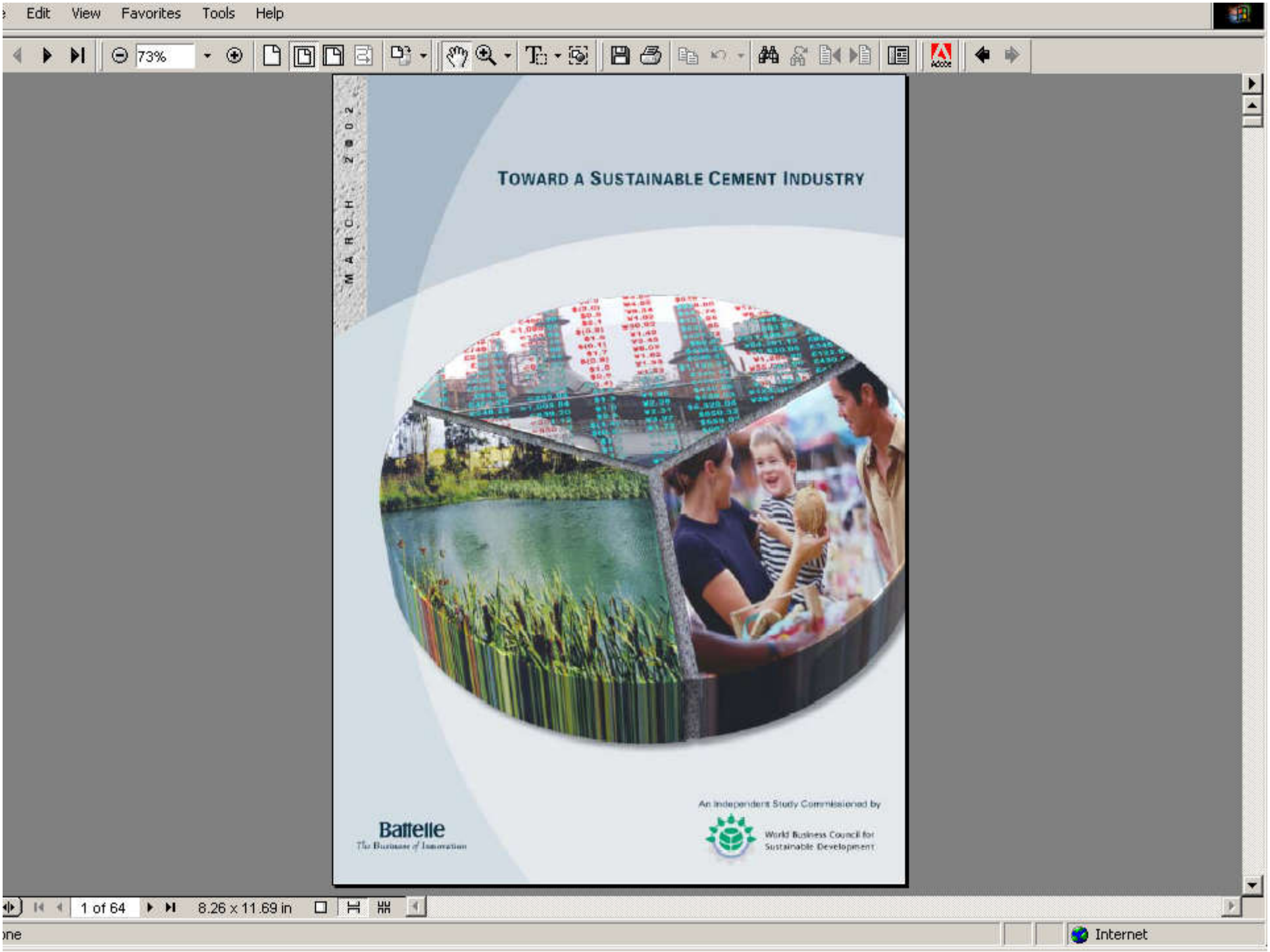
Convert into water reservoirs

Even a crocodile farm and major tourist attraction

BUT

Use as waste dumps should be discouraged

So ?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MARCH 2002
TOWARD A SUSTAINABLE CEMENT INDUSTRY
Battelle
The Business of Innovation
An Independent Study Commissioned by
World Business Council for Sustainable Development
1 of 64
8.26 x 11.69 in
Internet

The report lists **8 major topics** that will shape the cement industry's path toward a more sustainable future in the next 20 years:

- **resource productivity**: improving eco-efficiency through improved practices in quarrying, energy use and waste recovery and reuse
- **climate protection**: understanding and managing CO2 emissions
- **emission reduction**: reducing dust from quarrying, NOx, SOx, and other airborne pollutants from cement manufacture
- **ecological stewardship**: improving land use and landscape management practices
- **employee well-being**: managing and improving employee health, safety, and satisfaction
- **community well-being**: working more effectively with local communities
- **regional development**: participating in regional affairs
- **shareholder value**: creating more value for shareholders research.

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Canada, Office of Energy Efficiency, November 15, 1998 Vol. II No. 22

In manufacturing 1500M tonnes of Portland cement each year worldwide, an equivalent amount of CO2 is released into the atmosphere

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About the Initiative

The Cement Sustainability Initiative (CSI) was formed to help the cement industry to address the challenges of sustainable development. The business leaders of a group of major cement companies lead the initiative.

Its purpose is to:

- explore what sustainable development means for the cement industry
- identify and facilitate actions that companies can take as a group and individually to accelerate the move towards sustainable development
- provide a framework through which other cement companies can participate
- provide a framework for working with external stakeholders

About the Industry

The industry produces 1.6 billion tons of cement annually- a 'glue' which holds together much of our modern global infrastructure.

Find out about how cement is made, sources of information on the industry in general, and why the industry is concerned about sustainability.

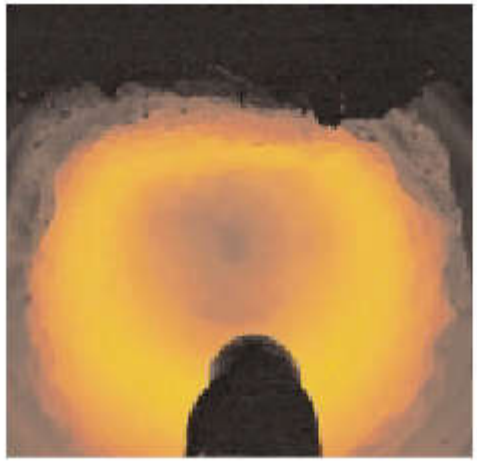
one Internet

Sustainable Cement

The newsletter of the WBCSD Cement Sustainability Initiative

Issue 4 September 2003

New Members coming on board



A year has now passed since the launch in Paris last July of the Cement Sustainability Initiative's (CSI) Agenda for Action on sustainable development by

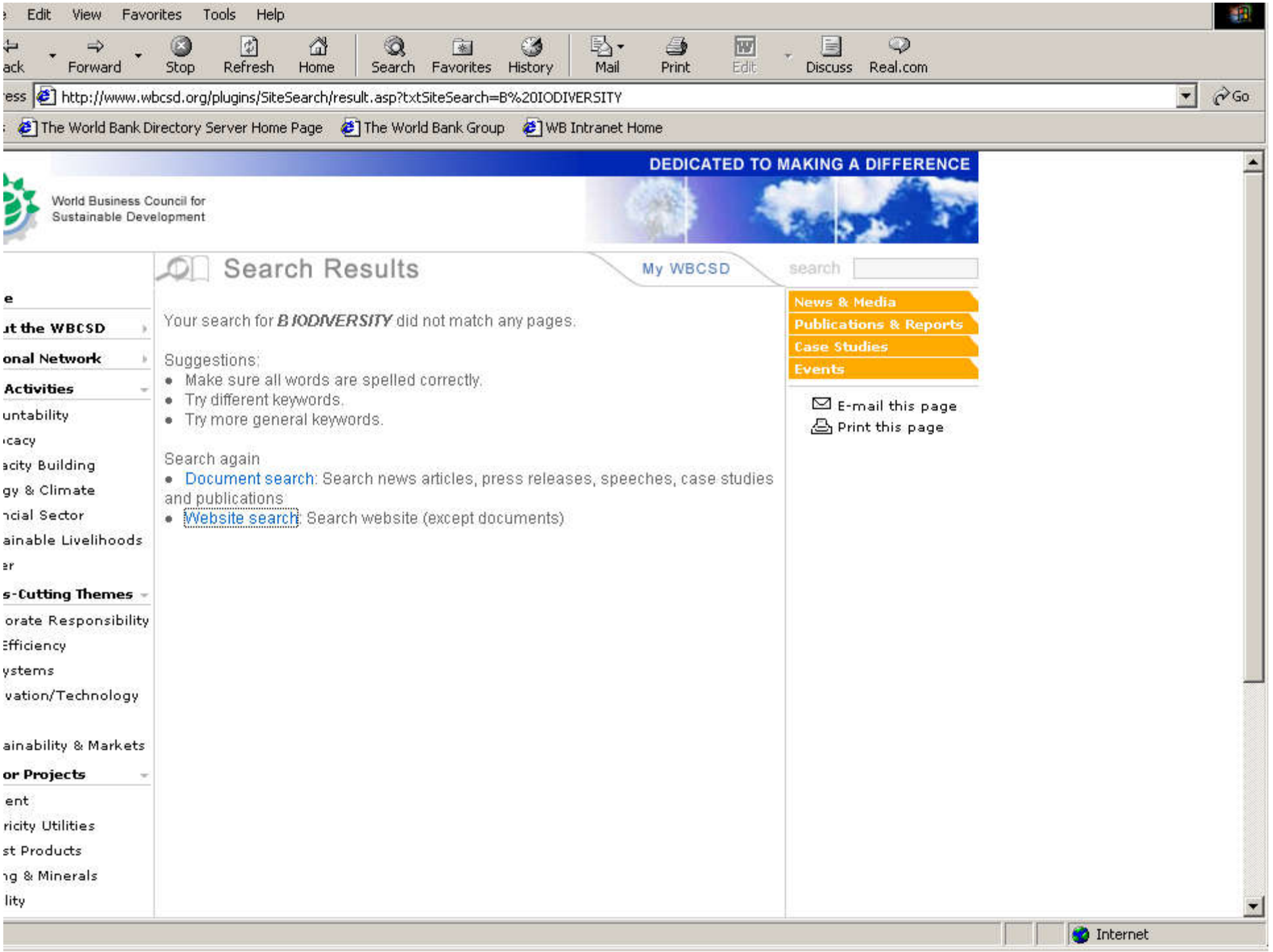
Following the WSSD in Johannesberg last year the CSI is pleased to welcome three new members on board:

Titan Cement, Greece

The sole Greek-owned cement maker has ranked high among the country's ten largest private industries for more than 100 years. The company operates eleven cement production facilities, with an annual capacity of 14 million tons - 8 million tons of which is produced outside Greece in the USA, Egypt, and the Balkans. The company also operates 67 ready mix concrete facilities in Greece and the USA (annual capacity 4.5 million cubic meters), 11 quaries and three mines. Titan Cement was a founding member of the WBCSD in 1992 and has rejoined in 2003.

CRH plc, Ireland

Headquartered in Ireland, CRH has operations in 22 countries. CRH core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Try more general keywords.
Search again
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Website search: Search website (except documents)
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Sustainable development

Partnerships

Global partnerships / Local partnerships / Memberships / Our partners' point of view

In-depth collaboration with our partner WWF / A local-global partnership with Habitat for Humanity / Care : the fight against HIV / AIDS

In-depth collaboration with our partner WWF

In March 2000, Lafarge and WWF, the conservation organization, signed a worldwide partnership agreement. Lafarge's objective in making this commitment was to undertake a continuous improvement drive in the area of environmental protection. The partnership reflects the Group's conviction that its policy in support of environmental preservation will ultimately give the company a competitive edge.
Lafarge is a Founding Member of the WWF Conservation Partner program and supports WWF's Forest Landscape Restoration work. Under the worldwide partnership agreement, Lafarge has finalized its quarry rehabilitation policy which integrates a strategy for biodiversity aimed at restoring the ecological value of quarries; implemented environmental performance indicators and objectives; and published its first sustainable development report. In addition, Lafarge made a commitment in November 2001 to reduce its CO2 emissions.
At the local level, several of Lafarge's Business Units have worked with the national organizations of WWF on issues such as quarry rehabilitation, environmental

Lafarge locations

Your contacts for sustainable development

Download kit

2d edition of our Sustainable Report

This report covers our economic, social and environmental performance over 2002.

More

Batimat

Lafarge at Batimat 2003, the international building exhibition.

More

Our job offers

Discover our job offers and the varied career possibilities available within the Lafarge Group.

More

Staying in Harmony with Nature

A century long commitment to the environment

For almost a century, we've worked to operate our business with care for our people, our communities, and our environment. Our responsibility—as well as the effort and resources we've invested in environmental protection and promotion—have grown as we've grown: from our early efforts to build a safe and healthy workplace environment, to the World Environmental Center's Gold Medal for International Corporate Achievement in 2002.

Endorsed at the top

Our commitment to environmental protection is endorsed at the highest levels of our company. Our Board of Directors and Chairman and CEO drive the environmental policies and strategy setting for the entire organization through periodic reviews of our environmental policy and EHS indicators.

Important environmental programs and initiatives

Our worldwide operations continuously implement new programs and initiatives to improve their environmental performance, minimize their environmental impact, and promote a better quality of life for their people and neighboring communities. Our EHS Reports review the results of the following environmental programs, which are implemented everywhere we operate, and enable us to continuously benchmark and improve our worldwide performance.

- Eco-efficiency program
- Air emissions control program

Related Links

Community Outreach
We're committed to building a better society.

LHZ WEC Medal Ceremony Speech
Reed our CEO's remarks in the WEC Gold Medal Award Ceremony.

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Environmental responsibility

Cement production requires intensive use of natural raw materials and energy. It also results in emissions to the atmosphere, the most significant being carbon dioxide (CO_2). That is why eco-efficiency is at the core of our business - producing more cement while using fewer resources and producing less waste and pollution per tonne. We aim to continuously improve our performance and increase our understanding of the challenges we face in moving towards environmental sustainability.

To support this commitment, we have developed and implemented our corporate environmental policy. There are four main pillars of Holcim's environmental policy, for which we have assigned principles to guide our progress.

The policy pillars are:

- Management systems, to ensure a structured approach More
- Resources utilization, to promote eco-efficiency More
- Environmental impacts, to measure our performance and promote best practice More
- Stakeholder relations, to report publicly on compliance, performance and progress More

Related information
Environmental responsibility
Management systems
Resources utilization
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Stakeholder relations
Summary of targets
Environmental policy
Fact sheet: environment
Cement manufacturing process
Acronyms, formulae and glossary

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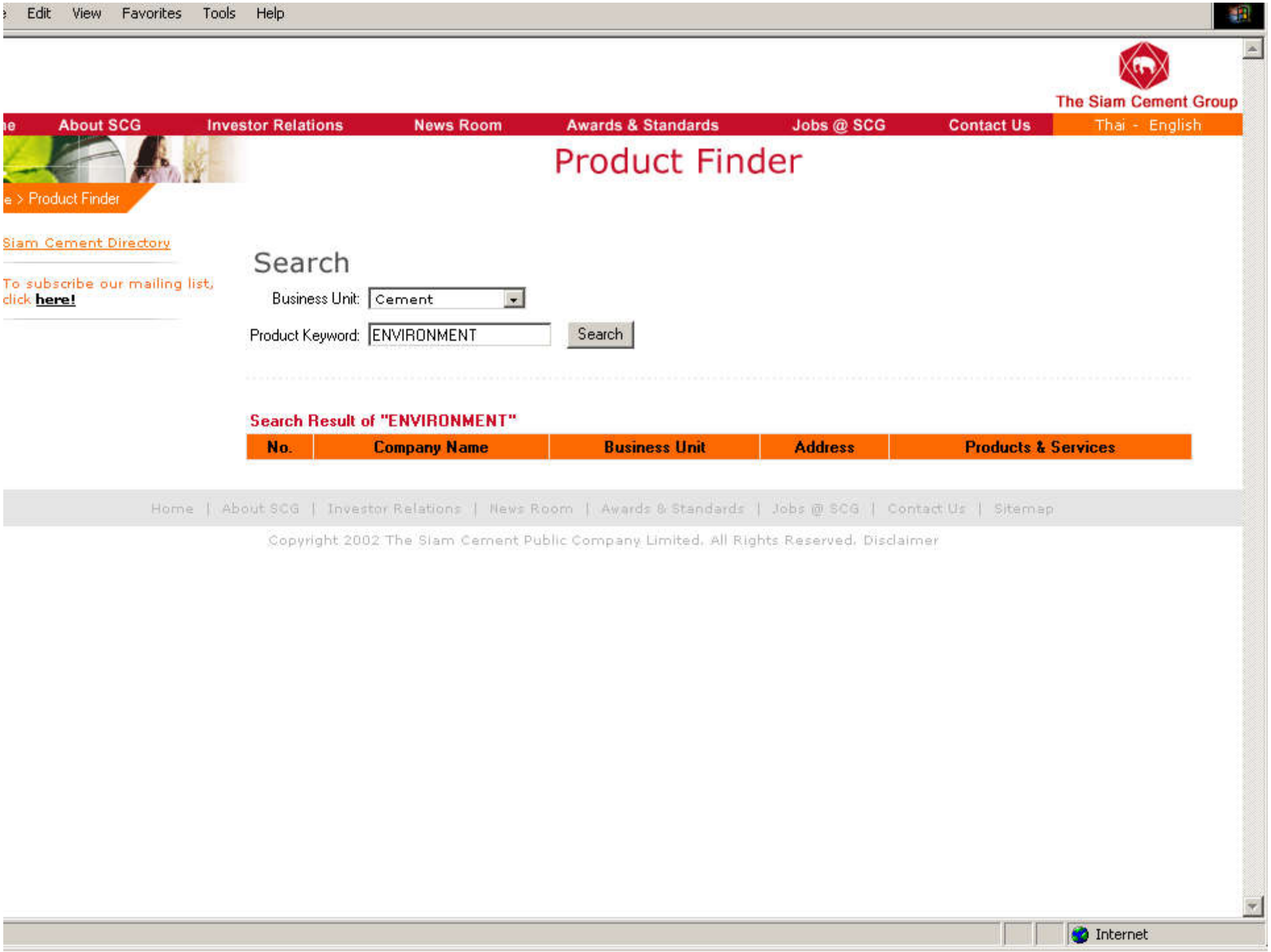
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A Long Way to Go