



United Nations Educational,
Scientific and Cultural Organization



Protecting infants
from AIDS, p. 11

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EDITORIAL

Small islands, big agenda

The current political crisis waging in Haiti and the civil unrest that peaked in the Solomon Islands last year are serious concerns for the Caribbean and Pacific regions. These incidents have brought home to their continental neighbours that these islands may be small but are in no way insignificant.

Haiti and the Solomon Islands are two of the world's 41 Small Island Developing States (SIDS), an umbrella term grouping the likes of Tokelau, a territory of just 10 km², with Papua New Guinea and its 453,000 km². SIDS could be perceived as being an odd grouping, given that they vary greatly in size and cannot even all be labelled 'developing states', as Singapore and Malta demonstrate.

They may not be a homogeneous group but SIDS often face similar challenges. These include geographical isolation, small markets, limited natural resources and vulnerability to natural disasters and climate change. The very survival of some SIDS is being threatened by sea-level rise, prompting their leaders to urge that the status of 'environmental refugee' be recognized by international law.

The 1994 Barbados Programme of Action (BPoA) was a watershed for SIDS, the first time the island states had formally outlined specific measures in support of sustainable development. It was at this time that the islands formed the Alliance of Small Island States to make their voice heard on the world scene.

If, ten years ago, talk was very much focused on environmental concerns, it is interesting to observe a fundamental shift in discussions in the lead-up to the Mauritius meeting in August to review the BPoA. Environmental concerns have been joined by such 'hot topics' as security and the importance of building resilience in small islands. These topics are omnipresent in discussions today both among islanders themselves and with observer countries – generally continental neighbours or countries with strategic or financial interests in islands. Drug-trafficking, illegal trade in small arms and the disposal and transport of radioactive waste are posing real problems both for archipelagic SIDS and for those with long coastlines but inadequate resources for surveillance. Moreover, small islands are seeking to enhance their preparedness for natural disasters by reinforcing security measures concerning energy, water and food, such as through agricultural diversification and aquaculture.

The world community will be meeting in Mauritius to review implementation of the BPoA and finalize the all-important follow-up strategy beyond 2004. 'Mauritius' will be an opportunity for SIDS to take centre stage and reaffirm their place in the global landscape.

W. Erdelen

Assistant Director-General for Natural Sciences

Small islands step into the limelight

If ever there was a way to draw the world's attention to the specific needs of small islands, Cyclone Heta was it. The cyclone bulldozed its way through the Pacific in the early days of 2004, sparing only Tokelau and Wallis & Futuna which had the good fortune to be situated where the cyclone formed. Five other islands were not so lucky. Heta wreaked severe damage in American Samoa, the Cook Islands, Niue, Samoa and Tonga.

Niue was worst hit. A single island state of only 250 km² with a resident population of 2,100, Niue could only watch as the cyclone laid waste to its recent development efforts. Heta's 300 km per hour winds, unprecedented in Niue's history, ripped away all the island's satellite communications equipment; however, due to the efforts of local volunteers, Internet services were operational only 10 days later.

While the future of Niue and the Niuean people continues to be debated – predominately by non-Niueans – the locals have quietly set about rebuilding their island, a testimony to the fortitude and resilience of islanders across the globe.

Hazardous territory

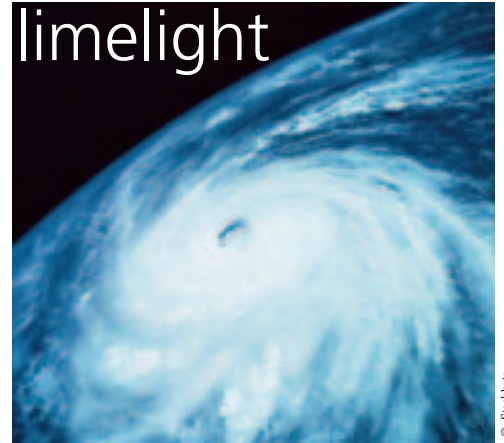
More than half of the 25 most disaster-prone countries are Small Island Developing States (SIDS), vulnerable as these are to volcanic eruptions, earthquakes, tsunamis, landslides, floods, hurricanes and cyclones. For the past 40 years, UNESCO has focused on identifying areas subject to natural hazards, improving risk assessment methods and encouraging preparedness for hazardous events. Work in the Pacific includes support to community-driven natural disaster/hazard mitigation in Tonga, Vanuatu and elsewhere, in collaboration with Massey University in New Zealand and other partners. UNESCO's Intergovernmental Oceanographic Commission (IOC) has provided support for many years to the Tsunami Warning System in the Pacific, which includes disseminating tsunami watches, warnings and advisory bulletins throughout the region.

For the past 10–15 years in the Caribbean, within UNESCO's Coastal and Beach Stability in the Lesser Antilles project, coastal planners, governments and NGOs have been monitoring beaches and coastlines to determine

wise developmental practices. Also in the Caribbean, a number of collaborative activities have been undertaken on educational and communication aspects of disaster mitigation, such as a disaster preparedness manual for Caribbean schools through a joint initiative with the Caribbean Disaster Emergency Response Agency.

Harnessing natural forces

The development of alternative energy systems is a crucial issue for many small islands. UNESCO's long-standing work on harnessing clean energy sources was boosted in the 1990s by the World Solar Summit process (1993–1995) and subsequently through the Organization's contribution to the UN World Solar Programme (1996–2005). Capacity-building aspects include the Global Renewable Energy and Training Programme (GREET) and a series of learning materials on new and renewable energies. Toolkits have recently been published on such topics as solar photovoltaic systems and geothermal energy, with a set of video materials (see *Rays of Hope*) tracing the history of, and prospects for, renewable energy in the Pacific.



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Pinney's Beach on Nevis in the Caribbean before Hurricane Luis struck in August 1995



© G. Cumbers

The same section of Pinney's Beach in October 1995, two months after the passage of Hurricane Luis

An ongoing UNESCO–UNDP initiative provides support to a range of regional and national Pacific sustainable energy projects, such as a national energy policy and strategic action plan for Tokelau, options for 24-hour power for Apolima Island (Samoa), increased use of renewable energies in the Cook Islands and training in photovoltaic solar home systems.

Rising seas

Since the 1994 Barbados Conference (see p.6), the Intergovernmental Panel on Climate Change has refined its projections of the impact of climate change on SIDS. This has prompted island nations to assess their needs in terms of resources, training and financial support. Faced with sea-level rise of up to 1 m by the end of the next century, many have drawn up plans to protect their coastlines, such as through the construction of dykes. The densely populated Maldives is even constructing an artificial island for some of its citizens, while Tuvalu and Kiribati in the Pacific are exploring options for the relocation of their entire populations to Australia, New Zealand and elsewhere within the next 50 years.

A major UNESCO contribution to issues related to rising sea levels is the Global Ocean Observing System (GOOS), a collaborative international effort led by the IOC. GOOS is a global network of ships, buoys (fixed and drifting), subsurface floats, tide gauges and satellites that collect real-time data on the physical state and biogeochemical profile of the world's oceans. This includes subsystems for data and information management for a variety of purposes, such as measurements and forecasts of changes in water level, the position and strengths of currents, sea-ice measurements and coverage, maps and forecasts of harmful algal blooms and vulnerability assessments of fish stocks and farms.



'Solar panels are made up of many individual cells connected in series. A panel of 34 cells (insert) is for 12 V systems. The larger the panel, the greater the electrical energy produced. For best results, there should be no shade on a solar panel between 9 am and 3 pm. Even if only one cell is shaded, the output can be cut by half or more.' Taken from UNESCO (2003) Solar Photovoltaic Systems Technical Training Manual. The toolkit is based on experience gained in the Pacific, where scattered island communities have pioneered the field testing of solar photovoltaics and rural electrification

Rays of Hope

The 'Rays of Hope' video and booklet highlight the importance of renewable energy in the Pacific, environmental concerns, energy dependence and types of renewable energy. Interviews and project insights from several countries are featured:

In **Kiribati**, solar panels power rural health centres and remote radio-telephone sites.

In **Fiji**, a village co-operative runs a small-scale hydro-electric project providing electricity for over 200 homes in a settlement deep in the interior of the main island.

In **Samoa**, a medium-scale hydro-project in Afalilo has reversed the proportions of hydropower and diesel feeding a hydro-electric power plant, with 80% of energy henceforth coming from hydropower and 20% from diesel.

In **Vanuatu**, coconut oil is being used as fuel for buses, taxis and other vehicles; it is also being used in generators that power a project in hydroponics (plant-growing in a medium other than soil).

'Rays of Hope' is an initiative of UNESCO's Engineering Programme: t.marjoram@unesco.org; to order a copy: www.unesco.org/publishing.

It's a question of 'fresh' water

With their small size and particular geological, topographical and climatic conditions, many SIDS face hurdles when it comes to accessing and managing freshwater of suitable quality and quantity. UNESCO contributes to sustainable water management through the International Hydrological Programme (IHP) and UN World Water Assessment Programme, as well through the Man and the Biosphere (MAB) Programme. Under the aegis of the IHP Pacific Working Group, past and ongoing studies have been focusing on catchments and communities (see *The drama of rivers*), atoll groundwater recharge and groundwater pollution, among others.

The flywheel of evolution

Small islands have long played an important role in scientific studies on the genetic diversity and evolution of living beings. As David Quammen in *The Song of the Dodo*¹ puts it, 'geographical isolation is the flywheel of evolution'. A century-and-a half ago, observations on the Galapagos Islands were critical in shaping Charles Darwin's revolutionary *Theory on the Origin of Species by Means of Natural Selection*. At about the same time, the islands in the Malay Archipelago proved essential for refining Alfred Wallace's thoughts on natural law.

However, biological diversity on many small islands is coming under increasing threat through the introduction of exotic species, development of tourism infrastructure, inadequate waste disposal, excessive harvesting of particular biotic groups, such as corals, and so on.

1. Quammen, D. *The Song of the Dodo. Island Biogeography in an Age of Extinction*. Simon & Schuster, New York, 1997, p 128

UNESCO's concern for biological diversity is rooted in two complementary international initiatives. The first is the Convention for the Protection of the World's Natural and Cultural Heritage, a binding legal instrument that focuses on unique sites of outstanding and universal value. The World Heritage List includes: the Aldabra Atoll (Seychelles), East Rennell (Solomon Islands), Morne Trois Pitons National Park (Dominica), Cocos Island (Costa Rica), two sites in Cuba and the Galapagos National Park and Marine Reserve (Ecuador). The second initiative is the World Network of Biosphere Reserves within the MAB Programme; these sites are exemplary in exploring approaches to sustainable development with the involvement of local people. The list currently comprises

440 sites in 97 countries and territories, including Cuba, Dominica, Mauritius and the US Virgin Islands.

A cultural melting pot

The perception of small island communities as historically remote and isolated is erroneous. In fact, the history of the islands testifies to the great cultural interaction and mixing that they have offered humanity. Indeed, it may be much more appropriate to understand islands as 'cultural crossroads'.

Unlike earlier theories, which imagined people 'drifting' on large rafts at the whim of the ocean currents, we now know that the first settlers were moving deliberately and

The world's small island nations

		Population (2003)	Terrain	Coast line (km)	Land area (km ²)	Renewable water/ capita/year (m ³)	Adult HIV/AIDS 2001 ^c (%)
Atlantic Ocean	Cape Verde	412,137	rugged, rocky, volcanic	965	4,033	703	0.04
	Sao Tome & Principe	175,883	volcanic, mountainous	209	1,001	15,797	-
Indian Ocean	Comoros	632,948	volcanic islands	340	2,170	1,700	0.1
	Maldives	329,684	flat	644	300	103	0.1
	Mauritius	1,210,447	small coastal plain, central plateau	177	2,030	1,904	0.1
	Seychelles	80,469	narrow coastal strip, coral, flat	491	455	-	-
Gulf	Bahrain ^a	667,238	low desert plain, low central escarpment	665	665	181	0.3
Pacific Ocean	Cook Islands	21,008	low coral atolls, volcanic, hilly	120	240	-	-
	Fiji	868,531	mountainous of volcanic origin, coral atolls	1,129	18,270	35,074	0.1
	Kiribati	98,549	low-lying coral atolls	1,143	811	-	-
	Marshall Islands	56,429	low coral limestone and sand islands	370	181	-	-
	Micronesia	108,143	low coral atolls, volcanic, mountainous	6,112	702	-	-
	Nauru	12,570	sandy beach, coral reefs, phosphate plateau	30	21	-	-
	Niue	2,145	limestone cliffs, central plateau	64	260	-	-
	Palau	19,717	low coral islands, mountainous main island	1,519	458	-	-
	Papua New Guinea	5,295,816	coastal lowlands, mountains	5,152	452,860	166,563	0.7
	Samoa	178,173	narrow coastal plains, interior: mountains	403	2,934	-	-
	Solomon Islands	509,190	low coral atolls, rugged mountains	5,313	27,540	100,000	-
	Tokelau ^{a,b}	1,418	atolls	-	10	-	-
	Tonga	108,141	coral formation, volcanic	419	718	-	-
	Tuvalu	11,305	low-lying and narrow coral atolls	24	26	-	-
	Vanuatu	199,414	narrow coastal plains, mountains of volcanic origin	2,528	12,200	-	-
Mediterranean Sea	Cyprus	771,657	plains, mountains	648	9,240	995	0.3
	Malta	400,420	low, flat plains, coastal cliffs	140	316	129	0.1
Caribbean Sea	Antigua & Barbuda	67,897	low-lying limestone and coral islands	153	443	800	-
	Aruba ^b	70,844	flat, some hills, scant vegetation	-	193	-	-
	Bahamas	297,477	long, flat, coral formations	3,542	10,070	66	3.5
	Barbados	277,264	flat, central highland	97	431	307	1.2
	Cuba	11,263,429	terraced plains, small hills, mountains	5,746	110,860	3,404	<0.1
	Dominica	69,655	rugged mountains of volcanic origin	148	754	-	-
	Dominican Republic ^a	8,715,602	rugged highlands and mountains	-	48,380	2,507	2.5
	Grenada	89,258	volcanic in origin, central mountains	121	344	-	-
	Haiti ^c	7,527,817	rugged, mountainous	-	27,560	1,723	6.1
	Jamaica	2,695,867	narrow coastal plains, mountains	1,022	10,831	3,651	1.2
	Netherlands Antilles ^{a,b}	216,226	hilly, volcanic interiors	364	960	-	-
	St Kitts & Nevis	38,763	volcanic, mountainous interiors	135	261	621	-
	St Lucia	162,157	volcanic, mountainous with broad valleys	158	606	-	-
St Vincent & Grenadines	116,812	volcanic, mountainous	84	389	-	-	
Trinidad & Tobago	1,104,209	flat, hilly, mountainous	-	5,128	2,968	2.5	
US Virgin Islands ^{a,b}	124,778	hilly, rugged, mountainous	188	349	-	-	
South China Sea	Singapore	4,608,595	lowland, undulating central plateau	193	683	149	0.2

^aNot a member of the Alliance of Small Island States (the Netherlands Antilles and US Virgin Islands are however observers); ^bNon-self governing;

^cPopulation estimates for Haiti explicitly take into account the effects of excess mortality due to AIDS; ^dEstimate

Source: www.un.org/esa/sustdev/sids/sidslist.htm; population data for 2003, HIV/AIDS and land area data: CIA Factbook : www.cia.gov/cia/publications/factbook/; freshwater data: UN (2003) *World Water Development Report. Water for People, Water for Life* (Table 4.2). UNESCO Publishing, Paris

The drama of rivers

For the past three years in the Epule community in Vanuatu, there has been a ban on fishing in the local river and on some of the associated reefs. This has met with resistance from the locals even though they have long suspected that their river was being polluted by logging, farming and a growing village population. The village chief hopes the locals will ultimately come to accept the ban.

The desire to impress upon the local ni-Vanuatu people that the ultimate responsibility for the management of water resources lay with them inspired the IHP to join forces recently with the local theatre groups Haulua and Won Smol Bag (bislama for 'one small bag'). The theatre groups put on plays for the local communities highlighting types of behaviour which are harmful to the river and contrary to laws and codes of practice within Vanuatu, such as logging within 50 m of a river.

The script for the *River Play* was developed in close collaboration with the Department of Geology, Mines and Water Resources. The performances were well received by village audiences at a number of locations. Most importantly, during the lively discussions which followed each performance, many villagers offered to participate in prevention and restoration activities, such as tree-planting along streams and rivers, or the monitoring of catchments.

For further information on the IHP's Catchments and Communities project: www.unesco.org/water

knowingly amongst the vast body of water that is the Pacific Ocean. Those 'bits' of land in the sea, the islands, were their meeting points, their 'crossroads'. With this understanding, UNESCO launched 'Vaka Moana: the Ocean Roads' under the auspices of the World Decade of Cultural Development, with the intention of reinforcing linkages between Pacific peoples through a better knowledge of their common historical links and dependence on the ocean, and the promotion of all forms of art which have the common theme of the sea.

Promoting cultural heritage

In terms of the conservation of cultural heritage, more important perhaps to many SIDS than tangible properties and sites is what is known as 'intangible cultural heritage'. This embraces all forms of traditional and popular or folk culture originating in a given community transmitted orally or by gesture, including customs, languages, music, dance, rituals, festivities, traditional medicine and pharmacopoeia.

Several UNESCO cross-cutting activities are underway in island settings on the use of cultural assets for raising living standards and preserving cultural heritage. These schemes include the promotion in the Pacific region of traditional crafts as a way to open up job opportunities for the poorest youth. In the Caribbean, the YouthPATH initiative seeks to involve rural youth in natural and cultural heritage tourism and other income-generating initiatives. Activities focus on such attractions as a nesting turtle site,

a former slave village, a fishing-whaling settlement. Underpinning the whole regional project is the notion of the Caribbean Sea as a connective link between island cultures, in temporal as well as spatial terms.

Transmission of traditional knowledge

Local and indigenous knowledge is another dimension of cultural diversity that takes on special significance in small island situations. Traditional marine resource management in the Pacific has been the focus of several UNESCO events since the 1980s. In recent years, UNESCO work on local knowledge has been boosted through discussions on 'science and other systems of knowledge' linked to the UNESCO-ICSU World Conference on Science (Budapest, June 1999).

One significant outcome has been the launching of the project on Local and Indigenous Knowledge Systems in a Global Society (LINKS). In mid-2004, LINKS will be releasing a CD-ROM on traditional navigation in the Pacific, which will serve primarily as an educational tool for schools highlighting to students the significance of stick charts for teaching swell patterns, stone circles for illustrating star compasses and other indigenous knowledge practices. LINKS is also working through a Vanuatu-based project to encourage primary and secondary pupils to incorporate indigenous knowledge within their own communities and schools.



Traditional navigation in the Pacific; foliage in the boat rigging provides a simple means of following subtle changes in the direction and strength of the wind

The fight against HIV/AIDS

Being a dynamic cultural crossroad can also negatively impact upon a country's aspirations. One serious concern in this regard is HIV/AIDS. Studies, especially those in the Caribbean², have underlined the cultural dimension in the prevention of HIV/AIDS and in caring for its victims, as well as the critical role of education in limiting the spread and impact of the epidemic. Multidisciplinary cooperation and broad partnerships are crucial for the prevention of HIV/AIDS, as are innovative uses of media and communication tools in building targeted public awareness and fostering behaviour change, particularly among youth.

'Front-line zones' on the road to Mauritius

'The world's small island developing states are front-line zones where, in concentrated form, many of the main problems of environment and development are unfolding'.

United Nations Secretary-General, Kofi Annan,
New York, September 1999

Rio, June 1992. The international community at the Earth Summit recognized that small islands are 'a special case for environment and development'. This understanding paved the way for small island developing states to come together as a group to discuss their specific concerns.

Barbados, April – May 1994, 'Small Islands: Big Issues'. The Global Conference on the Sustainable Development of Small Island Developing States. The *Agenda 21* adopted at Rio spawned the Barbados Programme of Action (BPoA). BPoA lists 15 priority areas for specific action, including climate change and sea-level rise; natural and environmental disasters; waste management; coastal and marine resources; and tourism.

Johannesburg, September 2002. The World Summit on Sustainable Development reaffirmed that SIDS are a special case in terms of both environment and development. Among the recommended follow-up actions, the Johannesburg summit called for a full and comprehensive review of the BPoA.

Mauritius, 30 August – 3 September 2004, 'Small Islands, Big States'. As decided by the UN General Assembly, a full and comprehensive 10-year review of the implementation of the BPoA will be undertaken and emerging issues will be identified for follow-up.

For further information on UNESCO's contribution to BPoA: www.portal.unesco.org/islandsBplus10; on the SIDS Network and the Alliance of Small Island States: www.sidsnet.org/aosis

In the Caribbean, UNESCO is working with a range of partners to encourage effective policies and practices for HIV/AIDS mitigation and prevention within formal and non-formal education. One example is a pilot project in Jamaica involving UNESCO, the Ministry of Education and other educational institutions in the country.

Sustainable development can never be realized without youth

Immediately prior to, and during, the international BPoA review meeting in Mauritius in August 2004, young islanders from all SIDS will meet to discuss their concerns about small island living, share experiences, promote cultural understanding, participate in debates and side-events and present their outcomes to the main meeting. This initiative, dubbed 'Youth Visioning for Island Living', while proposed by the Ministry of Education and Scientific Research of Mauritius, is being facilitated initially by UNESCO as a joint effort between its Coastal Regions and Small Islands Platform and its Section for Youth, and supported by a variety of national, regional and inter-regional organizations and donors.

Go to: www.unesco.org/csi/smis/siv/vision-action.htm

Connecting islands to the global community

With limited numbers of tertiary institutes based in small islands – thereby exacerbating island 'brain drain' – one of the burgeoning areas of higher education is expected to be distance learning modules and programmes through greater application of ICTs. In a similar way, Community Multi-media Centres (CMCs) encourage community empowerment and address the digital divide by combining community broadcasting with Internet and related technologies. The aim is to transform existing community radio stations into CMCs, complete with PCs, faxes, telephones, and email and Internet services (see also p.9). Initial participants include radio stations in Barbados, Cuba, Jamaica, and Trinidad & Tobago.

Small Islands Voice (SIV³) is an inter-regional initiative in the Caribbean Sea and Indian and Pacific island regions. It uses ICTs and existing media to encourage general public discussion and involvement in sustainable development activities at a local level. Young islanders are also assured their 'space to speak' via the SIV Internet youth forum⁴, which has generated debate on diverse subjects ranging from whaling and asbestos in schools to recycling and growing levels of gang violence.



Bequia Community High School in St Vincent & the Grenadines, contributing online to the Small Islands Voice youth Internet forum

Implementation of the UN Barbados Programme of Action has had mixed results. Many living in small islands have no knowledge of the BPoA and how it relates to their everyday life. However, various initiatives have been improving life in SIDS. These include the Alliance of Small Island States and the UN-based information network, SIDSNET. Along with sister agencies, UNESCO is contributing to the overall goal of sustainable island development, in the belief that these island states are not 'islands in a far sea' but 'a sea of islands'⁵.

Claire Green⁶ and Malcom Hadley⁷

2. UNESCO's International Institute of Educational Planning and the University of the West Indies, 2003; and the Regional Strategy on Education and HIV/AIDS for the Caribbean, UNESCO Kingston and IIEP

3. www.smallislandsvoice.org

4. www.sivoyouth.org – username: view; password: only

5. Hau'ofa, E. (1993) Our Sea of Islands. In: *A New Oceania. Rediscovering Our Sea of Islands*. University of the South Pacific, Fiji, and Beake House, p. 7

6. UNESCO Coastal Regions and Small Islands platform: www.unesco.org/csi

7. Former Editor; Nature and Resources (UNESCO quarterly)

Six West African countries tackle deteriorating environment

The first comprehensive study of biodiversity in West Africa's biosphere reserves was launched in January under a new US\$6-million initiative. Over the next four years, the project will establish institutional mechanisms in six biosphere reserves to enable these to monitor and manage their natural resources over the long term. The project will also study the interaction between savannah ecosystems and human activities in the reserves, including agriculture, pastoralism, hunting and fishing practices. Local communities will be associated with project implementation and will receive support for 'alternative' economic activities, such as apiculture (bee-keeping) and eco-tourism.

The project was officially unveiled at a one-day ministerial roundtable of West African environment ministers on 26 January at UNESCO Headquarters in Paris.

The initiative is being co-ordinated by UNESCO and UNEP, in conjunction with national authorities and local communities. The project budget of US\$6 million will be partly provided by the Global Environmental Fund.

The six biosphere reserves are the Pendjari in Benin, the Mare aux hippopotames in Burkina Faso, Comoé in Côte d'Ivoire, Boucle du Baoulé in Mali, Niokolo Koba in Senegal and the 'W' biosphere reserve in Niger.

All six reserves belong to the West Sudano-Sahelian savannah biome, an area sharing common features in terms of climate, vegetation and bird and mammal species. The territories also share important bird areas common to the Sudano-Guinean savannah biome. The reserves are characterized by a relatively high human population density of 50–100 persons/km² and by a long history of human occupation. Taken together, they account for much of the 28.7 million ha of protected area in West Africa and for about 1% of the continent's total extent of potential savannah biome.

Since the climate is tropical but strongly seasonal, there is considerable migration of large vertebrate and bird species. The habitats of these species are being threatened mainly by unsustainable human activities and by pressures on access to land and other resources. In Boucle du Baoulé, Niokolo Koba and Pendjari, for example, cattle and wildlife are competing for watering holes, a situation frequently exacerbated by drought in Pendjari. In Boucle du

Baoulé and Comoé, limited water resources are coming under additional stress from the growing cultivation of cotton, a thirsty crop. The flora and fauna in these two biosphere reserves are also threatened by uncontrolled bush fires lit by hunters or caused by lightning. Poaching and overfishing pose additional problems in Comoé.

Biosphere reserves operate on the basis of a unique zoning system which allows conservation in the core area and sustainable development and training in the peripheral transition area. The West African project will be monitoring ecosystem dynamics in the core area and supporting socio-economic activities in the transition areas. One sustainable activity identified by the participating countries and local communities is eco-tourism: eco-villages will be built in Comoé, for example, and villages in 'W' Niger, home to the last 200 remaining giraffes in West Africa, will receive training in eco-tourism. Key stakeholders at all

six sites will be trained in conflict prevention and management, micro-credit access and inventorying of fauna and flora, among other subjects.

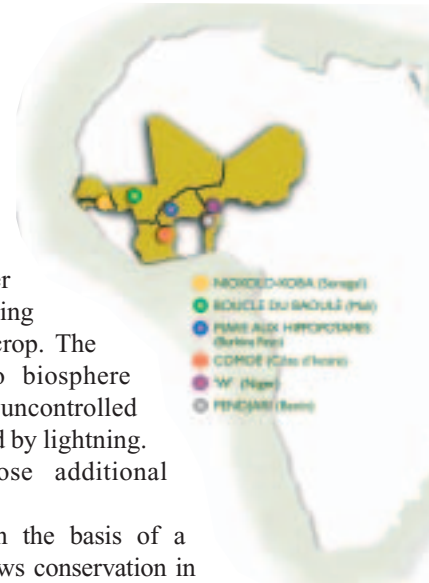
'Concerned by the ongoing environmental degradation and the concomitant increasing poverty across the African continent', the six environment ministers state in a joint declaration issued at the close of the January roundtable that 'we are committed to promoting the use of biosphere reserves as operational sites for sustainable development in the fight against poverty and in

implementing the action plan of the Environment Initiative of NEPAD.'

The ministers invite UNESCO, and more particularly the MAB Secretariat and its regional offices in Africa, to pursue efforts to reinforce the AfriMAB network. They also invite the Environment Minister of Senegal, Modou Fada Diagne, whose country is co-ordinator for the Environment Initiative of NEPAD, to transmit the declaration to the NEPAD Secretariat and the African Ministerial Conference on the Environment.

The roundtable was followed by a technical workshop involving numerous scientists and managers working in the region, as well as representatives from UN agencies and project partners.

For further information: www.unesco.org/mab; m.bouamrane@unesco.org



An impala in Pendjari Biosphere Reserve in Benin

H.R.H. Prince Talal donates US\$1 million to Solidarity Fund for Safe Water

UNESCO's Special Envoy for Water, H.R.H. Prince Talal Bin Abdul Aziz Al Saud, announced the donation of US\$1 million to the Solidarity Fund for Safe Water for All at the closing of the International Year of Freshwater at UNESCO Headquarters on 20 January.

This is the first donation since the Solidarity Fund was approved by UNESCO's General Conference in October. H.R.H. Prince Talal made the donation on behalf of the Arab Gulf Programme for United Nations Development Organizations (AGFUND), of which he is president. AGFUND has contributed more than US\$24 million to 68 UNESCO projects and has supported more than 900 development and humanitarian projects with diverse partners, including 32 water-related projects worth US\$31 million.

Prince Talal's donation will help UNESCO to promote the ideals of the International Year of Freshwater. UNESCO and the UN Department of Economic and Social Affairs were the lead agencies for the Year. To help co-ordinate the water-related events of diverse partners, including UN agencies, NGOs, national institutes, schools and youth groups around the world, UNESCO created a website⁸ that has won numerous prizes for its updates and information resources, including a photo library, national and regional scientific reports. At the same time, the Organization worked on several fronts – science, education and conflict resolution – to promote a better understanding of the need to protect this critical natural resource.

8. www.wateryear2003.org



Market day in Cotonou, in Benin. A recent African survey of about 20 transboundary aquifers has discovered that the aquifer providing water for Cotonou extends across the border into Togo. Both countries now plan to manage jointly the aquifer, which will come under increasing strain because of predicted climate change. Felix V. Azoni, Director of the Water Resources Department of Benin, confided to *The New UNESCO Courier* in 2002 that rainfall in the region was declining at a rate of 2 mm per year. The African survey was conducted within UNESCO's Internationally Shared Aquifer Resources programme (ISARM), which recently completed the first world map of transboundary aquifers



The ISARM partners launched an inventory of transboundary aquifers in the Americas, in collaboration with the Organization of American States, in June 2003

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The single most important contribution to the Year was the first *World Water Development Report, Water for People – Water for Life*, produced by the 24 UN agencies which make up the World Water Assessment Programme. The impetus generated by the Year in general and by the *Report* in particular prompted the UN General Assembly in 2003 to declare an International Decade on 'Water for Life' from 2005 to 2015.

The Year also provided new impetus for UNESCO's International Hydrological Programme (IHP), which organized a wide range of scientific conferences and training programmes covering such diverse topics as wastewater technology, flood forecasting, glacier dynamics, rainwater harvesting and the use of isotopes to map aquifers. In particular, the IHP produced the first global map of groundwater with several partner organizations and the first world map of transboundary aquifers.

This scientific work is complemented by IHP's new focus on preventing and resolving water conflicts. Work is now underway to finalize arrangements for a new Water Co-operation Facility, which will be based at UNESCO, to help countries resolve conflicts over shared rivers and aquifers. A series of reports and training projects on conflict resolution have also been developed with diverse partners, including the UNESCO-IHE Institute for Water Education (see p.17).

For further information: www.unesco.org/water

A water action plan for Africa

The four-day Pan-African Implementation and Partnership Conference on Water (PANAFCON) ended on 12 December in Addis Ababa (Ethiopia) with an action plan to meet Africa's World Summit on Sustainable Development targets, the African Water Vision and the Millennium Development Goals on water. These include halving by 2015 the proportion of people without access to safe drinking water and basic sanitation; and developing integrated water resource management and water efficiency plans by 2005.

'The water crisis in our region is a crisis of governance,' the Preamble begins. On a continent where more than

300 million people lack safe access to safe water and 14 countries are currently subject to water stress or scarcity, water management has become a development issue.

In his opening remarks, the Executive Secretary of the UN's Economic Commission for Africa and conference co-chair, Mr K.Y. Amoako, reminded participants that 'poor management of this precious gift of nature continues to hinder our progress and is a major constraining factor in food production, health and industrial development'. Mr Amoako also remarked that 'the average annual investment between 1990 and 2000 for water supply and sanitation in Africa was US\$4.6 billion, or 40% of the requirement for meeting basic needs'.

The 45 Ministers of Water and Environment from Africa attending the Conference resolved to pay special attention to countries likely to miss their targets for safe drinking water and sanitation. The Ministers agreed to establish National Task Forces on Water and Sanitation in 2004 which will prepare national plans with service delivery targets for achieving water and sanitation goals by 2015.

The Ministers welcomed the active participation of NGOs in the Conference and agreed to incorporate civil society and gender issues in policy formulation on water.

Among initiatives launched by Ministers during the Conference are the African Water Facility with targeted funding of over US\$600 million for medium-term projects on water and sanitation; the *African Water Journal* which will provide an outlet to disseminate knowledge; the Water and Sanitation for African Cities project (Phase II), the Rural Water Supply and Sanitation Initiative and the G8 Action Plan on Water for Africa.

The Ministers also signed a joint declaration with the European Commission on the implementation of the African-European Union Strategic Partnership on Water Affairs and Sanitation.

More than 1000 participants from around the world attended PANAFCON, which was co-organized by the African Ministers' Council on Water and UN-Water/Africa, a consortium made up of UNESCO, WMO, WHO, UNDP, FAO and sister agencies, the African Development Bank and other key development partners.

For further information: (in Nairobi) e.naah@unesco.unon.org; www.unesco.org/water or www.uneca.org/panafcon

Summit recognizes researchers' need for affordable Internet

It was with a certain satisfaction that UNESCO and its science partners observed the incorporation of a number of priorities for the scientific and engineering communities in the *Declaration of Principles and Plan of Action* adopted by the World Summit on the Information Society in Geneva on 12 December. These include the all-important recommendation to 'promote affordable and reliable high-

speed Internet connection for all universities and research institutions to support their critical role in information and knowledge production, education and training, and to support the establishment of partnerships, cooperation and networking between these institutions'.

Other recommendations that echo the *Agenda for Action* adopted by participants in a UNESCO-ICSU workshop in March 2003 – when science was still disturbingly absent from the Summit's draft documents – have found their way into the Summit's *Plan of Action*. These include promoting 'electronic publishing, differential pricing and open access initiatives to make scientific information affordable and accessible in all countries on an equitable basis' and 'the use of peer-to-peer technology to share scientific knowledge and pre-prints and reprints written by scientific authors who have waived their right to payment'.

The *Plan* calls for 'the long-term systematic and efficient collection, dissemination and preservation of essential scientific digital data, for example, population and meteorological data in all countries'. It recommends promoting 'principles and metadata standards to facilitate cooperation and effective use of collected scientific information and data as appropriate to conduct scientific research'.

Under 'Access to information and knowledge', the *Plan* 'encourages initiatives to facilitate access, including free and affordable access to open access journals and books and open archives for scientific information'. The *Plan* goes on to 'encourage research and promote awareness among all stakeholders of the possibilities offered by different software models, and the means of their creation, including proprietary, open-source and free software'.

Read the Declaration of Principles and Plan of Action: www.unesco.org/wsis; see also *A World of Science, Vol. 1, n°4*

150 multimedia centres for Africa

UNESCO and the Swiss Agency for Development have launched a multimillion dollar project to establish 50 community multimedia centres in each of Mali, Mozambique and Senegal. The launch took place on 10 December, in Geneva, on the sidelines of the World Summit on the Information Society. The project is to benefit from 3 million Swiss francs (US\$2.4 million) in funding.

The project marks a huge scale-up for UNESCO's Community Multimedia Centres programme, which to date numbers 20 pilot centres in Africa. These are currently equipped with 5–18 computers each. Existing community radio stations are transformed into multimedia centres which, at their most basic, use a portable FM broad-

casting unit known as a 'suitcase radio', worth less than US\$5,000 each, and a few computers for Internet browsing, e-mail and basic office, library and learning applications. The use of these digital resources by community radio hosts means that tens of thousands of people are able to access online information indirectly.

The centres belong to, and are managed by, the communities they serve. They provide literacy classes, targeting women in particular, spread health messages and collect and disseminate information about agriculture. In addition to these non-profit services, which are subsidized or provided free of charge, the centres offer commercial services to help themselves become self-sustaining. These include telephone, fax, scanning, computer training and e-mail services.

Only 0.9% of Malians, 1.4% of Mozambicans and 5.6% of Senegalese had Internet access in 2002, according to ITU.

The possibility is currently being explored of setting up community multimedia centres in the biosphere reserves participating in a new project to reverse environmental degradation and reduce poverty in West Africa (see p.7).

*For further information: s.hughes@unesco.org;
www.unesco.org/webworld*

Geologists campaign for Year of Planet Earth

A UNESCO meeting has hatched plans to make 2006 the International Year of Planet Earth. The brainchild of the International Union of Geological Sciences (IUGS) and UNESCO's Division of Earth Sciences, the Year would espouse the theme of 'Earth sciences for society' and serve both to popularize the earth sciences and to compile a 'global map' of geoscience research.

Argentina, Brazil, China, Italy, Jordan and Russia all expressed support for the Year at an informal meeting on 11 February at UNESCO Headquarters, which heard that a total of US\$20 million would be sought from national science foundations and industrial and commercial bodies to fund research and educational projects during the Year.

China will shortly be sending an official proposal to the UN General Assembly, which is expected to proclaim 2006 the International Year of Planet Earth later this year.

Richard Sinding-Larsen, chair of the IUGS national committee for Norway, where the union has its permanent secretariat, told the e-journal SciDev.Net that 'this will be of great importance for developing countries. The project will highlight important problems such as earthquakes, landslides and polluted groundwater. These are all issues that receive too little attention, especially in poor countries. This way, geosciences and development will be put higher on the political agenda.'

In another move to strengthen cooperation in the earth sciences, two Memoranda of Understanding (MoU) were signed between UNESCO, the United States Geological Survey and the German Geoforschungszentrum on 10 February at UNESCO Headquarters.

UNESCO's Director-General expressed satisfaction at this first MoU between UNESCO and the USA since the latter's re-entry into the Organization last year. The agreement will provide a framework for the exchange of scientific and technical knowledge and for capacity-building in disaster reduction, global earth observation, continental drilling, hydrology and sustainable development.

The MoU signed with Germany is a renewal of that signed five years ago. It provides for extensive cooperation, principally through the International Continental Scientific Drilling Programme that brings together not only Japan, Germany and the USA but also numerous developing countries. The agreement also strengthens cooperation in disaster mitigation, professional skill enhancement and public awareness-raising.

*For further information: w.eder@unesco.org;
www.unesco.org/earthsciences*

Young scientists get their own Academy

Young researchers chose World Science Day on 10 November to announce the creation of a World Academy of Young Scientists (WAYS). Speaking from the Hungarian parliament buildings during the first World Science Forum in Budapest (8–10 November), they described their mission as being twofold: to conduct quality scientific research and input regularly into policy-making on science and technology.

The World Academy of Young Scientists will be headquartered at the Hungarian Academy of Sciences in Budapest. This permanent global network for the young scientific community is the culmination of a process that first began with the International Forum of Young Scientists within the UNESCO–ICSU World Conference on Science in Budapest in 1999. After the Conference, UNESCO undertook to establish a permanent representative body for young scientists.

The World Academy of Young Scientists will strive to establish bridges between generations and continents, and above all between developed and developing countries. With UNESCO support, it will be holding its founding General Assembly in December 2004. In the meantime, it is attracting young scientists from all over the world to participate in developing its programme, including those belonging to other organizations of young scientists.

For further information: d.malpede@unesco.org or ways@szlaki.hu

Luc Montagnier

Protecting infants from AIDS

The HIV/AIDS virus was first identified in 1983–1984 by Professor Luc Montagnier of the Institut Pasteur (France) and Professor Robert Gallo of the National Institute of Health in Bethesda (USA).

Today, the World Foundation for AIDS Research and Prevention presided by Professor Luc Montagnier is working on a vaccine to eliminate mother–child transmission of HIV. The vaccine is being developed within the Families First Africa project launched by UNESCO in 2002. It benefits from US\$2 million in funding from Italy. The Institute of Human Virology in Baltimore at the University of Maryland, today headed by Professor Gallo, and the University of Tor Vergata in Rome, are associated with the project.

Every year, 800,000 African babies are infected with HIV/AIDS. Why wait until 2002 to begin research on a pediatric vaccine?

Two main factors explain why the transmission rate of AIDS to African babies is so high. Firstly, there is the general problem of the Third World's lack of access to medication, on account of the cost and the quasi-total absence of testing for AIDS. The problem is especially acute in Sub-Saharan Africa. As a result, very few African women infected with the AIDS virus receive any treatment at all during their pregnancy. Nor do their newborn babies.

The second factor concerns the efficacy of treatment. The reason we waited until 2002 to begin developing a pediatric vaccine is because therapeutic treatments reducing mother–child transmission already existed, so there didn't seem to be a problem. Just before delivery, Nevirapine is administered to the mother. This treatment is relatively straightforward and may be administered over a short period. It reduces from 25% to only 3–5% the infection rate in newborns. But there is still no treatment which is 100% effective. Recently, we realized that breastfeeding reinfected the infant and that the infection rate after a year is the same as if the child had received no treatment at all.

And most African babies are breastfed...

Yes, because, thanks to the mother's antibodies, breast-

*Luc
Montagnier*

feeding offers protection from the diseases which so often kill babies in Africa. Diarrhoea, for instance, causes an enormous number of infant deaths. The problem is that mother's milk can contain the AIDS virus in a form we still don't understand very well.

Our project for a pediatric vaccine targets infants infected by breastfeeding. The vaccine must be able to protect the child for the first two years of life, until it is weaned.

Infants in some West African countries are currently being vaccinated against the tuberculosis bacillus. The BCG is a living, pasturized vaccine made up of an attenuated tuberculosis bacillus. It doesn't offer complete protection from tuberculosis but it does erect a barrier against the most serious effects. It also has a very stimulating effect on the immune system. We take advantage of this immunity to add HIV proteins – we are still choosing the most appropriate molecules – to create a pediatric vaccine against AIDS.

At what stage is your research?

We have conducted trials on mice and are presently testing the vaccine on macaques to see if we can obtain a good cellular immunity. The next step will be to begin phase 1 clinical trials on adult volunteers a year or two from now, before testing the vaccine on infants in a second phase.

These trials will be conducted on 10–20 volunteer adults from countries in the North and in Africa. This is important not only because there are variations of the AIDS virus but also because genetic variability means that different populations react in different ways to the virus. Since we are going to be using the vaccine in Côte d'Ivoire, Burkina Faso and Cameroon to begin with, the researchers working with us from these three countries have identified the differences in the genetic response of their respective populations.



So you are working directly with African researchers?

It is even central to the project. Our Foundation's approach is to create centres in Africa which associate AIDS prevention, treatment and research. Each centre treats patients and, in parallel, participates actively in clinical research, including that on a pediatric vaccine. By grouping prevention, treatment and research under the same roof, the idea is to combine scientific and educational activities to ensure that both the population and the trainers are well-informed. Hence our plans to equip each centre with a multimedia training room. Each centre trains civil servants, including administrators, police and teachers, specialists and other groups. As for the researchers and doctors working in these centres, all have received, or will receive, advanced training on AIDS in either Paris, Baltimore or Rome.

The first centre was set up by the Foundation in Abidjan, Côte d'Ivoire, in 1996. We are now equipping a second centre in Ouagadougou and the Cameroon government is building a third centre in Yaoundé to serve the sub-region – as long as US\$2 million can be found to equip it. Professor Gallo's team is setting up similar centres in Nigeria and other English-speaking countries of Africa.

The Abidjan centre is headed by Dr Henri Chenal, a surgeon who was himself infected with the AIDS virus while operating. The centre has been approved by UNAIDS for the distribution of tritherapies but is financed solely by our Foundation and the Government of Côte d'Ivoire. An estimated 12% of the population is infected with the AIDS virus. Half of the declared AIDS cases in Abidjan – about 1500 people – come to the centre regularly to receive a bi- or tritherapy. Only those who can afford to pay are expected to do so. But the majority of those infected, those who have not yet fallen sick, don't wish to know their state of health and choose to hide their illness from their entourage, out of fear of rejection or of losing their job. Unfortunately, even those who do come to the centre have often waited too long; they are already very sick with tuberculosis or other diseases and in need of hospitalizing. The problem is, there are not enough beds.

Côte d'Ivoire has a population of 15 million. That means nearly 2 million people are infected with the AIDS virus, yet you say there are only 3,000 declared cases in Abidjan?

It's far from exceptional. An estimated 1% of AIDS victims in Africa know they are infected. And even those who do take the AIDS test these days and discover they are seropositive are told to wait until they fall ill to come for treatment. We want to incite people to follow treatment from the outset. But first, clinical trials need to be conducted to design treatments which are less toxic than

a tritherapy for people who still have a reactive immunity system. In passing, I should explain that, if a tritherapy is administered over a long period and, above all, not on a daily basis, this can allow the virus to mutate and develop resistance to treatment. Hence the current approach of administering a tritherapy solely to patients who are already heavily infected with AIDS; we are talking about a category which represents approximately 10% of the 30 million Africans infected with the virus.

To limit the spread of the epidemic, our vaccine could also be administered to adults for therapeutic purposes via our own centres. By adding an immunostimulating treatment, it would be possible to reduce the dose or even halt the tritherapy altogether. That would slow down the infection's progression and make it harder for people to pass on the virus to their sexual partners.

Are any other public or private research projects on vaccines working with African researchers?

African researchers are collaborating on many projects but not, to my knowledge, on any project to develop a pediatric vaccine.

Earlier, you explained that the lack of access to medication was a major problem for the developing world. What is being done to lower the cost of medication for poor countries?

There is already a significant difference in the price of medicines in rich and poor countries. The social security system in Western countries pays a high price for medicines so that these can be sold at lower prices to poor countries. There are also some international initiatives like the World Fund created in 2002 by the G8 and the United Nations. This Fund will make it possible to lower prices even further.

The pharmaceutical companies have also made a big effort to improve their image. Bilateral agreements have brought the cost of a tritherapy down from US\$10,000 to US\$300. Moreover, an agreement signed at the World Trade Organization last September will allow countries like India and Brazil to produce copies of the products manufactured by major pharmaceutical groups and to sell cheaper generic medicines in the developing world for diseases like tuberculosis, AIDS and malaria.



© UNESCO, Roger

If you succeed in your endeavour, do you plan to patent the pediatric vaccine and, if so, under what conditions?

The World Foundation for AIDS Research and Prevention is an NGO. As such, it is a non-profit organization. Our current project is pre-clinical and concerns solely the feasibility of a pediatric vaccine. Since UNESCO cannot engage its responsibility in the area of clinical trials, the clinical part will be placed under the auspices of WHO rather than under the auspices of UNESCO.

The universities involved in the project, namely those of Tor Vergata in Rome and of Maryland in Baltimore, do have policies for intellectual property protection —, as do all universities – not to mention our own Foundation for that matter – but up until now we have never envisaged this aspect. Once we move on to clinical trials on people, we may think about protecting the vaccine. Its development will either be undertaken in tandem with a pharmaceutical company or within the framework of a public project.

If we receive public support, the vaccine won't cost patients anything. If, on the other hand, we need to enter into partnership with a pharmaceutical company for the vaccine's manufacture, that will of course entail putting a price on the vaccine. Yet, for Africa, the cost of the treatment will need to be extremely low. At UNESCO's General Conference last October, all countries were asked to support the project.



© Henri Tullio Corbis Sygma

Professors Montagnier and Gallo (third from left) chatting with doctors at the Yaoundé centre

What level of investment will you need to complete the trials on infants?

At this stage, we need to be able to equip the centres in Burkina Faso, Cameroon and elsewhere with specialized material. It will take a minimum of US\$6 million to complete the second clinical phase, that of trials on infants.

Generally speaking, why, when the AIDS virus was first discovered 20 years ago, is it proving so difficult to develop a vaccine to fight it?

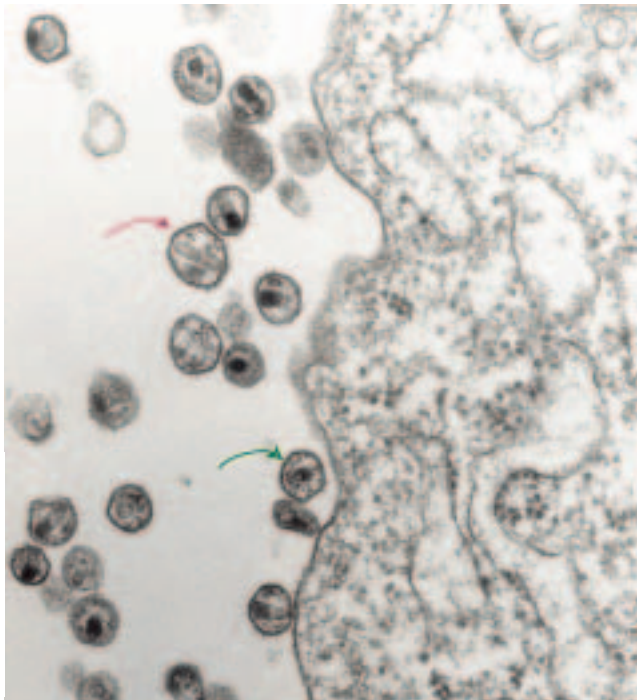
There are several reasons. One is the variability of certain parts of the virus which enable it to dodge the body's immune response. There is also the lack of animal models and the difficulty in testing the vaccine's efficacy on an exposed human population – even though we are certain of its inactivity.

In fact, it is possible to surmount these difficulties – and this is what we are attempting to do at the Foundation – by modifying the virus's surface protein using biotechnology, in order to expose the virus's least variable regions to the body's immune response, and by testing the candidate vaccine first as a complementary therapy. The immune system of a patient who has already been treated with a tritherapy is sufficiently restored to respond well to the vaccine. Whether or not the vaccine works will be determined by whether or not the virus begins to multiply once more after we stop the tritherapy. If the virus doesn't begin multiplying again, we will know we have a good candidate for a preventive vaccine.

Is the project well under way?

We would be able to progress faster with more substantial financial means.

Interview by Susan Schneegans



© L. Montagnier

Section viewed under an electron microscope of a cell fragment infected by the AIDS virus. Note the large number of viral particles (→) outside the cell on the right. Note also that those particles lacking the dark core (→) are not infectious

After the earthquake

On 26 December at 5:26 am local time, a devastating earthquake killed more than a quarter of Bam's 100,000 inhabitants, most of them in their beds. A further 15,000 or more were injured. Many of the city's 33,000 students perished, along with one in five of Bam's 5,400 teachers. Tens of thousands were left homeless and up to 6,000 children were orphaned.

Measuring 6.5 on the Richter scale, the earthquake destroyed up to 80% of the historic part of the city and extensively damaged the three-thousand year-old Arg-e-Bam (Bam Citadel), the largest earthen structure in the world. Both the city's hospitals collapsed and 85% of homes, schools, shops, medical and administrative buildings in the city and surrounding villages were flattened.

A task force convened by the Director-General met for the first time on 6 January to co-ordinate UNESCO's response to the earthquake and prepare the Organization's contribution to the joint United Nations Flash Appeal for Relief, Recovery and Immediate Rehabilitation. Funds were decentralized to UNESCO's Tehran Office for emergency assistance. This included helping children in need – almost all 131 schools in Bam and its surrounding area were destroyed –, assessing damage to cultural heritage and schools, and restoring the area's qanats system. Underground galleries that have tapped and continuously conveyed ground-water in the region since ancient times, the qanats are essential for irrigation of the Bam area, the primary produce of which is dates.

A series of technical missions to assess UNESCO's contribution to reconstructing a more earthquake-resilient city were despatched to Bam, including one from 26 to 31 January led by Wolfgang Eder, Director of UNESCO's Division of Earth Sciences, who was accompanied by Badaoui Rouhban, a specialist in disaster mitigation.

The mission worked closely with the International Institute of Earthquake Engineering and Seismology (IIEES), set up in Tehran under the impetus of UNESCO in 1990, to form an alliance in the aftermath of the earthquake between UNESCO, the IIEES, UNDP and United Nations Secretariat of the International Strategy for Disaster Reduction.

The great majority of homes, schools, shops, medical and administrative buildings in Bam and the surrounding villages were flattened

The IIEES and the Iranian authorities welcomed offers from international experts and delegations to examine the damage caused by the earthquake, including from a group of American-Iranian seismology engineers.

The alliance

In February, the alliance noted with regret 'the inertia and lack of effective action in enforcing building codes in Iran, as well as in other countries'.

In the medium term, the alliance will be publishing a report on the lessons learned from the Bam earthquake to reduce future losses in similar cases. It proposes developing a prototype school and hospital using advanced technology like base isolation, which would be adapted to the local culture, traditional architectural fabric and urban morphology of Bam. The alliance will be contributing to the restoration of the Arg-e-Bam and other heritage in the historic city.



In the longer term, the alliance will support the IIEES proposal to provide the Iran National Seismological Network with mobile seismological observation equipment and conduct seismic hazard zonation and microzonation studies for the most vulnerable inhabited areas. Annual courses on seismic design and construction will be run by the IIEES for countries in the region. It will also foster greater application of both traditional and new building technologies in cities and rural zones at risk. A geotechnical microzonation project devoted to major cities will also be implemented, as will a seismotectonic project encompassing detailed investigation of active faults in the high hazard zones. A joint pilot project will be launched to integrate earthquake risk prevention in educational programmes at all levels.

The alliance plans to present a report on the aforementioned projects and others to the UN World Conference on Disaster Reduction in Kobe (Japan) in January 2005.

Iran highly vulnerable to earthquakes

Iran is one of several countries which are highly exposed to earthquakes. Unfortunately, Iran's own vulnerability to earth-quakes – and other natural disasters – is growing, the result of population growth, relentless urbanization, industrialization, alteration of the natural environment, climate change, vulnerable dwellings and exposed 'lifeline infrastructure' providing basic services such as energy and water.

There are no known records of Bam ever having experienced an earthquake before but the city is located in an active seismic zone in South-east Iran, the Gowk fault system. Four major earthquakes have struck the region in recent years: the Golbaf earthquake of 11 June 1981 (6.6 on the Richter scale), the Sirch earthquake of 28 July 1981 (7.0), the South Golbaf earthquake of 20 November 1989 (5.6) and the North Golbak earthquake of 14 March 1998 (6.6).



© UNESCOB: Rouhban

Tens of thousands were left homeless



© UNESCOB: Rouhban

Many were still sleeping when the earthquake struck

The Bam earthquake is likely to cripple Iran's economic growth for some time to come, with investment funds being partially consumed by reconstruction efforts. Algeria is still today recovering from the earthquake that struck the province of Boumerdes in May 2003 and which continues to provoke severe aftershocks.

A brutal wake-up call

Every year, the Earth is shaken by half a million earthquakes, the great majority of which are so small as to be detectable only by a seismometer. A potentially headline-grabbing earthquake occurs once or twice a week and mega-earthquakes – those measuring in excess of 8 on the Richter scale – once or twice a year.

Although earthquakes can happen anywhere, the most destructive ones occur on the edges of the world's tectonic plates. Stress accumulates over time until the Earth's crust snaps under the pressure, radiating energy in the form of push and shake waves. It is the latter which do the most damage, causing buildings and bridges to sway perilously or even collapse.

Over the past 50 years, engineers and seismo-logists have acquired first-hand knowledge and know-how which can save lives if acted upon by politicians and other decision-makers. Seismological observation networks and systems give us a better understanding of the distribution in time and space of earthquake hazards and of their intensity. We know from these data, for example, that an earthquake can make a region more vulnerable to future shocks. The 1999 Izmit earthquake in Turkey accentuated the stress on the North Anatolian Fault, increasing the risk of a second major earthquake within the next decade or two.

That is not to say that seismological data act like a crystal ball. Earthquake prediction still eludes us. But governments can use the data to limit risk, such as by ensuring that

strict building codes are respected, organizing training and awareness-building campaigns for children and adults, and putting in place emergency evacuation procedures.

The Bam tragedy has come as a brutal wake-up call for the millions of people living in earthquake-prone cities like Istanbul, Tehran, Manila, Mumbai, Santiago, San Francisco, Cairo and Tokyo, among others. If we take the example of Tokyo, which has the dubious distinction of lying on as many as four active faults, it has been 80 years since the last major earthquake struck and there is a fairly big probability of another striking the megacity within our lifetime. The Government and population of Japan have gone to great lengths to prepare for the next 'big shake' but will this be enough to avoid widespread human and economic loss?

It is not the bullet that kills

Natural phenomena do not automatically have to spell disaster. It is human construction which is the primary agent of earthquake disasters. In other words, 'it is not the bullet that kills but the hole'. Earthquakes themselves do not kill; it was the collapse of buildings teetering on shaky foundations that was the main cause of death in Bam, Boumerdes and, most recently, Al Hoceima in Morocco.

Today, there is more scientific knowledge and technical know-how than ever before for anticipating the potential effects of an earthquake before it strikes. The survival story of the 40-storey Marriott Hotel – left structurally intact after an earthquake measuring 6.9 on the Richter scale devastated San Francisco (USA) the day the hotel opened in 1989 – speaks volumes for the sophistication of modern engineering.

Of all the global environmental issues, earthquakes and other natural hazards present the most manageable of situations: the risks of these are the most readily identified,

effective mitigation measures do exist and the benefits of reducing vulnerability greatly outweigh the costs. But the disastrous effects of natural phenomena will only be mastered once disaster preparedness moves up the public agenda.

Moving disaster prevention up the public agenda

Disaster relief may capture the public imagination but the same cannot be said for disaster prevention. Behind-the-scenes prevention is simply not as spectacular as the images of lurching apartment blocks or tents erected among the rubble.

Public resources spent on relief and recovery continue to account for 96% of all resources spent on disaster-related activities annually, leaving only a few crumbs for prevention. Decision-makers and donors tend to lay more emphasis on relief than on mitigation and preparedness that could help communities learn from disasters and reduce their vulnerability to future risks.

Cost-benefit analyses support the rationale behind disaster prevention. Some studies estimate the cost-to-benefit ratio of investment in disaster warning and mitigation systems, when compared to the economic losses associated with natural disasters, to be between 1:15 and 1:20.

UNESCO will continue to play an advisory and advocacy role until every country – be it rich or poor – has shifted emphasis from post-disaster reaction to pre-disaster action. Earthquakes are a fatality. They need not be a disaster.

Badaoui Rouhban, Wolfgang Eder,
Mohsen Ghafory-Ashtiany⁹ and Susan Schneegans

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⁹ Director of IIEES



The badly damaged Bam Citadel (Arg-e-Bam)

Doubling the **world's water professionals**

It is the largest postgraduate water education institute in the world. Over the years, the International Institute for Infrastructural, Hydraulic and Environmental Engineering (IHE) in Delft (The Netherlands) has trained thousands of students from developing countries who today form a vast international network of water specialists.

Since becoming a UNESCO institute in March 2003, the Institute is also the only body of the United Nations system authorized to confer fully accredited MSc and PhD degrees across a range of technical disciplines in the field of water resources management.

In the face of a looming global water crisis, the Director-General of UNESCO has called for a radical reform of water education programmes and for the number of water professionals around the world to double. The new UNESCO-IHE Institute for Water Education will be a pillar of that strategy.

'The prospect of a global water crisis is real. Population increase, the quest for greater food production, economic development leading to greater consumption of water, irrigation, especially in arid areas: all this is putting stress on a precious resource. At the same time, for many, water scarcity or unequal access to water is at the core of underdevelopment and poverty. Nature itself is unequal in water distribution, with 65% of the world's freshwater located in just 10 countries. Meanwhile, the demand for water is expected to rise by 38% in the next 25 years and by over 80% for drinking water. These stresses, coupled with the consequences of climate change and variability, deforestation, soil salinization and water quality deterioration, threaten to become critical'¹⁰.

Everyone knows something about the world's water crises. Yet few people are aware that the world is also facing a crisis in terms of the human capacity to implement the Millennium Development Goals and water targets fixed by the World Summit on Sustainable Development in Johannesburg in 2002 and the Third World Water Forum in 2003. These include halving the proportion of those without access to safe drinking water (1 billion today) and without basic sanitation (2.4 billion) by 2015.

Nearly all countries short of experts

Even if vast amounts of funding were to be released, the fact is that nearly all countries lack the numbers of sufficiently trained individuals to get the job done.

10. The Director-General of UNESCO addressing the World Water Forum in 2000

For this reason, the UNESCO-IHE Institute for Water Education is currently conducting a preliminary assessment of specific training needs on a regional basis which will lead into an in depth survey of regional needs throughout the world. Initial estimates indicate that, if the Millennium Development Goals on water and the Johannesburg targets are to be met, a 300% increase in the number of trained water managers will be needed in Africa. Asia will need to double the number of trained professionals and Latin America will require at least a 50% increase.



On 18 September 2003, UNESCO-IHE Director Richard Meganck awarded Christine Adongo Ogut from Kenya's Nairobi City Council Programme with the annual Wil Segeren Fellowship Award. This award enabled her to continue her studies towards a Master of Science in Municipal Water and Infrastructure in the 2003/2004 academic year

It is here that UNESCO-IHE can make a vital contribution. Over the years, the Institute has trained more water professionals than any other institution of higher education. Students come almost entirely from developing countries and all are mid-career professionals. Of these, 99% return home to assume positions of greater responsibility.

An institute born of a calamity

The Institute has remained faithful to its original mandate of serving the developing world, defined after catastrophic floods devastated large areas of the Netherlands in 1953.

This disaster triggered the introduction of the Delta Works Law, requiring the erection of storm surge barriers across the rivers of the Rhine Delta to protect the Dutch lowlands from such floods in the future. H. E. Mrs Begum Raána Liaquat Ali Khan, Ambassador of Pakistan to the Netherlands at the time, asked the Government of the Netherlands to share the knowledge and experience acquired in this field with other countries facing similar problems.

The IHE was born. At first, the Institute offered training courses solely in hydraulic engineering to practicing professionals from abroad. But within five years, it had extended the curriculum to encompass sanitary engineering. Today, an interdisciplinary approach to problem-solving is reflected in the number of courses proposed not only to engineers but also to economists, policy analysts and conflict resolution experts.

Four new Masters programmes

Since the Institute's inception in 1957, more than 12,000 individuals from 128 countries have graduated. The first UNESCO-IHE class is due to graduate in September 2004. To mark the Institute's new status, four new Masters Programmes with 15 specialisations were introduced in 2003.

UNESCO-IHE offers a 12-month Master of Engineering (MEng), an 18-month Master of Science (MSc) and a Doctor of Philosophy (PhD) programme of 3–4 years duration, the latter in conjunction with one of the larger Dutch Universities. Currently, some 400 students are pursuing degree programmes in Delft and many more participate in tailor-made 3–6 month-courses co-sponsored with partner universities throughout the world. The Institute also conducts research, participates in policy development and offers advisory services worldwide. Half of its 140 international staff members are academics.

One challenge facing the UNESCO-IHE is that of funding its academic and research programmes. The Government of the Netherlands is a generous host, providing a core subsidy through the IHE Delft Foundation of approximately

8.5 million euros annually, slightly more than one-third of annual budgetary needs.

Solving students' funding headaches

The lion's share of the remaining budget goes towards providing fellowships for students. Applicants to the Institute can apply to The Netherlands Fellowship Programme for tuition and subsistence support. However, this generosity notwithstanding, approximately 40% of MEng students and as many as 90% of those studying for an MSc or a PhD require complementary funding. Some students are funded as part of ongoing research undertaken by the Institute's academic staff.

Increasingly however, students are being funded by their own agencies or firms, many from developing countries. Even so, the Institute still has to turn away qualified applicants due to the lack of fellowships. 'Now that we are part of UNESCO', notes Richard Meganck, Director of the UNESCO-IHE, 'we hope to benefit from UNESCO's Participation Programme, as well as other fellowship programmes from the World Bank, the Organization of American States and the regional development banks. We are also beginning to approach other OECD countries, private companies and foundations, and have implemented our own Fellowship Trust Fund'.

Decentralizing to the developing world

Another challenge the Institute faces is to remain at the 'cutting edge' in terms of both the substance and the delivery mechanisms of its academic programmes. Many of the Institute's institutional partners throughout the world are rightfully demanding a more active role in training their professionals. 'We have long given priority to building training capacities in developing countries themselves', notes Meganck. 'Now, we are seeing the fruits of our labours. We may over time locate the majority of our courses within developing countries, once we solve the related accreditation and cost-sharing issues. We must be entrepreneurial in that regard. We cannot and will not reverse this commitment to decentralizing our operations over time'.

The four Masters programmes introduced in 2003/2004

Water science and engineering

- ▶ Hydraulic engineering and river basins
- ▶ Coastal engineering and port development
- ▶ Land and water development
- ▶ Hydroinformatics
- ▶ Surface water hydrology
- ▶ Groundwater hydrology

Environmental science

- ▶ Environmental science and technology
- ▶ Environmental planning and management
- ▶ Limnology and wetland ecosystems
- ▶ Water quality management

Water management

- ▶ Water quality management
- ▶ Water resources management
- ▶ Water services management

Municipal water and infrastructure

- ▶ Water services management
- ▶ Sanitary engineering
- ▶ Water supply engineering
- ▶ Integrated urban engineering



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Two-way videoconferencing (as here), Internet and other state-of-the-art technology give participants access to a wide range of communication and learning technologies

The PoWER network

The Partnership for Water Education and Research (PoWER) was founded just over a year ago. It creates a collaborative partnership between 17 partner institutions of higher education in Africa, Asia, Latin America and the Middle East.

Through the use of Internet, satellite, video-conferencing and other innovative ICT applications, ‘education and training can be delivered to many more people and institutions in the developing world by using blended learning systems which combine human-to-human interaction with electronic systems’, notes Atem Ramsundersingh, PoWER Programme Director. ‘These activities will accelerate the process of knowledge delivery’. ‘Innovation also means the use of e-tools and multimedia to increase the level of “edu-tainment” or education in an entertaining environment’.

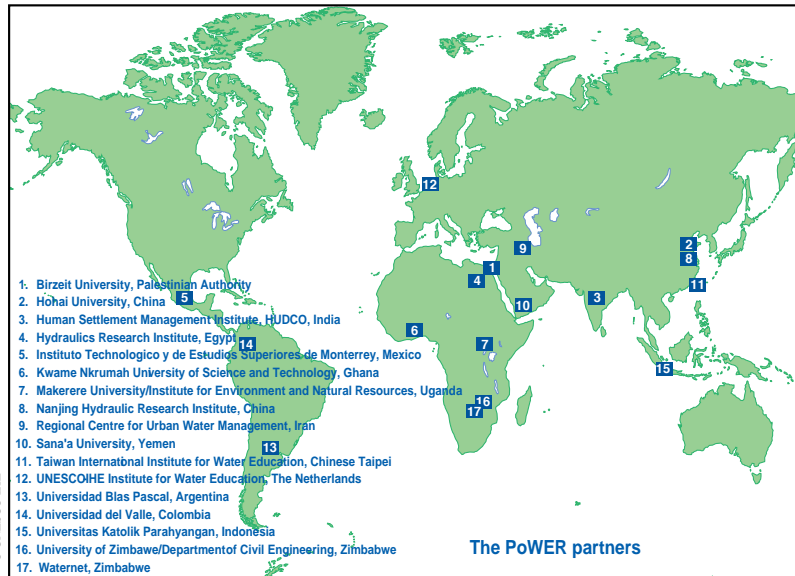


PhD fellows conducting water quality tests at Birzeit University in the Palestinian Territories, one of the PoWER partners

The PoWER partners (see figure) are currently collaborating to develop ten innovative learning modules in the subjects of water security, environmental integrity, urbanization, integration and information and communication systems. PoWER will also expand options on the Internet for continuous education of alumni and staff from partner institutions. It will provide photo and video archives, downloadable publications, and virtual collaborative workspaces. Moreover, UNESCO-IHE’s state-of-the-art Distance Learning Centre is connected to the World Bank’s Global Development Learning Network.

The Nile Basin network – a model for capacity-building

The UNESCO-IHE supports capacity-building networks throughout the developing world. These are often built around individual and regional PoWER partners. One example is that of the Hydraulics Research Institute (HRI) in Cairo (Egypt). After jointly developing and running a regional training course for river engineering professionals from the ten Nile Basin countries for many years, the UNESCO-IHE and HRI have developed a regional network of water sector professionals. Many of these are alumni of

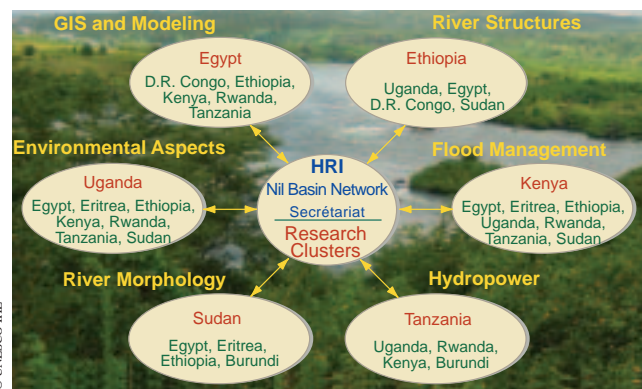


both the regional training course at the HRI itself and the UNESCO-IHE’s programmes in Delft.

Apart from information-sharing, the Nile Basin Capacity-building Network¹¹ stimulates collaborative applied research on six main issues of relevance to the region Sudan is hosting a research cluster that investigates river morphology, sedimentation problems in reservoirs and soil erosion problems. Tanzania is collaborating with other Nile Basin countries on the potential of both large and small hydropower. Egypt has taken the lead in stimulating research on the application of geographical information systems to the modelling of river channels. Ethiopia, Uganda and Kenya, for their part, are hosting regional research clusters on river structures and micro-dams, environmental issues and flood management respectively. In this way, each country is developing its own centre of excellence.

In June of this year, the first results of the Nile network will be presented to interested water managers and politicians from the region at a seminar organized to mark the official wrap-up of the network’s first phase.

Richard Meganck and Jan Luijendijk¹²



11. To join the network: www.nbcbn.com; UNESCO-IHE: www.unesco-ihe.org (only research cluster members may access the collaborative portion)

12. Head of Hydroinformatics and Knowledge Management Department

Diary

31 March – 2 April

2nd World Water Development Report
Preparation workshop. UNESCO HQ :
www.unesco.org/water/wwap/

2–3 April

European Network on Education and Training in Renewable Energy Sources
(within UNESCO's GREET programme)
Founding meeting. UNESCO Venice:
roste@unesco.org

5–7 April

Resource management for sustainable intensive agriculture systems
Promoting environmentally-friendly agricultural production in China. Chinese Ministry of Education, China Agricultural University and UNESCO. Beijing (China):
beijing.sc@unesco.org

19–21 April

Regional innovation systems and S&T policies in emerging economies: experiences from China and the world
Intl Conf. Zhongshan University, UNESCO, ISESCO, Institut de recherche pour le développement, et al. Guangzhou (China):
beijing.sc@unesco.org

19–30 April

Climate variability in the 20th Century
Two ICTP-sponsored workshops for scientists and post-graduate fellows in atmospheric

physics and dynamics, climatology, oceanography, environmental physics. Trieste (Italy): <http://agenda.ictp.trieste.it/>

25 April

2nd Earth Observation Summit
Tokyo (Japan): www.earthobservations.org

26–28 April

Hydraulics of dam and river structures
Intl Conf. Tehran (Iran): <http://hdrs.pwit.ac.ir/>

26–28 April

Lagoons and coastal wetlands in global change context Venice (Italy): www.corila.it/

3–5 May

Intl Consortium on Landslides
technical meeting within Inter-Agency Task Force meeting on disaster reduction. Geneva (Switzerland): w.eder@unesco.org, b.rouhban@unesco.org, sassa@scl.kyoto-u.ac.jp

10–12 May

The ocean in a high CO₂ world
Open SCOR/UNESCO-IOC symposium to address biological and biogeochemical consequences of increasing atmospheric and oceanic CO₂ levels, and mitigating strategies. Paris (France):
<http://ioc.unesco.org/iocweb/co2panel/>;
m.hood@unesco.org, scor@jhu.edu

10–12 May

Land-use planning and policy
Intl Conf. Urbanization is rapidly changing

China, which occupies less than 7% of the planet's arable land (and counts 20% of world pop.) and records ca 7% annual economic growth. Chinese Min. Land and Resources, German Fed. Min. Education & Research, UNESCO: beijing.sc@unesco.org

27 May

IGOS Partners Meeting Rome (Italy). FAO: www.igospartners.org

2–7 June

20th Colloquium on African geology (CAG 20), BRGM, Orléans (France):
igcp@unesco.org; w.eder@unesco.org;
jp.milesi@brgm.fr

4–5 June

Scales in hydrology and water management
UNESCO/IAHS 7th Kovacs Colloquium.
UNESCO HQ: www.unesco.org/water/ihp

15–18 June

Groundwater vulnerability assessment and mapping
Intl Conf., Ustron (Poland):
<http://khgi.wnoz.us.edu.pl/vulnerability.htm>

20–23 June

Chemistry for water (Chemrawn V)
Paris (France): www.worldwatercouncil.org/

27–29 June

Geoparks
1st Intl Conf., Beijing (China):
m.patzak@unesco.org;
chinageoparks@hotmail.com

New Releases

DIDAC

Top-quality chemical teaching materials: a five-volume set of transparencies and accompanying texts (also exists as CD-ROM). Can be adapted to multilingual needs. Vol. 1: the role of chemistry in our daily lives, water, the periodic table of the elements, colloidal systems and thermodynamics; Vol. 2: chemical equilibria and petrochemistry silverhalide photography; Vol. 3: electrochemistry, air and water, and atomic models; Vol. 4: polymers, biopolymers and the chemical bond; Vol. 5: separation techniques and chemistry and health. DIDAC is being made available to secondary schools and tertiary institutions in rural areas and developing countries free of charge through an AGFA Gevaert/UNESCO/IUPAC partnership. Soon to be freely accessible via a IUPAC website: www.unesco.org/science/bes

Geothermal Energy: Utilization and Technology

Eds M. Dickson and M. Fanelli, Renewable Energies Series (English only), ISBN 92-3-103915-6, UNESCO Publishing 24,80 euros, 206 pp. Introduction to the nature, classification and distribution of geothermal resources, description of geothermal electricity generation and non-electric uses, analysis of the potential impact of geothermal energy utilization on the environment, and socio-economic and regulatory aspects. Will appeal to under- and post-graduate students in power engineering, mechanical engineering and physics.

Solar Photovoltaic Systems Technical Training Manual

By H. Wade. Renewable Energies Series (English only), UNESCO Toolkit of Learning and Teaching materials, Vol. 1 (see below Vol. II), ISBN 92-3-103904-0, UNESCO Publishing, 12,80 euros, 114 pp. Contains detailed descriptive texts and graphics, and discussion of wider issues relating to project development for photovoltaic solar systems (including their installation, operation, monitoring and evaluation, management, maintenance and rehabilitation).

Solar Photovoltaic Project Development

By H. Wade, Renewable Energies Series, UNESCO Toolkit of Learning and Teaching Materials, Vol. 2, ISBN 92-3-103903-2 (English only), UNESCO Publishing, 16,80 euros, 140 pp. A companion teaching aid to the *Solar Photovoltaic Systems Technical Training Manual* (above).

Innovations in Science and Technology Education (vol. VIII)

Ed. Edgar W. Jenkins, produced by Education Sector. UNESCO Publishing, 16,50 euros, 348 pp, ISBN 92-3-103894-X National and regional studies of issues in secondary education.

For sales publications: www.unesco.org/publishing
UNESCO science portal: www.unesco.org/science

Governing Bodies

The Executive Board will be meeting from 14 to 29 April.

Under Item 3.1, the Director-General will be reporting on implementation of the Barbados Programme of Action (see p.2).

Under Item 3.2, he will be updating the Board on the International Centre for Synchrotron Light for Experimental Sciences and Applications in the Middle East (SESAME) and the outcome of the World Summit on the Information Society. The Board will also hear about progress towards a UNESCO strategy on education for management of water for all as an integral component of the UN Decade of Education for Sustainable Development beginning in 2005, and about progress on a feasibility study for a regional centre for biotechnology training and education in India.

Under Item 3.5.1, the draft statutes for the Scientific Board of the newly approved International Basic Sciences Programme will be examined by the Board, among other aspects.

In the area of ethics, the Director-General will be presenting the findings of an evaluation of the impact of the World Commission on the Ethics of Scientific Knowledge and Technology, under Item 3.6.1, and reporting on the drawing up of a declaration on universal norms in bioethics, under Item 3.6.2: www.unesco.org/exboard/documents.shtml