Knowledge systems
for sustainable development

24 WORLD ACTORS SPEAK IN FAVOUR OF A BETTER INTEGRATION OF EDUCATION AND TRAINING EFFORTS FOR SUSTAINABLE DEVELOPMENT.

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INSTITUT PASTEUR

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FOREWORD ON METHODOLOGY

This document is a summary of the major contributions made to the International Conference held on June 17 and 18 2004, organized by the Institut Veolia Environnement and the Institut Pasteur.
These oral presentations were transcribed and reorganised around the main themes of the conference. They have been reviewed by speakers.
The Institut Veolia Environnement coordinated this project.

Summary

Introduction

IN THE FOOTSTEPS OF LOUIS PASTEUR

Philippe KOURILSKY, Director-General, Institut Pasteur, Professor at the Collège de France

It comes as no surprise that the Institut Pasteur is hosting today the Institut Veolia Environnement's first "Future Environmental Trends Conference", because since its beginnings, at the end of the 19th Century, the Institut Pasteur has been involved in what we now call « sustainable development ».

Indeed, health is both one of the fundamental conditions of sustainable development, and one of its results. Firmly based on a network of scientific and medical cooperation represented by 23 Pasteur Institutes spread over the five continents, more than ever, the Institut Pasteur is committed to working on many of the disciplines that public health is concerned with:

- fighting transmissible diseases
- education in sanitation
- epidemiology
- screening and monitoring endemic diseases
- preventive medicine: prevention, vaccination...
- hygiene
- the environment: microbiology, environmental pollution (contamination of food, water).

Scientific research must be placed at the head of the list of public and private commitments if we are to attain the objectives of more sustainable development for future generations. It is through scientific innovation that societies will best be able to make the economy sustainable.

I shall briefly illustrate that statement:

Scientists and industrialists share the same awareness of the challenges of the future.

Scientific innovation is our best chance of making economies more sustainable, and of solving the sanitary and environmental challenges of our times, while we await the emergence of new global and equitable forms of governance.

Sustainable development offers a model to which we entirely subscribe

From Rio to Johannesburg, in the space of ten years, powerful awareness has grown of the planet's limits and the risks we incur by giving freedom of action to forms of development that are insufficiently careful of the interests of future generations and of rare resources. The United Nations, with the Global Compact, have set the "Millennium Goals" as regards health, education, standard of living, energy policies and democratic governance, and it is of value because it submits a road map to all the public and private decision makers who feel that our common medium and long term future is a matter for their concern.

In recent times, a corrective concept to market economy has evolved: sustainable development, and this does set out the need to balance everyone's right to prosperity and the duty to protect collective assets. It offers "a dynamic compromise between the pursuit of economic and social progress and the preservation of prevailing laws of nature". We strongly believe in the pertinence and value of this concept which is a further step towards responsible management. In the pursuit of our own activities, we are also moving in the same direction.

Scientific progress must regain its place at the centre of solutions for the future, and cease to be under suspicion.

Two hundred years ago, the world experienced an unbelievable conjunction between a cycle of discoveries in the physical and fundamental sciences, and a cycle of progress in medicine and biology. Louis Pasteur lived at the same time as the inventors of genius and the intrepid entrepreneurs who brought us the benefits of rail travel and electricity and simultaneously enforced prophylaxis and an understanding of microscopic life forms.

Was this the result of coincidence or of beneficial interaction? In any event, to reflect on our recent progress is to see that the drivers of extended life expectancy and improved quality of life owe everything to a combination of exceptional scientific breakthroughs and massive economic investment on the part of developed societies.

We must not forget that we owe to science our capacity to feed, care for, transport, shelter, and inform millions of people who up to this time had to be content with an autarchic and poverty-stricken existence.

This is Pasteur's lesson and we need to remember it to this day. It is true that he was in conflict with his times but he nevertheless managed to impress upon his contemporaries the force of rationality and faith in the benefits of progress, although society at the time hesitated on the brink of new developments.

If we truly wish to meet the challenges of a "sustainable" world, we must invest in science to a large extent.

A large number of scientific challenges still confront us. To quote some of them: antibiotic resistance, the issue of vaccine pressure, and our lack of knowledge as regards fighting AIDS, cancer, and the genetic vulnerability of certain populations.

At present, the people of the South are the first to suffer from our shortcomings. The conflict that arose over access to medicinal drugs can be viewed as an advance warning of North-South discord that had not been anticipated..

The sustainable model will be firmly based on cooperation between all the actors working on vital programmes.

The challenges of health and progress now call for commitment and innovation on the part of scientists.

The time has come to reaffirm the universality of researchers' missions, in time and in space, which must incite them, more than ever, to make fundamental learning available to all.

Like large corporations – Veolia Environnement publishes an annual report on accountability and sustainable development – which are now required to produce a "balance sheet", it could be a useful exercise to call on important scientific organizations to be more introspective as regards their purpose and the efficacy of their contribution to the common good.

The Institut Pasteur does keep this in mind. We are well aware today that research programmes, public and private, must take into account human priorities and that the action of international organizations does not absolve independent research from seeking the answers to problems which endanger the sustainability of certain regions and certain populations, as is the case in Africa at this time. This is why the Institut Pasteur feels that it remains faithful to its mission and to that vision when it works in close cooperation with international programmes on vaccination, research on AIDS and endemic diseases.

Science was the best product to emerge from the first industrial revolution. Is science the realistic and effective solution to these challenges that confront us, that we are well able to describe, but cannot deal with? We believe the answer is yes, and that is why we also believe that to mobilise scientific learning is the best and fastest way of finding lasting solutions to these issues, if we commit the necessary resources.

Our two organizations are cooperating by pooling their thoughts in this Conference on the Education, Environment and Health.

Later, I would like us to arrive at exchanges of information and research programmes, in connection with

the major issues we are involved in: safety and hygiene in the supply of water, management of sanitation policies, training and education as regards hygiene and management of water resources.

Indeed, both organizations are waging a battle against legionellosis, which is a major risk to public health, connected to liquid and gas flows. The Pasteur expertise in microbiology and Veolia Environnement's technical proficiency can surely help to curb this scourge.

The object is to encourage, through "scientific alliances", ambitious international commitment with the sole aim of seeking in order to find, and to get as involved as may be needed to eliminate the risks and threats that we cannot accept.

Such is the spirit in which these two institutions are tackling the issue of sustainable development. They know what unites them, despite radically different justification and organization, and they know that this is necessary for their continuing existence in the future and the continued validation of their true calling.

L'INSTITUT PASTEUR

Institut Pasteur is a non-profit private foundation dedicated to the prevention and treatment of disease, primarily infectious diseases, through research, education and public health activities.

Set up throughout the world with almost 8 500 individuals, the "Réseau International des Instituts Pasteur" shares the same missions, fighting against the diseases specific to the countries in which they are located.

In order to enable the results of its research to be of rapid benefit to the general public, in the form of new products, technologies or services, Institut Pasteur has established close partnerships with industry in a number of fields including: human health, the environment, the food industry, hygiene.

COMBINING OUR ASSETS FOR A BETTER UNDERSTANDING OF ENVIRONMENTAL AND HEALTH ISSUES.

Paul-Louis GIRARDOT, President, Institut Veolia Environnement

The Institut Pasteur kindly contributed to this conference its very rare cast of mind, that is, its independence, scientific exactitude, and will to innovate. Pasteur is the incarnation in our eyes of a particular way of experiencing the human adventure as a consequence of its very special history.

Cooperation between researchers, who are the major actors of public health, and entrepreneurs, the actors of material well-being, appeared to be possible on a common theme: scrupulous reflection on the subject of social and environmental responsibilities of public and private actors in the present context of globalisation.

It is true that Veolia Environnement and the Institut Pasteur have been working together for a very long time, which is possibly why they have a common approach to problems. This approach consists in confronting immediate issues, with a view to obtaining results and in a spirit of innovation, in order to solve basic problems troubling populations who are often deprived and who need to improve the basic conditions in which they live.

One may wonder why it was necessary to combine in this conference the two themes of environment and health. This association of two distinct, but complementary, issues, firstly has the advantage of touching upon one of the keys to sustainable development, at the centre of all public policies: interaction between the environment and the public health situation and the improvement of public health and living conditions.

Louis Pasteur taught us that public hygiene is a science, and we owe much to his teachings as regards methods and measures. Since that time, those who act on the environment have realised that they must operate a complete integration of the context, that is, their own by-products (sludge, smoke, odours, or air pollution, for example). However, to determine the "reasonable" limits of human implantation, there is no substitute to meticulous reasoning. Collective networks must therefore accomplish an essential task. With water networks, quality control becomes possible; the existence of collection networks for solid wastes is a way of avoiding uncontrolled dissemination.

In any event, it is clear that to conduct successfully these operations, non physical networks are also useful, those of knowledge and experience. This leads us directly to education, the key to knowledge and its transmission. In this respect, a study completed in 1996 produced results which came somewhat as a surprise compared to commonly accepted opinions. The subject was the incidence of gastrointestinal disorders in children, and it was evidenced that these regressed by 21% when the quality of drinking water was improved, by 27% with better sanitation, but above all, by 33% with improvements in behaviour.

When discussing global water shortages, it should be kept in mind that fostering good hygienic practices is just as important and essential as providing infrastructure.
However, it is sometimes very difficult to persuade a population, however educated, to adopt hygienic habits as it is illustrated by a frequently quoted case of a Paris suburb where, a few years ago, a source of non-drinkable water was in constant use despite frequent instructions to the contrary. The economic stakes underlying the social issues are, of course, of gigantic proportions.

A coordinated approach combining the environment, health and education could help to avoid serious disorders, and also have very positive effects on

public expenditure. But the time dimension also needs to be introduced.

People frequently forget that in Paris, between the introduction of the first water network around 1780, and the almost complete disappearance of water bearers in 1880, a hundred years had passed.

And so, in compliance with the mission of the Institut Veolia Environnement, we are embarking on a reflection which bears on the very future of our societies. We do so while keeping in mind the need for great scientific exactitude, in the wake of Pasteur, and the need to validate actions in concrete terms, as we do every day of our lives in the pursuit of our activities. Sanitation gives scientific foundations and structure to environmental activities; education is a foundation for their social and economic usefulness, and sustainably so.

INSTITUT VEOLIA ENVIRONNEMENT

Institut Veolia Environnement was created in September 2001 as a non-profit organization at the initiative of Henri Proglio, Chairmman and CEO of Veolia Environnement.

Forum for thinking and interchange, the Institute aims at identifying major future trends that will shape Veolia Environnement and its business in the coming decades, promoting public debate about world sustainable development issues and creating opportunities for dialogue between companies, public institutions, scientific experts and civil society.

The Foresight Committee, the Institute's central body, is made up of internationally renowned scientists and leading figures.

They contribute to defining research priorities and giving guidance about the Institute's activities. They also bring their expertise to bear in broadening perspectives on subject relating to environment and sustainable development.

1

Education must play a central role in meeting the challenges of sustainable development

THE MILLENNIUM DEVELOPMENT GOALS PLACE EDUCATION, HEALTH AND THE ENVIRONMENT AT THE CENTRE OF THE CHALLENGES TO BE MET BY THE INTERNATIONAL COMMUNITY

par Koïchiro MATSUURA, Director-General, UNESCO

Early in the 21st Century, the international community adopted the well-known "Millennium Development Goals" which should serve to guide the action of governments and major decision makers in the private sector. Some of these goals, and not the least important of them, are directly linked to education, environment and health issues.

The Education for All (EFA) priority target is to give all children access to a complete cycle of primary education. It is based on the need for children to stay in school long enough to acquire effective essential learning and life-skills. Many studies have demonstrated that children's health and nutrition are important factors that condition their ability to learn and the quality of their education.

The second education goal aims to reduce gender disparity and make sure that girls and boys get equal access to primary and secondary education. On this point, the interaction between education, culture and society is extremely important and is particularly revealing in regard to health and environmental issues such as separate sanitation facilities at school for boys and girls.

On the subject of infant mortality, the Millennium Declaration aims to reduce by two-thirds the mortality of children less than five years of age by 2015. With regard to maternal mortality, improvements in health care and nutrition considerably reduce the risk of anaemia, and fighting lethal infection before and after birth require sufficient quantities of clean water.

Concerning major diseases, one declared objective of the Millennium Declaration is to halt by 2015 the progression of AIDS and other major pandemics, and to begin to reverse the present trend. General improvements in health care and nutrition help to fight these diseases. The risk of water-related diseases can be reduced by improvements to water management and educational programmes.

The Millennium Declaration also emphasises the need to protect our common environment in the context of sustainable economic development. Major objectives are to cease the intensive exploitation of natural resources and to reduce by half the number of people who have no access to safe drinking water or adequate health care systems. The Declaration attaches importance to the need for a reduction to a minimum of the emission of greenhouse gases; it points out the efforts required to improve the mana-

gement, conservation and development of forests on a sustainable basis. It also calls for a termination of intensive exploitation of water resources, and for the development of national and local strategies to ensure equitable access to water, to combat pollution and to guarantee the protection of the quality of water. Good water management is a decisive factor for safeguarding ecosystem integrity.

The Declaration also underlines the need to protect biodiversity and for measures to be taken to combat drought and desertification.

On a more general level, all development objectives include one common aim, namely, to eradicate extreme poverty and hunger. In many parts of the world, poverty is defined by a combination of hunger, faulty health care systems, unfavourable environmental conditions, and inadequate and ineffective educational systems.

It is important to recognise that the World Education Forum (Dakar, Senegal, April 2000) went further than the two education-related goals in the Millennium Declaration by establishing four additional goals: early childhood care and education, quality of education, adult literacy, and equitable access to appropriate learning and life-skills programmes for all young people and adults.

Meanwhile, the United Nations General Assembly has recently proclaimed three initiatives, involving programme "Decades" on these subjects:

- The United Nations Literacy Decade (2003-2012)
- The United Nations Decade for Sustainable Development (2005-2014)
- The United Nations Decade for Action 'Water for Life', beginning on World Water Day 22nd March, 2005 (ending 22nd March 2015).

UNESCO is playing or will play a key role in each of these UN Decades.

Bridging the disciplinary divide:

Since the boundaries between various scientific disciplines are more and more sharply defined, reaching a common understanding is increasingly difficult. UNESCO plays a useful role by promoting dialogue among disciplines so that viable solutions to multi-faceted problems can be found. Such dialogue helps to dispel possible misunderstandings and bridge the disciplinary divide.

Improving the level of public debate about education, environment and health:

Research institutes, non-governmental organizations and civil society all have responsibilities to ensure that democratic debate is grounded upon cogent argumentation and reliable evidence. To ensure that dialogue among disciplines and informed democratic debate rest on strong foundations, quality education for all throughout the life-span is essential.

2

Major public health progress is achieved through education on hygiene

THE HYGIENE REVOLUTION IN EUROPE WAS CONCOMITANT WITH THE GENERAL PROGRESS OF SOCIETY WHICH BEGAN WITH THE INDUSTRIAL ERA

Harvey V. FINEBERG – President, Institute of Medicine (USA)

Progress achieved in the provision and sanitation of water in Europe since the 19th Century has made it possible to radically increase life expectancy. However, unlike industrial countries, in developing countries lack of investment in hygiene is still one of the most important health risk factors.

To explain recent improvements in the quality of life in the West, we must return to the 19th Century, when the hygiene revolution began. More specifically, attention should be given to progress in the field of sanitation since that time.

Life expectancy remained stable during the first part of the 19th Century. However, mid century, a new event occurred, that is that pure water was first provided to the cities in the Lyons region (second largest city in France situated in the South-East part of the country). Thus, around 1850, clean water became abundant. Although there was some progress, the situation in Paris was not so favourable.

However, progress in Paris only became significant in the last twenty years of the century. It was then that new pumps along the Seine made it possible to double the provision of water. Furthermore, the number of sewers increased significantly; comparing the situation in 1870 to the one in 1900, the number of sewers had more than doubled during that period of time. Finally, in Marseilles (South of France by the Mediterranean sea), the situation only improved in 1890, when a double sewerage system was installed. Around 1900, life expectancy increased considerably over the whole of France. In fact, at that time, Paris was considered to be the cleanest city in the world.

In developed countries, it is possible to say that progress in life expectancy only became significant once the provision of water and sanitation systems had been completed in the principal towns.

According to various studies, in the 1960s and 70s, infant mortality for children under one year of age, caused by disorders involving diarrhoea, the world over, was 23 per 1000. In the 80s, the figure dropped to less than 20 per 1000. However, today, more than 2.5 million children die every year from such causes. The World Health Organization considers that if the provision of drinking water was satisfactory, this mortality could be reduced by 65%.

What is the situation in the world today? There is a clear difference between two worlds, due to the quality of hygiene and of water management.

The burden of lethal diseases in developing and developed countries can be compared (cf The Lancet 2001). At present, the five gravest risks in developing countries are: malnutrition, high risk sex, doubtful water and lack of hygiene, high blood pressure, and cholesterol.

In contrast, in developed countries, major risks are: high blood pressure, tobacco, alcohol, cholesterol, and obesity. Obviously, this is a static image of the situation, which is evolving. In the United States, the problems of diet and lack of exercise, and resultant obesity, are severe and, without comprehensive intervention, likely to become worse in coming years.

On the whole, more efforts have been devoted to the provision of drinking water than to water management. It is therefore important to combine progress as regards water sanitation and health concerns. Kofi Annan (the United Nations General Secretary) recently stated that access to safe drinking water is a fundamental need, and therefore a human right.

In the future, we shall have to face up to the challenges awaiting us. The urban population in developing countries will be growing more than anywhere else in the next 25 years.

With this in mind, a dual problem confronts us as regards drinking water and sanitation: supply the necessary services in the sprawling cities of developing countries, and make similar progress in medium sized towns. Nor should we forget that over and above the problems already highlighted (natural disasters, poverty, limited natural resources) there will in time be another problem with which to cope, that of global warming which will exacerbate the shortage of safe drinking water.

TO MAKE WATER DRINKABLE IS TO DEFEND LIFE

Live beings need water to live and survive but water transports dangerous components. They are pathogenic agents, bringing cholera, bacillary dysentery, salmonella, or the rotavirus.

Renaud PIARROUX
Professor of Parasitology and Mycology, Director of the Rural Health and Environment Group (SERF – Santé et Environnement Rural) at the University of Franche-Comté

THE ENVIRONMENT: A DETERMINANT FACTOR FOR HUMAN HEALTH

As well as biological and behavioural factors, the environment is recognised as one of the major determinants of human health.
The provision of drinking water and sanitation are among the measures that mostly contribute to the improvement of public health and the expansion of social and economic life.

William DAB
Director-General, French Ministry of Health

THE MANAGEMENT OF WATER, KEY TO PUBLIC HYGIENE AND HEALTH POLICIES

William DAB, Director-General, French Ministry of Health

Public hygiene methods related to water treatment have played an important role in Europe for the eradication of diseases such as typhoid fever. Nowadays, in spite of the progress made in curative medicine, it is more than ever necessary to insist on the importance of hygiene and the quality of water.

Water and public health have always been closely related. Historically, safe water was the starting point for the development of the hygiene campaigns in the mid 19th Century.
Measures of public hygiene such as the treatment of water, the protection of sources, and progress in personal hygiene, made it possible to bring about a drop from a scale of 100 in 1860, to 10 in 1920, for typhoid fever, in just sixty years.

Progress in curative medical practices and vaccines, followed by the use of antibiotics, brought a further drop down to 2 in the next forty years. In epidemiology, water played a very special role. Studying cholera epidemics in 1854, John Snow became convinced the disease was related to water – and not miasma – and he then laid down the foundations for modern epidemiology (description, test, and evaluation).

Only too rapidly, this degree of attention to the cleanliness of water abated, and progress was taken for granted. In fact, in the 20th Century, it was as though the brilliant success story of curative medicine had eclipsed hygiene, as though the individual dimension had ousted the community approach.

In Johannesburg, experts pointed out that about 180 billion dollars a year would be required to respond to the commitments of the United Nations concerning access to water and sanitation. As of now, annual expenditure in this respect amounts to about half of this sum.

The present situation can be described as requiring a merger between the hygienist approach of the 19th Century, and the medical and biomedical approaches of the 20th. These two methods must be linked to achieve well-being, by combining an ever more powerful technical approach and a pedagogical approach based on social mobilisation and education. There is an obvious condition for that to happen: better scientific education.

FOUR CONCRETE EXAMPLES OF A CONNECTION BETWEEN WATER RESOURCES AND EPIDEMICS IN DEVELOPING COUNTRIES

Renaud PIARROUX, Professor of Parasitology and Mycology, Director of the Rural Health and Environment Group (SERF – Santé et Environnement Rural) at the University of Franche-Comté

In developing countries, the scarcity of drinking water and insufficient hygiene create the conditions in which diarrhoea and cholera epidemics thrive. Local experience demonstrates that access to safe drinking water is an effective weapon to combat these epidemics.

There is a very clear connection between drinking water resources and the risk of outbreaks of diarrhoea (epidemic or endemic). This relationship can be illustrated with four concrete examples.

In 1994, after the Rwandan genocide and the defeat of the Hutus, there was an exodus of a million people. In just a few days, refugee camps sprang up in Goma and Zaire containing as many as 200,000 people. Hygiene was precarious or totally lacking. Immediately after their creation, the camps were the scene of epidemics of exceptional amplitude, partly due to a shortage of drinking water: in July 1994, refugees could only get an average of 0.2 litres of drinking water (the equivalent of a single glass of water) a day per person. A minimum of five, or even twenty litres would have been necessary. Of course people continued to drink but from water sources which were used for everything (cleaning, washing, defecation) thus multiplying the risk of epidemic disease. In all, more than 10,000 people died of cholera, out of a reported (but not exhaustive) number of cases amounting to 60,000. The cholera problem was only solved once an increased supply of drinking water became available.

The second example was situated in the Grande Comore. The island is in an intertropical area, and judging by the landscape, would not seem to suffer from any shortage of water. However, there are neither rivers nor springs, and the main water resources are provided by rainwater and pools of brackish water, referred to as "swimming pools", near the ocean. Most of the villages are therefore along the coastline, in close proximity to these sources of brackish water. Remaining resources are supplied by rainwater collected on housetops and stored in cisterns (30,000 cisterns for 300,000 inhabitants). In 1998, cholera was introduced by a visitor and spread very quickly through various vectors, such as transmission in hospitals or funeral rites. However, the main cause was above all faulty personal and food hygiene because of a water shortage. The fight against cholera focused on conservation of the sparse drinking water resources, in particular by chlorinating the cisterns. At the close of the epidemic, the hardest hit villages were those along the coastline close to the "swimming pools", whereas in the mountain villages situated further away where the only water came from the cisterns, there were a great deal fewer cases of cholera (2% of the population hospitalised as compared to 10% in coastal villages).

In the poorer parts of Côte d'Ivoire, water is usually drawn from wells, where the lip is a drum or a tyre and the dipper is an old inner tube. No particular hygiene precautions are observed when the water is

consumed. A programme was launched to improve access to drinking water, using a network of supply lines and individual or collective branch lines (street fountains). In parallel, a community information scheme was launched on the subject of using water and desirable hygiene precautions. However, in 2001, when the programme was evaluated, it was found that the street fountains had remained largely unused, in particular because they were not profitable for the suppliers. Childhood outbreaks of diarrhoea and epidemics had fallen sharply where the fountains were used, but there was no improvement in places where they were little used or not at all.

The last example is again situated in Goma, where in 2002, the Nyiragongo erupted and sent voluminous flows of lava into the heart of the town; 100,000 people were homeless as a result.

The water supply network was destroyed and so were some of the hospitals and outpatient facilities.

A Médecins du Monde mission was sent to support the healthcare system.

Their task was to ensure continuity of healthcare and to watch out for the possible appearance of epidemics. Since 1994, there had been several cholera epidemics in Goma, even in the absence of any natural disaster or of any connection with armed conflict. Before the volcanic eruption, visits to healthcare centres were infrequent because they were not free of charge. However, because of the precarious situation brought about by the disaster, the health authorities decided that for a period of six weeks, care would be provided free, after which it would be provided at a lower cost than before. Epidemiological supervision evidenced some outbreaks of diarrhoea in certain parts of the town, but there was no cholera epidemic. In fact, as soon as a case was suspected, the organizations in charge of water supplies were alerted and took immediate action. One of these organizations was Water Force, an association within Veolia Environnement, which was working in cooperation with the International Red Cross Federation. In this way, diarrhoea problems were dealt with before the event, so that there was no epidemic of cholera in Goma in 2002.

These four examples show that water is an effective weapon in the fight against outbreaks of diarrhoea and a useful instrument to curb epidemics, of cholera in particular. Alas, this instrument is still too rarely used in emergency situations.

EMERGENCIES THAT ARE KEPT TOO QUIET...

As regards water and sanitation, more often than not the situation is typically a "silent emergency". Mortality in developing countries, particularly where there is no access to water, is still extremely high.

Various studies have shown that 2.5 million people die every year because of lack of clean water. This is a deep-rooted problem. Its first victims are among the poorest: as of now, three billion people do not have access to water. Future development can only aggravate these deficiencies. Two thirds of the population will be living in an urban environment within the next fifty years. Unfortunately, this is not a very fashionable subject, and the media are not very interested. The problem is to raise sufficient and appropriate political commitment to confront it as it should be confronted. In fact, this is not a subject which seems to attract the greatest expertise

Darren SAYWELL
Programme Manager, Water Supply and Sanitation Collaborative Council

3

Sanitary prevention, a question of training

EDUCATION FOR HYGIENE HAS PLAYED A CRUCIAL ROLE IN THE EXTENSION OF LIFE EXPECTANCY IN THE BEGINNING OF THE 19TH CENTURY

Velvl W. GREENE, Professor, Emeritus of Epidemiology and Public Health,
Ben Gurion University

In the second half of the 19th Century, because of the sanitation revolution, mortality diminished radically in Europe and the United States. Also, this revolution made it possible to fight effectively some serious diseases, such as malaria and tuberculosis.

Some people portray the 19th Century in idyllic terms: neither pollution nor climatic change were problems to worry about! Nevertheless, this was not a golden age.

In the middle of the Victorian era, the average life expectancy in Liverpool, for example, was only 15. Cholera was pandemic in Europe in 1831-33, 1848-49, 1853-54, 65-67 , and even later. The disease killed vast numbers: in London, 53 000 people died from it in one single year.

The history of humanity is a long tale of plague, mega mortality, and social upheaval. All of a sudden, around 1860 in the middle of the century, something happened...

Two very important events occurred in the 19th Century: malaria, that had been rampant in Chicago, which was built on marshland, vanished; then smallpox, also disappeared. In 1838, records show that tuberculosis began to decline in the United States, but nobody really knew exactly why. Scarlet fever also declined.

The United States do not have any national records of mortality prior to 1900, but local records show that the death rate started to decline during the middle of the 19th Century and continued to improve year after year, a veritable "health revolution".

This phenomenon, which cannot be attributed to a single factor, continues today, particularly as regards infant mortality. It could be called the "great sanitary awakening".

In the 18th Century, a few individuals began to worry about living conditions in prisons and among the poor. This was later picked up again by those militating for hygiene. The equation was a simple one: people were contaminated by the excrement of others which led to cholera, typhoid fevers, and infant diarrhoea.

In fact, the revolution simply consisted in cleaning what was dirty. The sanitation revolution began in France. Pierre Charles Alexandre Louis, at the end of the 1800s, developed a computation system to translate medical parlance into quantitative and sta-

tistical terms. Some of his students disseminated the information, in particular the one who discovered the origin of typhoid fever.

In London, Hamburg, Albany (State of New York), and Pittsburgh, water sanitation made it possible to fight epidemics. This was the starting point of campaigns in favour of hygiene in general.

Regarding infant diarrhoeas, sanitation became important in the 1890s. Starting at this time, the Sears catalogue began to offer for sale toilets, bathtubs, and various qualities of soaps. We can now establish a relationship between infant mortality and the consumption of soap. These remarks are not meant to denigrate the progress of medicine in the 19th Century, but rather to point out that the battle against epidemic diseases was won more by sanitation than by medication.

Sanitation is still an essential ingredient of Public Health today, and it is a pity that medical students see this as an unimportant part of their training.

THE ORIGINAL ROLE OF "HEALTH-PROMOTING SCHOOLS", OR LEARNING HYGIENE IN SCHOOL

Jack T. JONES, School Health Specialist, Department of Chronic Diseases and Health Promotion, School Health and Youth Health Promotion, WHO (World Health Organization)

"Health Promoting Schools" were created following a WHO initiative, and they aim to promote health in the broadest terms, by reinforcing the capacity of pupils to care for themselves and for others. Furthermore, through this initiative, WHO seeks to prevent leading causes of death, disease and disability (use of tobacco, alcohol, drugs, etc.) at the earliest possible stage.

Today, in thousands of schools, pupils, parents and community members are working together to help their schools become "Health-Promoting Schools". In doing so, they are helping to bring about the vision of health that WHO has fostered for half a century. WHO defines health as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity". The concept of Health-Promoting School is a perfect example of the kind of initiative which promotes health in the broadest terms. The Health-Promoting Schools follow principles and actions called for in the Ottawa Charter for Health Promotion.

WHO began to foster the concept of Health-Promoting Schools in Europe at the beginning of the 1990s. In 1995, the organization began to extend the concept on a global level. The initiative strives to reinforce international, national and local capacities for the development of Health-Promoting Schools. Its success relies on partnerships within and between organizational levels, and within and between sectors.

A Health-Promoting School can be defined as constantly seeking to strengthen its capacity as a health setting for living, learning, and working. It is therefore more of a process than an end.

_ Health-Promoting Schools improve health by implementing four basic components of a school health programme. These are:
- School health policies;
- A health supportive school environment;
- Skills-based health education;
- Linkages to health and other services

_ Health-Promoting Schools create health by enabling staff and students to care for themselves and for others, make healthy decisions and take control over life circumstances and create conditions that are conducive to health. In doing so, they build capacity for peace, education, income, equity, shelter, that are the pre-requisites for health.

_ All schools can foster caring, decision-making and conditions which support physical and psychosocial health.

_ Health-Promoting schools also help to prevent leading causes of death, disease and disability when they implement interventions that prevent tobacco use, alcohol and drug use, injuries, risky sexual behaviour, unhealthy diets, and sedentary lifestyles.

_ Thus, the advantage of a Health-Promoting School is that it fosters important determinants of health (caring, decision-making, healthy physical and psycho-social environments) that enhance efforts to prevent important risk factors. Vice-versa, prevention efforts offer opportunities to care, make healthy decisions and create supportive environments.

WHO has produced a School Health Information Series to help health and education workers implement the four components of a Health-Promoting School. It also focuses on environmental factors, education policies and services to the education community.
A few examples can be mentioned, on the prevention of important risks:
- Prevention of tobacco use;
- Healthy diet;
- Prevention of violence;
- Creating an environment for emotional and social well-being.

These documents are also designed to help staff evaluate the performance of their school as regards:
- Supporting cooperation and active learning;
- Forbidding physical punishment and violence;
- Not tolerating bullying, harassment and discrimination;
- Valuing the development of creative activities;
- Connecting school and home life through involving parents;
- Promoting equal opportunities and participation in decision-making.

There is also emphasis on the physical school environment, so as to help school personnel understand how this environment has an influence on the incidence of childhood illnesses and deaths (respiratory infections, diarrhoeal diseases, vector-borne diseases, cancer, developmental disabilities, asthma). The case is also made that school environments are of essential importance because children are more susceptible to environmental threats than adults. Thus, the document stresses that high priority should be given to preventing risks and hazards associated with:
- Water and sanitation;
- Indoor and outdoor air pollutants;
- Ultraviolet radiation;
- Pesticides;
- Hazardous location.

In 2003, Dr. Grö Brundtland, former Director-General of WHO said: "WHO alone cannot change the environment in which our children live, learn and play. But working with others, we can."

So, what will happen when all schools are Health-Promoting schools? When these components are planned and implemented together, they can be expected to improve health, enhance learning, support development, foster good citizenship and reduce priority health problems.

WHEN SCHOOLS AND FAMILIES WORK TOGETHER: SOME EXEMPLARY CASES

Loïc MONJOUR, President, Eau, Agriculture et Santé en milieu Tropical

Complementary actions added to programmes for the supply of water, for increasing awareness on hygiene and the installation of sanitation infrastructure, can lead to a significant reduction of the incidence of infant diarrhoea in developing countries. Combining the two components: prevention, and the development of social and sanitary conditions, is an absolute requisite in order to deliver safe drinking water and therefore improve the health of a population, in particular the health of children.

A very lengthy and costly study of three schools in Ouagadougou (Burkina Faso) was used to evaluate the consequences of poor quality drinking water and mediocre hygiene on the health of children. The first of these schools (1) was very privileged. It was supplied with potable water, sanitation infrastructure (latrines and areas for waste destruction) and it ran a sanitary education programme about the salubrity of water and of the environment. The second school (2) only had the benefit of potable water and some education on the protection of water. The third school (3) had neither potable water, nor sanitation, and did not run any health education programme.

A group of children from each school – living at home with their families in conditions of sanitation similar to those of their schools – participated in a comparative study for six months. The study was designed to determine, on a regular basis, the quality of their drinking water, the presence of bacteria and pathogenic parasites in their faeces, and the inter-group incidence rate of diarrhoea. The differences were significant – school 1 (10%), 2 (36%), 3 (53%) – and were even greater for younger children. Children in schools 1 and 2 had a relative risk of diarrhoea 5.2 and 3.5 times lower than that of school 3.

It appears therefore that associated and complementary actions: health education, raising awareness about hygiene, and installing sanitation infrastructure – combined with hydraulic programmes – can lead to a very significant reduction in the rates of incidence of infant diarrhoea.

In contrast, deprived of both information and sanitation, the majority of children in developing countries consume, from one end of the year to the other and with no restriction, unclean water, polluted by environmental pathogens and dangerous for their health.

A major step forward as regards health could be achieved by an increase in school attendance. Less than 40% of African children are enrolled, and girls seldom venture to go to school, particularly in rural areas. Furthermore, the words “health education” are almost never heard in suburban areas and the countryside. In the circumstances, deprived of sanitary information, children and adults, village and peri-urban communities, live in unsanitary environments, both in and out of their homes. They are not given any instruction, nor any rules of hygiene or regulations, to improve their behaviour and habits as regards hygiene at home or outside it, on the one

hand; nor their comfort and the health of their community, on the other.

When there are no campaigns for the promotion of public hygiene, nor any significant increase in the meagre financial resources of families, sanitation programmes are often more or less ignored. The paradox is that, even now, an obvious truth is neglected: to hear about good hygienic practices, before and after the installation of sanitation infrastructures, leads to an improvement in water quality and curbs the spread of infectious water-borne diseases.

On the basis of these findings, some proposals for action could be made, in order to improve the quality of the potable water supply and of sanitation, and to combat diarrhoeal diseases:

- Recommend that all sick people should receive health care. Although this is illusory in view of the economic difficulties of developing countries, the lack of available health care facilities and medical personnel, it remains the first condition for public health.
- Give first priority to strategies for sanitary prevention, omitting neither health and hygiene education, nor sanitation infrastructure, when working on village and urban hydraulic projects.
- In these concerted programmes associate decision makers, partners, and beneficiaries: representatives of institutions, departments for health and hygiene, hydraulics, education, sociologists, and above all civil society, since they are all essential to further the quest, step by step, for potable water and health.
- Encourage a demand for potable water and demonstrate its beneficial effect on health; turn this into one of society's major expectations.
- Finally, in programmes for the supply of water and sanitation, never neglect traditional lore and the potential for innovation of communities, although at a later stage the local authorities may consent to implement government rules of hygiene and official public health documents.

Before there is an increase in the pollution of potable water due to demographic expansion and frenzied urbanisation in developing countries, it is of the utmost urgency for the sake of public health, to apply the above proposals. Most of all, national and international financial sources must be found very soon for that purpose.

4

Training and scientific knowledge: essential components of education

TRAINING STARTS WITH TRAINERS

Hélène AHRWEILER, President, University of Europe

In France, education issues are focused on the transmission of knowledge. But we should remember that the essential task is to impart a taste for knowledge and a liking for learning. This should lead to a change in the training of trainers and sometimes to forgetting the official curriculum. But we must not forget that education is conveyed primarily by family, language, and traditions

In my own experience, I have found that any time something goes awry, education gets the blame. However, education is not the solution, it is in fact the problem!

We need to know how to share knowledge and infrastructures, as in times of old, we knew how to share bread. He who gives and he who receives are both the richer. The use of available instruments must therefore be explained, and in order to do so, enquiries made on how to train the teachers, how to train the trainers; this is the first condition for success.

Scientists, however, find that transmitting their knowledge is a problem.

We know how to teach, generally speaking. We know how to teach how this should be done, i.e. pedagogy. However, there is one thing we are not very good at, in France anyway, and that is to make known, to give others a taste and a liking for knowledge. We are very dependent on the media, but our notions of time are not identical: journalists do not understand that researchers have a right to make mistakes and that their work takes place in another time frame...

Two evils afflict the world today. The first is illiteracy as demonstrated by the incapacity to analyse the syntax of a sentence, and therefore inability to undertake a scientific or literary study of any kind. A recent study conducted by the Académie de Paris revealed that the population of Paris schools includes 17% of illiterates. This is particularly the case in the periphery of the city, considerably more deprived than the city centre.

The second evil is images and the language of imagery. Few people are able to comment, to read with correct syntax, a series of pictures (apart from films), and yet today we live in a society obsessed by imagery. As a results, many individuals are ill-adapted to the world they live in.

Schools must therefore contribute to fighting these evils and this type of ignorance. In order to do that, it would seem that training needs to be approached through partnerships, in particular with actors in the private sector and in the very areas where the individuals concerned are living. However, training trainers is a more difficult task than training children.

Clearly, the first phase of the education concerns adults, and teachers in particular, who then relay the information to children. This is a problem in that it is difficult to change the habits of teachers who have been trained to perfection, or at least to believe that is the case. Let us not forget that when we tried to introduce new programmes, none of the new subjects have ever managed to gain a foothold in the traditional programmes.

We should therefore abandon the official curriculum and start off with the type of ideas that Mr. Charpak recommends in "La Main à la Pâte". This is the kind of course which could have a considerable impact and be an example.

Nor should we forget that education and schooling are not synonymous. The foundations of education are laid by the family, in a country-specific environment, in a tradition that cannot be shared on an immediate basis with anyone else, and schools comes as an adjunct. It is through his native language that an individual "enters" into culture, civilisation, and humanity. Language is truly fundamental, the origin of everything else, even though other essential languages exist.

To learn another language is a humbling and mind-changing experience for an individual. Mastering a foreign language leads to the discovery that other people do not ask the same questions in the same fashion and that they start from different standpoints.

This discovery leads to wondering about one's own origins, and their importance. Nor should we forget that apart from other languages, there is also the language of science, of economics, of arts, and body language, which have great significance, in particular as regards self-confidence. To control one's own body is a step in the direction of self-harmony and progress. With that in mind, perhaps the most important school of all is the kindergarten. There is the space where one learns that you must take someone's hand to cross the street, and move to other horizons.

MAKING KNOWLEDGE ACCESSIBLE IS A JOB FOR THE EXPERTS

Jacqueline McGLADE, Executive Director, European Environment Agency

The time has come to understand the extent of the problems raised by the process of education. An approach based on practical and experimental methods is the appropriate response, in particular for education on health and the environment.

Health and the environment are complex matters which demand increased understanding from public opinion. These issues involve interaction between ecological, biological, and socio-economic systems. This also means that more effective methods must be found to make information and communication technologies serve pedagogical objectives. The time has come to take stock of the dimensions of problems raised by education, using practical and experimental methods ("learning by doing").

But as we progressed, we became aware that we needed to associate children in our action, so that we developed some tools for them to use. For example, we shall be launching Honoloko, which is an educational game about health and the environment for children in the 8 to 12 age group. The purpose of the game is to raise awareness about these issues and to promote a gradual modification of behaviours. The game is designed to illustrate the relationship between environmental causes and health effects, especially in children. The game also serves to encourage the view that small behavioural changes can have large impacts.

It was interesting to note that at first, children behaved very well, because they wanted to win. However, as time went by, they frequently scored less well, because of lack of motivation. This demonstrates that education about health and the environment is really a long-term effort. Another lesson learned from this game is that learning has to be recreational. In conclusion, integrating pluridisciplinary knowledge via expert systems and interactive games, aimed to facilitate public participation and stakeholder dialogue, is daunting. However, evidence and experience from a number of initiatives now available show that such endeavours are extremely valuable..

SCIENTIFIC EDUCATION CAN BE PUT WITHIN THE REACH OF CHILDREN

Georges CHARPAK, Physics Nobel Prize, member of the Académie des Sciences and the European Council for Nuclear Research

The art of introducing children to scientific reflection acquired by personal experience.

In the last five years, a process of educational reform has developed at an ever faster pace. It is called « La Main à la Pâte », but this name should not lead to excessively learned interpretation since it is simply the result of accidental circumstances connected to the difficulty of translating the expression « Hands on » which is used in the United States to describe a pedagogical experiment based on the same premise. It can be summed up by its most salient points: when children first attend school, around the age of 4 or 5, they are full of curiosity about the world around them, which leads them very naturally and instinctively to interact with it. They seek physical contact with the world, they want to interpret their perceptions, they construct concepts based on their experience.

Some people see this innate attitude as being very akin to the attitude of scientists who go to their laboratories because they are struggling to understand the whys and wherefores of hitherto unknown phenomena. As a result, they conduct experiments, take notes of their observations so that they are recorded and can be communicated to their peers.

5

Taking into account the local context to promote knowledge and training

EVALUATION AS THE POINT OF DEPARTURE TO TRANSMIT KNOWLEDGE

Darren SAYWELL, Programme Manager, Water Supply and Sanitation Collaborative Council

There is a need for information and communication programmes to make public opinion fully aware of the issues of water sanitation and related hygiene principles. For such programmes to be successful, clear and comprehensible messages must be elaborated using sound scientific foundations.

We have adopted several approaches to develop a sound evaluation system of our programmes. The WASH (Water, Sanitation and Hygiene for All) is a case in point.

Launched at the International Conference on Freshwater in Bonn (Germany) in December 2001, and working with governments, civil society organizations, community groups and other stakeholders, the WASH campaign focused inter alia, on promoting the adoption of a sanitation target. This was highly recommended by the World Summit on Sustainable Development in Johannesburg in 2002. The aim was obtaining high-level political support internationally, and to raise awareness of national actors on the importance of sanitation, hygiene, and water supply. With the inclusion of the sanitation objective gaining international recognition, the focus of the campaign has now shifted to country level, although international efforts still continue.

WASH aims to raise the commitment of political and social leaders to several objectives:

- universal access to water, sanitation and hygiene
- necessary behavioural changes through various information and communication channels (traditional and mass media)
- promoting hygiene in schools
- training and building local capacity in communications and improving networking and research.

The campaign thus encompasses social education, social mobilisation, advocacy for a change in behaviour. The campaign in fact seeks to send four very simple messages: water, sanitation and hygiene save lives; women and children must be a priority for action; reform and careful management are essential; the provision of water and sanitation are vital conditions for achieving sustainable development.

Elsewhere, every opportunity must be seized to establish links with other networks and sectors.

As a first step, it would seem essential to set up programmes based on simple but striking messages. We try in this respect to base our messages on local

conditions and translate them into language which is as close as possible to the people who are most directly concerned. As a second step, a link must be established between national priorities (water and sanitation) and familiar events. Furthermore, the message must be based on scientific principles and also on practical experience. Finally, adaptable material and instruments condition success and effective dissemination to large numbers of people.

In our experience, we have found that in-depth cooperation with journalists and the media is also beneficial. Therefore, we work with a network of journalists, and we have designed special workshops for them.

Advocacy campaigns aimed at political leaders or large corporation have also turned out to be useful. Finally, we also are in touch with schools in order to promote social mobilisation.

This work has taught us that approaches must be kept simple and be based on striking messages. Applied research is always necessary in order to demonstrate to political leaders that the plans advocated actually work.

HOW TO COPE WITH THE COMPLEXITY OF SANITATION AND ENVIRONMENTAL MODELS TO HAVE AN EFFECT ON POPULATIONS

Jacqueline McGLADE, Executive Director of the European Environment Agency

So far, most sanitary and environmental planning decisions are based on models for analysing consequences, which are very restrictive because simulations are quite crude. Today's models are becoming more interactive and demand the participation of all those involved, including in particular children. Nevertheless, there is still in Europe a problem of coordination in government departments engaged in protecting the environment.

Contemporary health and environment issues have grown in range and complexity. There has been an explosion of knowledge coupled with a recognition of the number of interactions between human life and its physical environment, so we lack reliable and conclusive evidence. This has given rise to delays or misdirection in key decisions and actions.

Unfortunately, many health and environment institutions seem to be convinced that the effects of interventions can be predicted reliably. The reason why this belief is so widely held is that most existing planning models encourage health professionals and environmental managers to simulate the future in a crude way. However, for any health-environment model to include the widest array of possible interactions and future states, its inner workings would have to contain so many factors that the model would cease to be manageable.

Remarkably, most health and environment planning decisions have ignored these issues and have concentrated instead on a highly restrictive view of what is actually happening. Thus, we often find that

environmental scientists and health professionals have been forced into a position where they are trapped by the limitations of their own knowledge.

In response to this, traditional approaches to education and science-society interactions are being transformed by more iterative models involving active and shared participation, that give a more central role to indigenous knowledge, public participation and to the two way communication of facts, values, and expertise.

Few of these exercises have directly involved children, but many of the lessons being learnt from these experiments in public participation are relevant to the younger generations. It is a fact that more and more people, children in particular, fall victim to the degradation of their environment. For example, a degraded environment may be the cause of cases of asthma (a disease which is increasingly widespread) or even cancers. The European Environment Agency is well aware of the problem and publishes environmental signals annually which inform the population concerned about the quality of their local environment. This is part of growing European awareness of these issues.

It is to be noted however, that legislation regarding the environment differs considerably from one part of Europe to the other and that there are no less than 380 varieties coexisting on the European continent. Although, generally speaking, these legal frameworks ensure adequate protection of water, it is true to say that the price of water treatment is borne by the consumer. In contrast, for atmospheric pollution, concern is shared by Ministers in the European Union. They wish for regular reports on ozone, including specific findings, based on solid and undisputable scientific data. However, our environment is in a constant state of flux so that measurement is a complex task.

In the circumstances, it is worth debating how much immediate information should be disseminated. The Agency's objective is to establish a link between long term and short term reports. On the contrary, political leaders would like us to anticipate fortuitous events, which is of course totally impossible.

The Agency has undertaken several projects designed to raise awareness in the public on matters related to the environment and health. They originally addressed the adult population, but are increasingly addressing children.

As an example, this is the type of action we have undertaken on the North East coastline of Brazil: the tourist industry wished to construct infrastructure. We were able to point out some of the environmental aspects with an impact on the ecosystem to those in charge of this project so that they could integrate them in their planning.

GOOD HEALTH POLICIES REQUIRE ACTION ON THE GROUND

Producing good policies in an office is very difficult. They have to be developed on the spot, on a local level.
Sustainable development is a key issue, for which both rich and poor countries are responsible. Plans developed to help countries often pose some very difficult challenges. There is a need for more commitment and finance from donors in favour of health.
Take the example of vaccines. One company decided to develop vaccines containing five antigens, and the competition did likewise. There is now a 50% reduction in the price of that vaccine.

Tore GODAL
Executive Secretary, Global Alliances for Vaccines and Immunization

THE LOCAL CONTEXT CONDITIONS THE EFFECTIVENESS OF ACTION IN FAVOUR OF DEVELOPMENT, OR HOW TO DEVELOP "BEHAVIOURAL SKILLS"

Benoit SILVE, Director-General, Bioforce

So as to make humanitarian aid increasingly professional, Bioforce provides a vocational training course for logisticians engaged in humanitarian action. The course is designed to make them more efficient but its main thrust is to integrate local and regional specificities. The object is to teach "behavioural skills".

Bioforce was created by Charles Mérieux, whose father was one of Pasteur's assistants working on bacteria. He therefore represents a part of our history, the history of the last century, when mankind began to distance itself very forcibly from its natural environment and become aware at the same time of the possible consequences of such evolution, in particular as regards the impact on the cultures that had emerged from this age old environment.

These problems were compounded in part by conflicts, the unacceptable effects of which on civilian populations are all too noticeable. In that same time frame, there was a constructive effort to improve methods of assistance to developing countries and to provide a systematic framework for concepts such as "emergency" and "development" embedded in local contexts.

However, as the conflicts in Afghanistan and Iraq now demonstrate, new perils threaten humanitarian action. The need for an element of partnership in any development activity, as opposed to aid born of purely bilateral North-South processes, is also increasingly evidenced in factual situations.

The enthusiastic spirit of the "humanitarian generation" of the 70s often led to a preference for action. With hindsight, the experience and commitment of the "French Doctors" helps to show that results are more important than the action itself. Progressively, the effects of humanitarian assistance on the natural environment and biodiversity are coming under scrutiny.

Other theories have prevailed since the beginnings of humanitarian action. One of the mutations is the importance of being a professional. In 1974, when an epidemic of meningitis hit Brazil, thanks to an extraordinary public health operation, 90 million Brazilians were vaccinated. The lesson Dr. Mérieux drew from this experience was that the logistical element is fundamental.

With this in mind, he created Bioforce in 1983 so as to provide vocational training for logisticians engaged in humanitarian action. The Institute also aims to train them for a given context, in order to integrate local issues more realistically.

In practical terms, the Institute based its action on cooperation with existing humanitarian organizations so as to identify clearly the various specific missions of international solidarity: managers, logisticians, etc.

The effectiveness of humanitarian action is enhanced if a careful analysis is made of professional "job descriptions". In so doing, the personal development of humanitarian professionals is enhanced, as is their specific know-how and it becomes possible to bridge gaps between various professions.

The issue of water is a clear illustration, in every context, that international solidarity concerns man as part of his environment. This must never be forgotten and we must always keep in mind the need to assimilate the local context. The first rule is to learn how to ask the right questions, before any attempt at integration.

As regards humanitarian training activities, it has sometimes been said that urgency takes precedence over development. We would consider that the truth lies in a continuum where urgency is to humanitarian aid what emergency medical aid is to medicine. The concepts are not opposed, and it is a matter for response to a specific context. Whenever a decision is called for, immediate needs must be weighed in the balance of durable effects. Obviously, such a process requires a good deal of preparatory work, otherwise only urgency's voice will be heard.

The professions of humanitarian action therefore require specific training. The values which are the very essence of that occupation must stay in the foreground. Reflection is naturally based on the respect of values subscribed to locally. The importance of these local values is such that we are more inclined to speak in terms of education than purely vocational training, and this structuring process is what we call "behavioural skills".

Characteristic behavioural skills are precisely the capacity to adapt behaviour to context, to be aware of personal limitations and capacities, to be capable of distancing oneself from a situation in order to adopt an objective viewpoint. This is what we see as the meaning of "respecting others in their own environment".

However, learning behavioural skills cannot be solely theoretical. Specific experience is also required. Bioforce considers that it is essential to integrate the local and regional context, in cooperation with international aid organizations, so as to deliver the specific training that is needed. We also emphasize the multi-cultural aspect of tuition so as to cope with the different facets of reality.

The situation today is all the more worrying because the effects of human "development" on the planet are accelerating and leave little time for reflection and decision on the steps which could be taken to allow individuals to prosper in their environment without any harmful effects on biodiversity. It is true that collective action can be mediated by humanitarian action, but broadening the notions of respect for others and for their social and natural environment remains essential.

This is what we mean by "behavioural skills" : encouraging positive action in widely differing contexts.

6

Beyond the debate between "specialists and activists"

SCIENCE MUST NOT BE USED TO DISINFORM THE PUBLIC

Paul REITER, Head of the Insect and Infectious Diseases Research Unit, Institut Pasteur

Public policy is increasingly dependent on issues of science, but many scientists avoid public debate because their speciality defies straightforward dialogue. In contrast, many advocacy groups use well-defined and fiercely judgmental "scientific" pronouncements to influence public perceptions, adding a tone of danger and urgency to attract coverage in the news media. Such coverage nurtures notions of "scientific knowledge" that influence education, public opinion and the political process. Some scientists are willing to endorse such notions to secure public interest and funding, and dismiss those who question them as insensitive sceptics. In reality, a genuine concern for mankind and the environment demands the inquiry, accuracy and scepticism that are intrinsic to real science. A public that is unaware of this is vulnerable to abuse. Scientists need to develop effective strategies to communicate with the public.

More than a million articles are published in peer-reviewed scientific journals every year. The lay-public is unaware of this colossal output; popular information on research findings is limited to "newsworthy" articles, selected, described and interpreted by the media.

Professional scientists rarely draw firm conclusions from a single article, but consider its contribution in the context of other publications and their own experience, knowledge, and speculations. The complexity of this process, and the uncertainties involved, are a major obstacle to meaningful understanding of scientific issues by non-scientists.

In the age of information, popular knowledge of scientific issues—particularly on issues of health and the environment—is awash in a tide of misinformation, much of it presented in the "big talk" of professional scientists. Alarmist activists operating in well-funded advocacy groups have a lead role in creating this misinformation. In many cases, they blatantly manipulate public perceptions with emotive and fiercely judgmental "scientific" pronouncements, adding a tone of danger and urgency to attract media coverage. Their skill in promoting notions of scientific "fact" sidesteps the complexities of the issues involved, and is a potent influence in education, public opinion and the political process. These notions are often re-enforced by attention to peer-reviewed scientific articles that appear to support their pronouncements, regardless of whether these articles are widely endorsed by the relevant scientific community. Scientists who challenge the-

se alarmists are rarely given priority by the media, and are often presented as "skeptics".

The misuse of science is not a new phenomenon. A classic example is the eugenics movement that emerged soon after the publication of The Origin of Species and culminated in the atrocities of the Nazi regime. In the early 20th century, many countries implemented laws to "preserve" racial purity and "improve the human stock". These laws were based on "science" that demonstrated, for example, that the chromosomes of Africans were visibly "inferior" to those of Europeans, and "morphometric tests" that revealed criminal traits by analysis of facial characters. Forced sterilization of "feeble-minded" persons and other undesirables continued in Europe until 1970. Another example was the tragic destruction of Soviet Biology by Trophim Lysenko, a poorly-educated agronomist who persuaded the Soviet government to replace "bourgeois" genetics with a form of neo-Lamarckism, with devastating impact on Soviet agriculture. Lysenko continued to ruthlessly suppress his critics until the mid-1960s; aspects of the damage caused by his autocratic reign have yet to be corrected. A current example is the promotion of unsubstantiated claims that mosquito-borne diseases are moving to new latitudes and altitudes because of "global warming". These claims are made by persons unfamiliar with the complexity of the epidemiology of these diseases. None have been substantiated by professional scientists, but they continue to be repeated in public by environmental alarmists, national governments and international agencies.

The democratic process requires elected representatives to respond to the concerns and fears generated by such alarmists. Denial is rarely an effective strategy, even in the face of preposterous claims. The pragmatic option is to express concern, create new regulations, and increase funding for research. Lawmakers may also endorse the advocacy groups, giving positive feedback to their cause. Whatever the response, political activists—not scientists—are often the most persuasive cohort in science-based political issues, including the public funding of scientific research. There is an urgent need to correct this situation by promoting the participation of professional scientists in public debate.

PROMOTING A RECONCILIATION BETWEEN SCIENTISTS AND PUBLIC OPINION

One of our problems is the growing dichotomy between scientists who are in the possession of knowledge, and everyone else. If research is not also aimed at users, there is soon a confrontation with pressure groups who claim varying degrees of scientific competence. I find it surprising that scientists are so often ready to go on missions, but very rarely desirous of staying where they are to implement lasting solutions

Mamphela Ramphele
Managing Director of the World Bank

SCIENTISTS AND THE DUTY TO WARN: HOW CAN MANIPULATION BE AVOIDED

The concept of precaution implies a duty to sound alarms. Today, alerts are amplified by very powerful media whose interests are not always clearly visible. There can be social manipulation in a context devoid of any democratic safeguard. This justifiably worries the scientific community. The debate on GMOs is a case in point..

William Dab
Director General, French Ministry of Health

THE ETHICS OF SCIENTIFIC COMMUNICATION REST ON THE RELATIONSHIP TO EXPERIENCE

William C. CLARK, Harvey Brooks Professor of International Science, Public Policy and Human Development, John F. Kennedy School of government, Harvard University

Knowledge and action in the service of development need to be linked more efficiently because, although we often have pertinent data, it is often badly disseminated or poorly understood. To accomplish this, the scientific community needs to highlight the Pasteurian style of work, integrating in the same labs fundamental research and practical efforts to grapple with problems of great social importance.

Today, much of the debate on what science and scientists need to do for the world implies a false dichotomy between "basic" and "applied" research. Both of these have much to offer. In addition, however, there is a great need for a third approach, the "use-inspired basic research" pioneered by Louis Pasteur. Like Pasteur, we need today to focus the most fundamental and original scholarship we can muster on the great practical problems of the day. This necessarily implies a dialogue between scientists and activists.

On the subject of sustainable development, it is commonly accepted that its advancement depends not only on the accumulation of technical, scientific and technological knowledge, but even more so on learning to adapt behaviour to utilize that knowledge. We do know many things that are pertinent in the field of development, but much of this is not well distributed or has not been at all well integrated.

Obviously, expertise from all fields must be recruited to research development, but lessons for practice require that laboratory knowledge be taken experimentally into the field, as has been the case for international agricultural research. Some such "knowledge systems" are more efficient than others, as is demonstrated by the example of agriculture compared to education. In fact, the technology of education has not progressed as quickly as it should have.

More generally, we should be more systematic in our attempts to relate knowledge and action. There is not sufficient empirical research on the solution of specific problems, or of systematic comparisons of experience bearing on universal problems. There is a need to encourage greater interaction between producers and users of knowledge. Pasteur was extremely successful along those lines. Dialogue is necessary from beginning to end of a project, and our research institutions must establish this kind of dialogue.

For example, the International Research Institute for Climate Prediction is trying to associate users to their programmes. This is also what the International Agricultural Research System is doing. Risk taking is encouraged by such institutions. This is needed to protect innovators from the various kinds of bureaucratic and disciplinary interests that threaten them. However, if risk taking is encouraged, then targets, objectives and means of evaluation must be found, so as to put a stop to what is not effective or not appropriate. Like Pasteur, we need to build institutions committed to learning from the interaction of science with practice.

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Partnerships between both the public and the private sector, a key issue for development

USING THE METHODS OF LOUIS PASTEUR TO ENCOURAGE COOPERATION BETWEEN VARIOUS ACTORS

William C. CLARK, Harvey Brooks Professor of International Science, Public Policy and Human Development, John F. Kennedy School of government, Harvard University

There are numerous instances of the need to better direct fundamental research towards potential uses for satisfying human needs. To succeed, it is essential to create links between researchers and the various organizations working in different countries on the same subjects.

For the work we have to do, we are fortunate in being able to rely on fundamental research. We can also turn to purely applied research leading to important products, as the exceptionally striking example of Thomas Edison has demonstrated. Furthermore, there is also the possibility of directing fundamental research towards its potential uses; this is what Louis Pasteur did in his time. But this is a method that explores the most fundamental aspects to harness them to the needs of the human race, without ceasing to engage in research. This type of action must be supported by strong moral principles in order to continue to be meaningful. Louis Pasteur led us along that road and the verdict of history has been in his favour.

To succeed in the same way nowadays, it is essential to create links between various organizations working on the same lines in different countries.
In fact, the two universes of fundamental and applied research differ, and it is not an easy matter to get them to speak to each other. Knowledge must be translated into reality. Another difficulty today is the fragility of the organisations able to do such work; they can be subjected to pressures that orient their applications in a certain direction. Fortunately, there are some bodies who can maintain a balance, such as the Institut Pasteur, or the Tyndall Centre in the United Kingdom.

The challenge is to find a way of following in Pasteur's footsteps, by empowering users in the process of research and development. Of course, the objective is to create precise knowledge, but principally to relate knowledge to action, that is, the use to which it is put. To encourage that process, one cannot but repeat over and again that the few organizations that do that must be supported preferentially. One solution would be to mobilise private and public sector partnerships and give them stable financial resources.

THE EXAMPLE OF IMMUNIZATION PROGRAMMES OR HOW TO ARRIVE AT SUCCESSFUL PARTNERSHIPS FOR CONCRETE OBJECTIVES

Tore GODAL, Executive Secretary, Global Alliances for Vaccines and Immunization

GAVI (an international programme for immunization) have demonstrated how to create a virtuous circle connecting health and an improvement in the quality of life. There is a need to further develop alliances and partnerships between public and private entities supporting this programme.

We started in July 2000, and four years later 70 countries were involved. At the end of 2003, 250 million dollars have been allocated to this objective.

By attributing 20 dollars for every extra child to be vaccinated, we arrived at a figure of 8 million extra children being immunized, in the first phase.

Vaccination is a profitable operation in terms of years of life spared. WHO believes they have saved between 500'000 and a million lives, with an outlay of only 250'000 dollars.

WE MUST ALL MOBILISE

Freddy Karup PEDERSEN, Chairman of the Health Commission of the International Federation of Red Cross and Red Crescent Societies

The Red Cross is fortunate in that it can use the services of a network of 100 million volunteers throughout the world. Protection of civilians is the task of the Committee, and the Federation acts in emergencies. It puts emphasis on the large health problems presently identified: AIDS, tuberculosis, malaria, infant diseases. To carry out this mission we rely on a network of committed professionals and active partnerships.

What problems will we encounter in the future? We shall have to cope with societies unable to carry out the tasks at the very bottom of the ladder. There is therefore a need to help these populations. For that, people need to be trained for field work. In southern Africa, we are losing 25% of our volunteers because of the AIDS epidemic.

However, volunteer health workers can also help in other battles, particular on the subject of retroviruses. Science is also very helpful. For instance, in anti-whooping cough vaccines, scientific progress has been remarkable.

All those concerned must contribute. This applies most particularly to political decision makers who should be more involved as regards public health and environment issues.

It is true that sometimes there is some competition between actors or that there is some scepticism . However, since there is no other way of dealing with the major problems that confront us all, everyone must make a contribution.

HOW CAN COOPERATION BETWEEN ACTORS IN A MARKET ECONOMY BE A SUCCESS?

Pierre Marc JOHNSON, Former Premier of Quebec, Special advisor on environmental issues to international organizations

As regards major public health issues, the fact that there are two confluent situations must not be forgotten:

- on the one hand, the needs of developing countries are evident and frequently desperate. Although mention of them has raised public awareness, one seldom gets the impression that the actions required to alleviate this poverty are launched with efficiency, perseverance, and vigour.
- secondly, it is essential to understand that the market economy framework plays an essential role in relations between fellow citizens, and in relations between citizens and the State. Sustainable development issues are part of that context. The market economy cannot be left out of the equation when the ways to remedy even public health problems are analysed and deployed.

However, demand is largely made up of social needs, which implies value choices and a definition of the challenges of social solidarity; it is therefore unreasonable to allow the market to be the sole instrument to respond. To meet these needs, a multiplicity of actors have a role to play: States, the private sector, civil society, the world of education, academia, and others.

One of the contemporary issues is to find the way that would allow the different actors to find their specific role in responding to these social needs, without upsetting the existing economic framework.

COOPERATION BETWEEN ACTORS: A COMPLEX BUT NECESSARY CHALLENGE

It cannot be concealed that working in partnership can lead to conflict, particularly with influential people who are reluctant to allow some part of their authority over local populations to be taken away.
It is also difficult to obtain financial support from donors when one is not on the spot, but presence in the field inevitably increases costs. Therefore, to design and manage a long term project is a particularly complex task that must integrate numerous organizational parameters..

Renaud PIARROUX
Professor of Parasitology and Mycology, Director of the Rural Health and Environment Group (SERF – Santé et Environnement Rural) at the University of Franche-Comté

INNOVATION AND ACCOUNTABILITY: BALANCING THE STRUCTURES WITH THE PURPOSE OF PARTNERSHIPS IN THE WATER AND SANITATION SECTOR

Ken CAPLAN, Director of BPD (Building Partnerships for Development in water and sanitation)

The provision of water supply and sanitation services in poor communities is a complex challenge. Successful approaches must incorporate a clear understanding of social, technical and economic dimensions. This requires close links between social development specialists, engineers and economists or financial analysts...

In a number of places Public Private Partnerships (PPPs) have been introduced in an effort to achieve greater efficiencies, promote greater innovation, and create a more consumer-driven approach to the provision of water supply services. 'PPPs' take a number of different forms employing a range of different types of private sector entities. More straightforward service contracts involve a company assuming a specific aspect of the service (leakage control, for example). Concession contracts involve a company taking over full responsibility for operations, maintenance, and investment (including expansion).

The overarching goals for PPPs are three-fold: 1) to improve operating performance and effectiveness; 2) to depoliticise policy making and enforcement; and 3) to depoliticise the approach to, and potentially leverage in different forms of, investment. For services in poor communities, each of these three goals needs to be viewed through a technical, social and economic lens. For example, to improve operating performance and effectiveness, contracts need to be written in such a way that incentives exist for companies to explore what kinds of services poor households want. Sufficient flexibility should be available to experiment around different approaches to technology, customer relations, and the use of subsidies, for example. Ways need to be found to mitigate against the financial and political risks to the companies that generally drive up contract costs. Finally, the greatest challenge is around the capacity of the public sector to establish appropriate policies and support suitable approaches to meet the needs of the poor. Though public-private contracts have been in operation in many places for decades, access to information, legal skills, and technical competencies still create power imbalances that make these contracts challenging.

Within this context of PPPs, multi-sector partnerships between the public, private and civil society sectors may be part of the solution. By incorporating a more formalised social, civil society angle, such partnerships are expected to create more sustainable delivery. They can enhance approaches by encouraging innovation around process (e.g., consumer voice) and delivery (e.g., collection mechanisms). If water and sanitation partnerships are to deliver what is expected of them at the local level, also they must introduce accountability mechanisms that do not overshadow their ability to innovate. Balancing innovation and accountability is critical if multi-sector partnerships are not to become a mechanism of the past, leaving us no further in getting services to those that need them, than we were before.

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Broadening vision and disrupting set patterns...

RUFFLING ATTITUDES, PRECONCEPTIONS, AND INGRAINED BEHAVIOURS

Bernard KOUCHNER, Former French Minister of Health
Professor, Conservatoire National des Arts et Métiers

Globalisation must first of all involve dialogue, information, and sharing. This is our objective today. Not a single decision without this globalisation. But commitment to this notion in our country is inadequate. We only allocate 0.23% to the development of poor countries.

In the past, there has been too much emphasis on the opposition between humanitarian emergencies and development. Very soon, it became apparent that emergencies also had an influence on the living conditions of populations, and that action to remedy emergencies were the complement of action for development. Very frequently, in both cases, commitment is the result of training at the local level, as early in the process as possible.

After "Médecins sans Frontières" (Doctors without Borders), we are now working on a new concept, "malades sans frontières" (patients without borders). I am convinced that globalisation will turn out to be a positive factor for health, if certain conditions are met. The "alter-mondialistes" (those in favour of "alternative globalisation"), whose demands I support, find it difficult to accept that a certain amount of progress has been achieved through a movement that focuses not just on medical matters but also on economics. Remember the successful eradication world-wide of smallpox. Tomorrow, it will be the turn of polio.

As regards sustainable development, promises were made at the Johannesburg summit. Where do we stand two years on? Declarations that don't lead to deeds are shameful. Sustainable development is still an objective, but achievements are slow.

TRAINING OF PEOPLE IS NOT SUFFICIENT, WE HAVE TO LEARN TO WORK TOGETHER

The problem is not only one of training local populations. Of course this is useful but it is not sufficient. Training has to produce highly qualified specialists, health care systems must be able to anticipate problems, and there is a need for reinforcing capacity to bridge the gap between knowledge and solving problems, the world over.

Unless this is done, scientists will remain isolated from the real world and remain in their ivory towers, political leaders will take decisions that are not based on science, and those populations who are most concerned will be the first to suffer.

MAMPHELA RAMPHELE
Managing Director of the World Bank

HEALTH: THE PERSPECTIVE OF KNOWLEDGE

Amartya Sen, Nobel Prize for Economics, Lamont University Professor, Harvard University

The global health crisis we face today demands fresh reflection and new departures. Central to this encounter is the development and use of social and scientific knowledge. The crisis does, of course, demand dedicated action as well as faith in mankind's ability to overcome monumental adversities. But we need a knowledge-centred approach to make our actions fit the needs...

...I concentrate on the central question: in what ways are better understanding, including clearer knowledge, important for an adequate global health approach? There is, in fact, an embarrassment of riches in answering this question, but I will confine the discussion to eight basic points.

1 | Relative magnitudes and comparative finance

Even though the seriousness of the health problem facing the world is widely accepted, the relative magnitudes involved are frequently missed in the presentation of global news. Since the battle against terrorism has become the central motif in world affairs, it is worth noting that there is not a single day in the history of the world in which more people died from terrorism than from entirely escapable fatalities related to avoidable or controllable illnesses. In fact, absolutely the contrary... While terrorism may kill thousands, and sometimes hundreds of thousands, it is estimated that more than 20 million deaths from illnesses each year (out of a total of 57 million total mortality in 2003) are entirely preventable. And yet the money spent on aiding health care in developing countries is a tiny fraction of what goes into military expenditure, including the so-called war on terrorism.

2 | Continued scourge of old-fashioned illness

The second point concerns the continued toll from traditional diseases, as opposed to new ones. The gigantic health predicament in the world today arises-not just from the new epidemics such as AIDS (alarming though the numbers of people affected by these new epidemics are) but also from traditional killers, such as malaria, tuberculosis and gastrointestinal diseases, which figure much less strongly in the public understanding of the nature of the global health problem. The need to pay attention to the old – and well understood – case for cleaner water, better sanitation, and the elimination of parasites has never been stronger...

3 | Need to reassess the Hippocratic prohibition

There is also a case, particularly in dealing with old-fashioned diseases, for reviewing and reassessing old priorities. For example the prohibition of the use of DDT and the considerable reluctance to use such chemicals is easy to understand, because of their environmental effects and the health hazards that are involved. DDT does indeed carry some considerable long-term risk, though that risk has not been put on a comparative perspective vis-à-vis its life-saving role, preventing millions of deaths, from malaria in particular, in a largely predictable way! There is an important decisional issue here that needs careful scientific scrutiny. It is not, of course, being presupposed that the odds will come out in favour of resuming the use of DDT: it may or may not. But the decisional issue does deserve serious epistemic scrutiny, rather than being ruled out on the ground of some general deontological proscription...

4 | Health demands health care but other things too

A wide range of policies and actions have powerful influence on our health, and these must be taken into account in evaluating the use of resources for the pursuit of good health. Indeed, in dealing with policy making, it is important to go beyond health care facilities into general economic and social arrangements,

which can have very important effects on health... Educational expansion, for example, is certainly a very important part of the story, and indeed there is some evidence even to suggest that general education in schools may be more effective in advancing health achievements than is specialized "health education"...

5 | Equity is compatible with incentives for medicinal research

There has been a good deal of discussion recently, not least in meetings of the World Trade Organization, on the conflict between the incentive for drug companies to develop new medicines which requires a higher price, and the usability of the developed medicines, which requires especially lower prices for poorer users. As we know from the marketing of "generic" substitutes of patented medicines, the production cost of an actually developed medicine can be astonishingly low, but drug companies have an incentive to keep the prices high. Does this reflect an unalterable conflict between development of new medicines on the one hand, and their use on the other? ... This very serious issue needs to be discussed more thoroughly. What is important to understand is that incentive systems can be organized in pursuit of whatever our objectives are. If equity is an important part of our goals (as it ought to be), then that too can be integrated into an appropriately devised incentive system.

6 | The direct role of equity

Recent research has brought out the negative effect of inequality of status and decisional power on health. Those at the bottom of the hierarchy seem to suffer disproportionately from bad health and premature mortality, linked particularly with behavioural adaptation (such as excessive drinking, smoking, and lack of exercise) that reflect their frustration and which, at the same time, badly affect their health... An epistemic approach to health care has to cast the net quite wide to have an adequate grip on the causal influences that impact on illness and mortality.

7 | The intrinsic importance of health

I turn, finally, to two valuational issues which have strong epistemic connections. It has become increasingly common to focus on the fact that good health can enhance economic performance. Human productivity is raised by better health, and the economic loss from illnesses can be reduced by cutting down morbidity ... This focus is important, but it would be a mistake to make that connection be the central reason for seeking (and devoting more resources to) the expansion of health care and to improving health. No matter what indirect contribution good health makes, good health is also its own reward. People tend to value, for understandable reasons, the possibility of leading a healthy and long life. Indeed, at a very basic level economics has to be subservient to health – not the other way around.

8 | Health as Capability

Last but not least, it is important to appreciate that we seek good health not only because it makes our lives more pleasant and less painful –the classic utilitarian focus – but also because having a long and healthy life enhances our capability to do what we would like to achieve... Indeed, good health is sought not just for pleasure, nor only for reducing pain, but also for expanding a person's significantly important capabilities and freedoms... This is one of the reasons why the focus on longevity in many widely used indicators of human achievement, such as the Human Development Index (used by the United Nations), reflects an implicit valuation of human freedom, our capability to do what we value doing. Once this is accepted it is readily seen that any systematic framework for the assessment of health and health care must look beyond just medical excellence, and take note of the kind of lives that people can lead.

THE EXAMPLE OF A COMPANY CONCERNED WITH HEALTH AND EDUCATION AND WITH AN ENVIRONMENTAL MISSION

Henri PROGLIO, Chairman and CEO, Veolia Environnement

To successfully pursue development strategies, a company must be efficient, scrupulous and audacious, and it must also be able to develop a long term vision of the issues to which it is confronted. Acting in partnership with local actors, we can solve concrete problems and anticipate future change.

We are all aware that there will be no sustainable development if we cannot devote our full time attention to the environment.

In this connection, in ten years time, there will be 8 billion people on our planet, and this will be a major challenge. Furthermore, 70% of that population will be living in increasingly tentacular cities. The huge needs generated by this demographic and sociological evolution must be kept in mind. Sustainable development means environmental control, which includes education and health.

For development strategies to be a success, efficiency, exactitude, competence, or even expertise, and then audacity, are needed, that is a capacity to anticipate through the use of research and sensible use of technology. A company must accept this type of risk, that is its mission. It is true, however, that more often than not, we are judged by the short term standard of progress of our share of the market. This constraint must not, however, detract from a successful company's ability to develop a long term vision. Furthermore, a company like Veolia Environnement must contribute its capacity for understanding and commitment, which go hand in hand with solidarity. I could enumerate many examples of projects implemented in that spirit.

As regards the contractual aspect, we are able to solve some specific problems. This was the case in Niger, for example, where we manage two thirds of the country's water. Without the benefit of aid or grants, we have found that at this time, there are no longer any notable losses on the networks, and that the percentage of paid invoices is as much as 95%, which was unexpected. This is not charity, it is efficiency shared with local actors.

We are also concerned with education and we are present in some Moroccan schools where poor sanitary conditions have led to numerous drop outs. When sanitation is deficient in schools, in cooperation with partners such as UNICEF, we take steps to improve matters.

SCIENTIFIC EXPERTISE MUST BE GIVEN ITS FULL STATUS IN SOCIETY

Philippe KOURILSKY, Director-General, Institut Pasteur, Professor at the Collège de France

Adding further regulations as regards health and the environment very often brings about a parallel increase of the economic cost of operations. This process of regulation is an obstacle for poor countries and prevents them from finding solutions to their own problems. Avoiding these obstacles requires a proper cost-benefit analysis, differentiating according to context. The "contextual" ethics method should therefore be considered. A scientific approach to find a workable solution would be an instrument for progress.

Regulation of the major health and environmental issues raises the whole question of the role of regulating authorities. This role is nowadays the purview of the major international agencies that are invested with considerable power because they draw up and monitor the various standards that operators in the field must comply with.

The standards expand continually, sometimes with good reason, and this entails a similar increase in expenditure. This is a major problem for poor countries that are no longer able to keep up with increasingly demanding standards. Regulatory hurdles may prevent them from solving their own problems.

As an example, the Institut Pasteur in Cambodia has been immunising against rabies free of charge, using a vaccine produced in Viet Nam, but WHO has recommended its suspension. It is true that this old fashioned vaccine is no longer up to standard and can have secondary effects. However, we are at a loss to adapt to this new situation because the new vaccine is 50 times more expensive than the old one!

Also, it is implicitly accepted that raising standards is a way to improve safety and is a universally acceptable ethical activity. But perhaps we ought to adopt another ethical view, describing it as "contextual", in contrast with what is supposed to apply everywhere according to the same pattern. There is fierce controversy on this subject. In this context, I can quote the example of the rotavirus vaccine. In the United States, after 500'000 children had been immunised using this vaccine, about twenty of them suffered from serious intestinal disorders at a level that was apparently only slightly higher than is the case in a non-vaccinated population. As a result, the vaccine was withdrawn, but no one suggested that it could be used in developing countries, where 600'000 children die every year of rotavirus contamination and its complications.

How can we cope with such a predicament? As a minimum, we must go much further down the road of measuring the cost of implementing these regulations, including those on the subject of safety. A proper cost-benefit analysis must be performed for the different situations where problems arise. Academia must take on the responsibility of making sure that this debate makes some progress.

My suggestion would be to consider contextual ethics instead of relying exclusively on universal ethics. Unlike William Dab, I believe that precaution can, in some cases, be a luxury that only developed countries can afford. Substituting precaution for prevention is in fact an "ethical confidence trick"

On the basis of these considerations that relate solutions to local environmental and health challenges, I shall use the support provided by the activities of the Network of Pasteur Institutes. This international net-

work for cooperation, which operates in all five continents, is continuing to expand, particularly in developing countries where the main thrust of efforts to achieve health and sustainable development is in progress. I refer in particular to the curbing of transmissible diseases, sanitary education, epidemiological research, screening activities, preventive medicine, vaccination, hygiene, and of course, action to improve the environment with all the favourable sanitary consequences that are well known.

In pure Pasteurian tradition, we consider that scientific research must play an important role in developmental issues. Scientific innovation is in fact one of the ways for society to attain this "sustainable economy" that we all strive for.

However, I must qualify my statement and say that I am fully aware that science, on its own, cannot solve all the problems we are confronted with. Research has a contribution to make, but this does not mean that it is the only possible way forward.

In the space of ten years, between the summits of Rio and Johannesburg, there has been growing awareness that development models, when they do not take sufficient care to protect the resources of the planet, are dangerous. This is how the corrective concept to market economy typified by the word "sustainable" was coined. The aim is to reconcile the right of each of us to prosperity with the duty to protect collective assets, amongst which are health, the environment, and education. Continuing economic and social progress must be equated with the prevailing natural laws that condition our access to these collective assets.

We may well wonder in today's world if the considerable advances of science, in particular the life sciences, will produce progress of equal importance in the field of health. And how can we ensure that the life sciences generate further knowledge that can help to manage the environment? The fact that the countries of the South are the first to suffer from some of our deficiencies must be continually stressed. How to improve treatment and health care to deal with the scourges that afflict them are matters we are much concerned with. More than half the research done in the Institut Pasteur on infectious diseases is for orphan diseases, i.e. those that affect individuals and populations who have no financial resources. Therefore, prospects of a market or any direct profitability are not encouraging. Progress in the prevention and treatment of these neglected diseases raises a number of problems, in particular as regards clinical and pharmaceutical development.

For development to be sustainable, it must therefore be based on cooperation between all the actors. There are a great number of them. They are in the public, international and private sectors. In this respect, I am glad of our association with Veolia Environnement. It is a symbol of tighter links between a research institute and an industrial concern of impressive international stature. Such partnerships are extremely useful and need amplification by prior reflection and subsequent attention, along the courses of action of both entities.

PRECAUTION IS NOT A LUXURY RESERVED FOR RICH COUNTRIES

Development of precautionary principles also depends on a reinforcement of scientific organization. However, this does not mean that precaution is a luxury reserved for rich countries. There cannot be durable precautionary principles applied to the countries of the North and laisser-faire in the countries of the South

William DAB
Director General, French Ministry of Health

EDUCATING TO COMBAT OBSCURANTISM

We live in a society overrun by well organized obscurantism. It is essential that we extricate children from such situations and lead them towards the use of reason.

Georges CHARPAK
Physics Nobel Prize, member of the Académie des Sciences and of the European Council for Nuclear Research.

Biographies of participants

Biographies of participants

Hélène AHRWEILER

President, University of Europe

Hélène Ahrweiler has a doctorate degree in history and classics. She has been a professor at the Sorbonne, Faculty of Arts in Paris, since 1967. She was vice-chancellor of the University of Paris I (1976-1981) then rector of the Académie de Paris (1982-1989) and Vice-president of the French National Education Council (1983-1989). She is also a former President of the Maison des Sciences de l'Homme (1982-1989) and the Centre Georges Pompidou (1989-1991).

At the moment she is President of the University of Europe, a corresponding fellow of the British Academy, the Athens Academy and the Berlin and Bulgarian Academies of Science, and an associate member of the Belgian Royal Academy.

Hélène Ahrweiler is also a UNESCO social and human sciences expert.

Finally, she is the President of the European Cultural Centre at Delphi and of the National Theatre of Greece.
She has written many works on Europe and on Byzantium (and is moreover Honorary president of the International Association of Byzantine Studies) and has been awarded honorary doctorates by the universities of London, Harvard, Belgrade, New York, Haïfa, Lima, New Brunswick, by the American University of Paris and by the Athens School of Higher Studies in Political and Social Sciences.

Ken CAPLAN

Director of BPD (Building Partnerships for Development in water and sanitation)

Ken is the Director of BPD, a small, not-for-profit organization that works with and supports responsible partnerships between different sectors to help meet the Millennium Development Goals around water and sanitation. Ken also currently serves as a tutor on the University of Cambridge Cross-Sector Partnership Course. Prior to moving to the UK in 1998, Ken worked in Thailand and Vietnam for 8 years with both donors and NGOs on issues including urban infrastructure, social inclusion, and partnerships around labour standards. Ken holds a Masters degree in International Development and a Bachelor of Science in Foreign Service.

Georges CHARPAK

Physics Nobel Prize, Member of the "Académie des Sciences", and the European Council for Nuclear Research

French physicist. Graduate of the Ecole des Mines, Paris. He turned to research when he entered the Centre National de la Recherche Scientifique (CNRS) in 1948. He was also working at the Collège de France (1948-1955), with Frederic Joliot. In 1959, he joined the CERN in Geneva (European Council for Nuclear Reserch) where he invented new types of particle detectors, including the multiwire proportional chamber, known as "Charpak's chamber" (1968) for the real time tracking of elementary particles. The speed, reliability, and processing capacity of the "Charpak chambers" have made it possible to study extremely rare events occurring during interaction between high energy particles. Since 1980, Georges Charpak has been studying applications in biology and medicine of these instruments, in particular for medical imagery. He became a member of the French Science Academy in 1985, and was awarded the Physics Nobel Prize in 1992.

William C CLARK

Harvey Brooks Professor of International Science, Public Policy and Human Development, John F. Kennedy School of government, Harvard University

William C. Clark is the Harvey Brooks Professor of International Science, Public Policy and Human Development at Harvard University's John F. Kennedy School of Government. A biologist by training, he now teaches and does research on science and technology policy for development. He is a member of the US National Academy of Sciences, and a recipient of both the MacArthur Prize and Germany's Humboldt Prize.

William DAB

Director-General, French Ministry of Health

Director-General of the Direction Générale de la Santé and Professor of the "Hygiene and Safety" Chair of the Conservatoire National des Arts et Métiers, William Dab is a physician, ex resident at the Hôpitaux de Paris, holder of a doctorate in Science (Epidemiology). He worked at the Observatoire Régional de Santé d'Ile-de-France. He then taught risk evaluation at the École Nationale de la Santé Publique. He was Deputy Director of the Department of Medical Studies of EDF-GDF, and has represented the Association for the Prevention of Atmospheric Pollution. His personal research has been directed at epidemiological surveillance, the consequences of terrorism, AIDS, and environment-related risks (radiation, geology, air-conditioning, water heating for sanitary uses, quality of inside and outside air). He has authored three books and approximately a hundred scientific publications.

Harvey V. FINEBERG

President, Institute of Medicine (USA)

Dean of the Harvard School of Public Health for 13 years, he served as Provost of the University from 1997 to 2000.

He is a specialist in decision-making and health policies, and his research interests include the evaluation of vaccines and medical technologies and the development of medical innovations.

He is past President of the Society of Medical Decision Making. In addition, as a member of the Institute of Medicine, he has led research in various areas (such as AIDS, medical technologies, and risk in society)

Recent works:

Society's Choices: social and ethical decision making in biomedicine (1995)

Innovators in Physician Education: the process and pattern of reform in North American medical schools (1995)

AIDS: prevention through education: a world view (1993)

Tore GODAL

Executive Secretary, GAVI (Global Alliance for Vaccines and Immunization)

A Norwegian-born immunologist, he is former head of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR),and has also served as the initiating project manager for the Roll Back Malaria Project and as special advisor to Grö Harlem Brundtland, Director-General of the World Health Organization. In this discussion with IAVI Report Senior Writer Emily Bass, he describes what GAVI has learned about establishing effective vaccination programs in developing countries and how these lessons could apply more generally to programs that might follow in its footsteps, including the GFATM and future AIDS vaccine distribution schemes.

Paul-Louis GIRARDOT

President, Institut Veolia Environnement

After working in water distribution in Morocco from 1958 to 1963, this engineering graduate of the French Ecole Polytechnique and Ecole Nationale des Ponts et Chaussées (ENPC) joined Compagnie Générale des Eaux in 1964, where he stayed for the rest of his career, serving as General Manager from 1981 to 1998. He currently serves as member of the Veolia Environnement Board of Directors.

Velvl W GREENE

Professor Emeritus of Epidemiology and Public Health Ben Gurion University

Dr. Greene was born and educated in Canada, served in the Royal Canadian Army Service Corps, did post-graduate studies at the University of Minnesota, and taught Microbiology, Public Health, and Epidemiology to tens of thousands of university students in Canada, America, and Israel. Though his research career was focused almost entirely on the study and control of Nosocomial infections, he was also one of the early participants in NASA's Exobiology program and was the first director of the Lord Jakobovits Center for Jewish Medical Ethics. He and his wife, Gail, live in Beersheva, Israel.

Pierre Marc JOHNSON

Former Premier of Quebec, Special advisor on environmental issues to international organizations

Lawyer and Physician, Former Premier of Quebec, Pierre Marc Johnson trained as both a physician and a lawyer, has distinguished himself above all through his political career (member of cabinet in numerous postings from 1976 to 1985 before becoming Prime Minister of Quebec) and since going back to private life, his involvement in public policy issues related to sustainable development. He is currently Senior Counsel with the law firm of Heenan Blaikie and serves on numerous corporate boards as a Director. He acts in commercial negotiations and the setting up of international partnerships. Former Chairman of the Foreign Policy Committee of the National Round Table on Environment and the Economy in Canada (1990-1997), he regularly publishes articles on the workings of globalisation.

He frequently participates in international negotiations on environmental and developmental issues: he was Rapporteur Général of the Bergen Conference (Norway, 1991), special advisor to the Secretary General at the UN Conference on Environment and Development (Rio, 1992), chair of a working group and mediator on financial issues at the Conference of parties for the International Convention to Combat Desertification (UNCCD), 1993-1997, chargé de mission for the UN in Africa in the early implementation stages of the UNCCD; he chairs the TenYear Review Committee of the North American Commission for environmental Cooperation (2003). He has acted as an expert advisor for various G7 and later G8 preparatory meetings dealing with sustainable development issues. He was Council member of the International Union for the Conservation of Nature (IUCN). He lectures in Universities and is an invited speaker to professional, business and NGO gatherings in the Americas and Europe.

Jack T. JONES

School Health Specialist Department of Chronic Diseases and Health Promotion, School Health and Youth Health Promotion WHO (World Health Organization)

Work prior to joining WHO: Mr Jones was employed by the Centres for Disease Control and Prevention (CDC) from 1967-2001. He held two field posts from 1967-73 and worked out of CDC Headquarters from 1974-2001.

Work in WHO: Mr Jones was seconded by CDC to WHO in 1991 to promote school health as a viable public health intervention. From 1995-2002, he served as WHO's School Health Team Leader with responsibilities for strengthening the Organization's capacity for school health. During this period, the school health team launched the WHO Information Series on School Health, initiated development of the Global School-based Student Health Survey; developed WHO's Rapid Assessment and Action Planning Process; created networks and alliances for concerted action; and launched county-level capacity building efforts, including nation-wide training programmes to improve school health/HIV prevention efforts in Africa.

Bernard KOUCHNER

Former French Minister of Health, Professor, Conservatoire National des Arts et Métiers

Physician (gastroenterology). He went to Nigeria in May, 1967, shortly after completing his studies. He was resident for the Red Cross and the Secours Médical Français during the conflict in Biafra.. The Nigerian army was slaughtering the civilian population, including the wounded. Unwilling witnesses, doctors were requested not to divulge any information. In the face of such atrocities, silence was unacceptable. At this point, Bernard Kouchner entered the media and public affairs scene. He was the founder of Médecins Sans Frontières in 1971, but left the association in 1979 because of a disagreement. Médecins du Monde was created the following year. From 1988 to 1992, he served as Secretary for Health, and the following year became France's Minister of Health. He was elected on Michel Rocard's European list in 1995, so that the "French Doctor" continued to appear on the political scene. As of 1998, combining politics and humanitarian missions, Bernard Kouchner was designated Special Representative to head the United Nations Mission in Kosovo where he served from 1999 to 2001. When he returned to France, he joined the Socialist Party and continued his political activities.

Philippe KOURILSKY

Director-General, Institut Pasteur, Professor at the Collège de France

Biologist, Director-General of Institut Pasteur, Professor at the Collège de France.

He is an expert on molecular biology and has been research director at the French National Scientific Research Centre (CNRS) since 1983. He is also Director-General of Institut Pasteur and heads a research unit at the French National Institute of Health and Medical Research (INSERM).

Mr Kourilsky was formerly head of research at Pasteur-Mérieux and Connaught (1992-1995).

He is also Professor at the Collège de France and a Member of the French Académie des Sciences and of the Academiae Europae.

He has written several books: Les Artisans de l'hérédité (The artisans of heredity,1990), La science en partage (The lost of science, 1998), Du bon usage du principe de précaution (2001), as well as having had more than 300 articles published in international journals (Nature, Cell..).

Koïchiro MATSUURA

Director-General, UNESCO

Born in 1937, Koïchiro Matsuura's early years were formatively influenced by war and its consequences. He grew up in the district of Yamaguchi, just two hours by road from Hiroshima.

He studied law at the University of Tokyo and economics at Haverford College (USA) before embarking on a long diplomatic career. He held senior diplomatic posts in Washington DC and Hong Kong before becoming Director General of the Economic Cooperation Bureau and then the North American Affairs Bureau of the Japanese Ministry of Foreign Affairs. He became Deputy Minister of Foreign Affairs, representing Japan in the G-7 Summit sherpa group from 1992 to 1994. He served as Ambassador of Japan to France from 1994 to 1999.

Mr Matsuura first became involved with UNESCO as Chairperson of its World Heritage Committee. Subsequently, in November 1999, he was elected the eighth Director General of UNESCO, the first person of Asian origin to hold this post. He has sought to revitalize the Organization's programmes in education, culture, the natural sciences, the social and human sciences, and information and communication.

Mr Matsuura has also published many works in the fields of economic cooperation and development, bilateral relations and diplomacy.

Jacqueline MC GLADE

Executive Director, European Environment Agency

Jacqueline McGlade became Executive Director of the European Environment Agency in Copenhagen in 2003; she is on leave from her post as Professor in Environmental Informatics in the Department of Mathematics at University College London. Until 2003, she was a Board member of the Environment Agency of England and Wales with responsibility for Thames Region, navigation and science. Formerly she was Director of the NERC Centre for Coastal and Marine Sciences, Professor of Biological Sciences at Warwick, Director of Theoretical Ecology at the Forschungszentrum Juelich and senior scientist in the federal government of Canada. Her research has focussed on the spatial and non linear dynamics of ecosystems, with particular reference to marine resources, climate change and scenario development. In her non-academic life she is a mother of two daughters, director of a software development company and has written and presented a range of radio and television programmes.

Loïc MONJOUR

President, Eau, Agriculture et Santé en milieu Tropical (EAST)

MD, Ph D

Professor of tropical medicine and public health.
President of the EAST (Eau, Agriculture et Santé en milieu Tropical)
Vice – President of the Health commission of the Académie de l'Eau

Freddy Karup PEDERSEN

President of Danish Red Cross, Chairman of the Health Commission of the International Federation of Red Cross and Red Crescent Societies

Education: medical doctor 1971 (University of Copenhagen)
Speciality: paediatrics 1982 (Danish National Board of Health)
Doctoral thesis: Pneumococcal vaccination, University of Copenhagen 1985
Head of University Clinic of Paediatrics Copenhagen 1987
President of Danish Red Cross 1997
Chairman of the health Commission of the International Federation of Red Cross and Red Crescent Societies 2001
Member of the standing commission of the International Red Cross 2003

Renaud PIARROUX

Professor of Parasitology and Mycology, Director of the Rural Health and Environment Group (SERF – Santé et Environnement Rural) at the University of Franche-Comté

Paediatrician, specialising in infectious and tropical diseases, Doctor of Sciences in microbiology. Professor at the Université de Franche-Comté. He now directs the department of parasitology and mycology of the CHU (teaching hospital) of Besançon. Director of SERF (Research unit for rural health and environment, Université de Franche-Comté). He has particularly studied the transmission of disease working in the INSERM 399 research unit (immunology and genetics of parasitic diseases) in Marseilles and then at SERF. He has also participated in the fighting epidemics in developing countries, (Sub-Saharan Africa, Comores, Middle-East, Central America) in the course of humanitarian missions as Head of Mission with Médecins du Monde and later as epidemics consultant to the association.

Henri PROGLIO

Chairman and CEO, Veolia Environnement

Henri Proglio is a graduate of the HEC business school in Paris. He joined Compagnie Générale des Eaux in 1972 and was appointed President and Chief Executive Officer of CGEA in 1990. He was appointed Executive Vice President of Vivendi Universal and President and Chief Executive Officer of Vivendi Water in 1999. He became Chairman of Veolia Environnement's Management Board in 2000 then Chairman of the Board of Directors and Chief Executive Officer in April 2003.

Henri Proglio is a member and director of the main subsidiaries of the group Veolia, in France and abroad. He is also a member and director of main French companies such as Elior, Casino, Thales, CNES...
Today Mr. Proglio chairs the France- China Committee (2004/2005) and is a member of the French National Committee for Sustainable Development.

Mamphela RAMPHELE

Director-General, World Bank (until 2004)

Mamphela Ramphele is one of the four Managing Directors at the World Bank. She oversees the strategic positioning and the operations of the World Bank Institute (WBI) and the Vice-Presidency of External Affairs (EXT). WBI is responsible for the Bank's work on knowledge and capacity enhancement. She is principally involved on matters of knowledge and socio-economic development with major responsibility for the relationship and program implementation of the Development Gateway. In addition, Ms. Ramphele leads the formulation of the Bank's policies on health and education, and is in charge of integrating, monitoring, and evaluating progress with regard to the attainment of the Millennium Development Goals (MDGs). Recently, she led the formulation of the Bank's policy framework on the social dimension of globalisation, including human rights.

A South African-born medical doctor, Mamphela Ramphele is also a former Vice-Chancellor of the University of Cape Town. She also holds a Ph.D. in social anthropology, a BCom degree in Administration, and diplomas in Tropical Health & Hygiene and Public Health. She has written many books and articles on education, health, and social development for which she has received numerous prizes and awards.

Paul REITER

Head of the Insect and Infectious Diseases Research Unit - Institut Pasteur

Paul Reiter is a specialist in the biology, ecology, behaviour and control of mosquitoes, and the transmission dynamics and epidemiology of the diseases they transmit. He joined the Institut Pasteur in 2003 after 22 years as a Research Scientist at the US Centres for Disease Control and Prevention (CDC). He is actively involved in the international debate on climate change.

Darren SAYWELL

Programme Manager at the Water Supply and Sanitation Collaborative Council (WSSCC)(until 2004)

Dr. Darren Saywell was till recently the Programme Manager at the Water Supply and Sanitation Collaborative Council (WSSCC), an international organization based in Geneva, Switzerland dedicated to accelerating progress towards safe water, sanitation and hygiene for all.

A specialist in urban sanitation services, he has ten years of research, training and consultancy experience in the water supply and sanitation sector, working mainly in Africa and South Asia.

Amartya SEN

Nobel Prize for Economics, Lamont University Professor, Harvard University

Armatya Sen is Lamont University Professor and professor of Economics and Philosophy at Harvard University (USA). Previously he was Master of Trinity College, Cambridge (UK). Amartya Sen's research has ranged over a number of fields in economics, philosophy and decision theory, including social choice theory and welfare economics, for which he was awarded the Nobel Prize in Economics in 1998. He has also worked on development economics, measurement theory and political philosophy.

He is past President of the Econometric Society, the Indian Economic Association, the American Economic Association and the International Economic Association. His awards include the Bharat Ratna (the highest honour awarded by the President of India), the Brazilian Ordem do Merito Cientifico (Grã-Cruz), the Presidency of the Italian Republic Medal, the Eisenhower medal, and Honorary Companion of Honour (UK).

His publications include:
Collective Choice and Social Welfare (1970), Poverty and Famines. An Essay on Entitlement and Deprivation (1981), Inequality Reexamined (1992), Resources, values and development (1997), Development as freedom (2000), Rationality and freedom (2002).

Benoit SILVE

Director-General, Bioforce

Engineer, graduate of the Ecole Navale and of the US Naval War College, Master of Arts (International Relations – University of Salve Regina, RI-USA). After a career as a fighter pilot and commanding officer in the French Navy, (Captain, now retired), in 2003 he joined the Institute "Bioforce Development", of which he is the Director. He also teaches on the subjects of management, project management, and evaluation. Throughout his career, he has focused on natural resources. On a more personal note, nature has played an important role in his life, and in particular the high altitude mountain setting, generating harmony between man and the environment.