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Choices bring power.**

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SPECIAL FOCUS: *The World's Most Polluted Places: The Top Ten of the Dirty Thirty*

The health of the environment is a delicate and global issue. Every country on every continent contributes to the environmental distress in which the world finds itself currently mired. However, as with every situation of global proportion, each country's contributions to both the problem and the solution are not the same. Since 2006 the Blacksmith Institute has released a report listing the 30 dirtiest countries in the world. Each country on the list has been the subject of an extensive and in-depth analysis of the polluted area, examining the criteria under assessment as well as charting the progress each country has made in its efforts to remediate the situation. Nations within the same region frequently share similar characteristics due to their geographical location. The dirtiest countries currently are in Asia, including India, as well as in the former Soviet Union, Africa and South America. These nations suffer from environmental issues which are a direct result of human behavior and technological disadvantages which make rectifying their environmental discrepancies a consistent uphill battle.

Each region of the world has specific countries which are so ingrained with human activity that creates environmental pollution and its associated human behaviors that they form clusters of countries which are among the 30 dirtiest in the world.

World Region/ Type of Pollution	Mining	Metals	Petro-chem	Nuclear	Weapons	Industrial Complex	Small and Medium Enterprise	Urban Waste	Air Pollution
Africa	Kabwe, Zambia*							Dandora Dumpsite, Kenya	
China	Wanshan China	Tianying, China				Huaxi, China			Lanzhou, China Linfen, China Urumqi, China
Eastern Europe and Central Asia	Chita, Russia	Norilsk, Russia Rudnaya Pristan/ Dalnegorsk, Russia	Bratsk, Russia	Chornobyl, Ukraine Mailuu-Suu, Kyrgyzstan	Dzerzhinsk, Russia	Sumgayit, Azerbaijan Ust-Kamenogorsk, Kazakhstan			Magnitogorsk, Russia
Latin America and the Caribbean	Huancavilca Peru La Oroya, Peru	Haina, Dominican Republic	Oriente, Ecuador			Matanza-Riachuelo, River Basin, Argentina			Mexico City, Mexico
Asia	Sukinda, India		Hazarib'g Bangl'sh Ranipet, India			Mahad Industrial Estate, India Vapi, Gujarat, India	Meycauyan City and Marilao, Philippines		

*Bold indicates Top Ten Dirtiest Places

30 Dirtiest Places in the World

Asia and Asia Minor have contributed to this compilation given the environmental pollution in India and China. In Sukina, India, Hexavalent Chromium and Chromite mines have led to the extreme pollution of water supplies. The waste rock and the untreated water from the mines have caused the drinking water to become unfit for human consumption. Additionally pollution of the air and soil have resulted in severe health consequences for its residents, who suffer from gastrointestinal bleeding and tuberculosis, as well as asthma and infertility, with a significant increase in birth defects plaguing the surviving births.



Chromite Mine Related Pollution, India

Similar situations have arisen in Vapi, India where more than 50 industrial estates discharge heavy metals, pesticides and chemical waste all of which have led to birth defects and high incidences of cancer. Mercury latent water readings 96 times higher than World Health Organization standards are also to blame for the dire medical situations endured by the residents in these afflicted areas.

Attempts at rectifying the problem have proved to be futile and staggering. Mining companies have taken a few piecemeal actions, however the problems have been identified as being so widespread they are beyond the control of the respective states. Consequently the problems persist without any genuine concern on behalf of the governments or the companies themselves. A dedicated initiative by the governments of Sukina and Vapi are needed to enforce policies requiring corporations to exercise cleaner practices. In Linfen and Tianying, China, the conditions are tragically similar.

Linfen and Tianying are the most polluted cities in China. Particles and gases from industry and traffic have resulted in Linfen having the worst air quality in all of China. Coal and other related resource extraction industries have continued to expand operations while their activities are unregulated by the Chinese government, resulting in respiratory and skin diseases, as well as lung cancer.

Tianying suffers from the same heavy metal and particle pollutants as Sukina and Vapi India. The heavy metal pollutants in Tianying have settled into the soil creating an average lead content 10 times higher than the Chinese national standard. As a result, children in Tianying frequently suffer from birth defects and developmental challenges. However, the changes taking place in Linfen and Tianying, China are vastly different from those occurring in Sukina and Vapi, India.

In Linfen, the local government has made plans to shut down more than 200 factories by the close of 2007 and replace them with cleaner and better regulated facilities. The State Environmental Protection Administration has ordered that all lead processing firms in Linfen be shut down until the environmental effects have been accurately and adequately assessed.



Mother and Child in La Oroya, Peru

La Oroya, Peru, appropriately named for its long history of mining, and Kabwe, Zambia suffer from extremely high lead pollution. WHO has determined that in La Oroya, the average blood level for lead in children is 33.6 micrograms per deciliter, three times the recommended safe limit. In Kabwe, levels of lead in children

are even higher (50-100 micrograms per deciliter). Limited efforts have been taken in La Oroya. There have been initiatives which attempted to isolate children from lead contamination, however, these efforts have been undermined by economic conditions which force children, some as young as 7 or 8, into the mines.

In Kabwe, the public knows very little about the health implications of working in 80 plus year old mines. Often workers will die as a result of physically unsafe conditions before they begin suffering any acute health



Chornobyl: Reactor 4 Sarcophagus

effects. As such, clean-up has not even been targeted as a priority.

Soviet rule left a legacy of a dilapidated environment throughout the former USSR. In Ukraine, the Chernobyl nuclear disaster released more radiation than the atom bombs dropped on Hiroshima and Nagasaki during World War II. Nineteen miles of land around the reactor 4 site remain completely uninhabitable. Nearly 2,000 tons of combustible material still exists within the structure. Leaks in that structure have led experts to fear that rain water and dust from fuels have formed a toxic liquid that may currently be contaminating the ground water in the surrounding areas.

The health impacts of the meltdown have resulted in more than 5,000 cases of thyroid cancer, with those under the age of 14 being the most severely affected. These cases have been attributed to elevated concentrations of radioiodine in milk. Pollution which resulted from the Chernobyl nuclear disaster still affects vast swaths of land in Belarus, Russia, and Ukraine, all countries are still classified (by the Blacksmith Institute) as “contaminated” with radionuclides. Additionally, following the incidents, residents were acknowledged as having skin lesions, respiratory ailments, infertility and birth defects.

Clean up activity begun in 1986 immediately following the disaster has resulted in a significant decrease in pollution, especially radio nucleotide concentrations. Furthermore, decreased radioactive activity has been projected for future generations. Following the meltdown, the reactor was enclosed in a concrete casing designed to absorb radiation and contain the remaining fuel. The sarcophagus, however, was not a permanent solution. Its effectiveness in reducing the exposure of the remaining radiation from the reactor was only to last at a maximum 30 years. New programs are underway to further secure the sight. Currently there are plans for a 19 mile exclusion zone around the site, once an appropriate environmental impact assessment is completed. Nevertheless, Chernobyl seems poised to remain one of the top ten most polluted areas for the foreseeable future.

In other areas of the former Soviet Union, Cold War era manufacturing has led to very different environmental problems. In Dzerzhinsk and Norilsk, Russia, chemicals and toxic byproducts, including Sarin and VX gas as well as lead, have caused a staggering death rate that far exceeds the country’s birth rate (by 280%). In Dzerzhinsk, the city’s annual death rate of 17 per 1,000 is higher than Russia’s national average of 14 deaths per 1,000. The nickel and related metal mining in Norilsk has caused air pollution with sulfur dioxide and heavy metals such as nickel, copper, cobalt and lead, as well as phenols and hydrogen sulfide. Norilsk’s population is subjected to numerous respiratory, ear, nose and throat diseases. Norilsk also shares Dzershinsk’s elevated mortality rate, with 15.8% of these deaths being in children.

Clean up work has begun in both cities to undo the health dilemmas caused by the exposure to harsh metals. In Dzerzhinsk, a local NGO, DRONT, in cooperation with the Nizhniy Novgorod municipal government has brought together a steering committee to work on the design of a large scale remediation and pollution

mitigation plan for the affected area. In Norilsk, Norilsk Nickel has worked to reduce its emissions of major air pollutants. In 2006, the company invested more than \$5 million to overhaul its dust and gas recovery and removal systems. It has committed nearly \$1.4 million for its air pollutant prevention program and is eagerly working to combat its high emissions statistic.



Air pollution in Dzerzhinsk, Russia

While initiatives such as those funded by DRONT do have significant impact, much more work is needed.

The environmental issues that plague the planet's most polluted countries are an ongoing issue and can no longer be ignored. In order to adequately address these problems, there must be financial and political support, as well as a willingness by the polluters to modify and if necessary cease the actions which are destroying the environment and harming the citizens. The most effective method for achieving these necessary goals is inter-network cooperation between the private and public sector, working toward changing behaviors and enforcing enacted policies. Lastly, financial assistance to national and/or local governments would help impoverished polluted areas to make use of the technologies and expertise required for large scale clean-up. We must realize that contamination abroad will have will have a deleterious affect on the entire world.

Sources: *The World's Worst Polluted Places: The Top Ten of The Dirty Thirty.* A project of the Blacksmith Institute, September 2007. *Health Effects of the Chernobyl accident: an Overview,* World Health Organization, April 2006

CHORNOBYL UPDATE - Green Investment for Ukraine

Ukraine was one of the first countries to sign both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol to the UNFCCC and is thus taking voluntary measures to limit its greenhouse gas emissions (GHG).

According to official data, Ukraine has a large potential for selling its GHG emission quotas estimated at 1.5 billion. 1990 was taken as a basis for Kyoto protocol obligations and since then economic development in Ukraine declined approximately 59% and Ukraine cannot recover its economic development to the extent to be able to emit the same amount of CO₂ that was emitted by Ukrainian industry in 1990. In 2008, Ukraine will start to trade in Assigned Amount Units (AAU) that could bring more than US\$10 billion to the Ukraine budget.¹

According to a report by the World Bank: "Ukraine Options for Designing a Green Investment Scheme under the Kyoto Protocol" a Green Investment Scheme (GIS) is a vehicle to channel AAU sales proceeds into measures for reducing GHG emissions, or creating broader environmental benefits. Sellers commit to such measures to ensure the environmental integrity of the Kyoto Protocol and to secure better terms of sale, but this commitment is voluntary since greening is not defined under the Kyoto Protocol. The revenues received from AAU trading could be coming back to the environmental field and invested in projects aimed at mitigation of climate change consequences inside the country.

Presently, climate change policymaking in Ukraine is characterized by the absence of a state strategy for use of surplus GHG emissions; lack of laws necessary to implement the UNFCCC and the mechanisms of the Kyoto Protocol; lack of state policy in the field of GHG emissions reduction and removals by sinks; and involvement of investments in energy sector.²

The notion of the GIS is quite new to the legislation and practice of Ukraine, although Ukraine had been using the practice of allocation of polluters taxes into the State Environmental Protection Fund for "environmentally friendly" measures and projects for more than ten years. Ukraine's State Budget consists of a Special Fund called the State Environmental Protection Fund.³ Its goal is to finance environmental protection measures and conservation of natural resources.

The possible sectors of the Ukrainian economy that have the potential to receive green investments, after the trading of AAUs are: the energy sector, forestry, centralized and individual heating, agriculture, waste management, transportation and iron and steel production. Ukrainian renewable energy consumption totals only 1% of total energy consumption. The launch of AAU trading in 2008 should encourage the creation of new laws and new models of behavior in the sphere of production, the extracting industry, agriculture and forestry.

Citizens and environmental groups must take the initiative in every stage of green investment implementation, starting from participation in the selection process of the projects and ending with the control of the results of implementation of such projects. The public must also fight for better access to information at every stage of decision-making and ensure quick action in cases of violation by public authorities and business enterprises using funds from AAUs sales but failing to achieve environmental benefits. Public education of their rights and climate change problems is imperative to bring about positive changes in the future.

Sources: Olya Melen, Chief, Legal Unit of Environment-People-Law (EPL) Lviv, Ukraine; <http://www.epl.org.ua>

1. <http://www.vertisfinance.com/index.php?page=news&newsid=55&l=1>
2. Order of the Cabinet of Ministers of Ukraine "On approval of the plan for preparation to the consideration during the meetings of the Cabinet of Ministers of Ukraine of the most important issues of formation and realization of the state policy in first decade of 2007", 27.12.2006. N 674

3..Decision of the Cabinet of Ministers of Ukraine On approvals of the Statute of the State Fund of Environmental protection , 7.05.1998 N 634



DID YOU KNOW?

Diabetes in Relation to Pesticides in Adult Native Americans

Diabetes is one of the most prevalent chronic diseases in developed countries. Between 1980-2004, the number of Americans with diabetes increased from 5.8 million to 14.7 million, and significantly, in 2004, there were 1.4 million new diagnoses of diabetes among Native Americans.

A recent study examined levels of total PCBs in relation to key pesticides and found that DDE and HCB were positively associated with an elevated incidence of diabetes in the Native-American population. These findings are consistent with the hypothesis that exposure to organochlorine compounds increases the risk of developing diabetes and merit further investigation.

Source: *Neculai Codru, Maria Schymura, Serban Negoita, The Akwesasne Task Force on the Environment. Dec. 2007*

Uranium Concentrations in Port Hope, Ontario, Canada

Since the early 1930's, uranium has been refined in Port Hope and in 2007, the Port Hope Community Health Concerns Committee (PHCHCC) analyzed samples, taken from residents, to assess the radiation exposure of persons living in the area. Health Canada's analysis

showed that the uranium concentrations in nine residents of Port Hope are within the range of natural levels and that there is no health hazard posed from these levels.

The major health defect posed by uranium exposure is kidney damage. This effect only occurs in high concentrations, a thousand times greater than the levels at Port Hope. In March 2001, the Government of Canada began a 10-year, \$260 million initiative to develop a long-term management solution for Port Hope. The Low Level Radioactive Waste Management Office of Atomic Energy of Canada Limited is managing this initiative.

Source: *Radiology/ Nuclear Medicine News, 12 Dec 2007.*

US Baseline for Bisphenol A

Nearly all participants on a recent US survey had showed indications of the plastic component, bisphenol A, in their urine. A Centre for Disease Control and Prevention (CDC) survey of more than 2500 U.S. residents shows that nearly everybody in the country carries bisphenol A (BPA) in their bodies and the highest burden is carried by children.

The CDC's published biomonitoring data also indicates that the typical intake of an individual in the U.S population is 50 nanograms/ kg per bodyweight/day and is about 1 million times lower than the highest levels where no adverse effects on reproduction or developments were observed.

Source: *www.pubs.acs.org. Nov. 26, 2007*
www.bisphenol-a.org. Dec. 5, 2007

20 Million Americans Fight Illness

The likelihood of knowing someone with asthma is pretty high with about 20 million Americans suffering from the disease. Of asthma

sufferers, 60%, or 12 million individuals, have been diagnosed with allergic asthma, which is triggered by allergens like dust mites, pet dander, mold spores and cockroaches according to the National Institutes of Health (NIH). Atlanta is the most challenging place to live for asthma sufferers due to its high-year round pollen levels, bad air pollution and lack of public smoking bans in its restaurants. Plus, Atlanta's high poverty and uninsured rates hamper quality health care, but each year these asthma capitals (Philadelphia and Milwaukee both are featured on this list) highlight trends and methods to combat asthma induced illnesses. Over time if an illness like asthma is left untreated it can cause irreparable damage to a person's lungs.

Source: *www.medicalnewstoday.com, 27 April 2007.*

Close-Up of Cosmetics: Experts Divided on Safety of Parabens

Have a closer look at the ingredients list of your favorite shampoo or skin lotion, and chances are that you'll see ethylparaben, butylparaben, propylparaben or all of the above. These chemicals are some of the most commonly found preservatives in the cosmetics industry.

Parabens are also a source of much controversy, primarily because in numerous in-vitro studies they have demonstrated activity similar to estrogen, which threatens the health of humans and aquatic ecosystems.

A well-known study in 2004, detected parabens in breast tumors and, although no conclusive proof could be found, the area where the tumors occurred were also areas where heavy cosmetics were used.

Source: *Eviana Hartman, Nov. 2007, www.washingtonpost.com*

Shipping Pollution Linked to Deaths

A new health study links air pollution generated by international shipping to more than 60,000 premature deaths across the globe annually, including as many as 8,800 in North America. The study estimates mortalities will increase by 4% each year unless emission controls are adopted in the near future.

Southeast Asia, India and Europe bore the brunt of the mortality rates along coastlines and ports, but inland France also saw high rates due to population density and atmospheric circulation patterns.

Source: *Environmental Science and Technology: Death from Shipping*. Nov. 29, 2007

Seas Pollution Speeding Global Warming

Humanity is rapidly turning the seas acidic through the same pollution that causes global warming. This process, considered the most profound change in the chemistry of the oceans in over 20 million years, is expected to both disrupt the entire web of life of the oceans and make the climate worse.

Scientists have found that the seas have already absorbed about half of all the carbon dioxide emitted by humanity since the start of the Industrial Revolution, a staggering 500 billions tons of it. Although this has helped slow global warming, it has a heavy cost. The naturally alkaline water is being soured by the gas that dissolves into dilute carbonic acid. As the waters grow more acidic, calcium carbonate is greatly reduced affecting the coral life eco-system.

Source: *Geoffrey Lean, IoS Environment Editor*, Nov. 2007.

Understanding the Information on Pesticide Product Labels: Farmers

Brazil is one of the world's largest consumer of pesticides, and the

largest in Latin America. The use of pesticides in the Amazon region is intensive and is perceived as necessary by local farmers. Because of the remoteness of some areas, the limited or poor literacy skills of Amazonian farmers, and the widespread use of pesticides, it is expected that exposure to pesticides should be high.

It was discovered that the information displayed on product labels was not effective in promoting protective and safety measures. The farmers also considered the fonts to be too small, and that overly technical Portuguese was used. The pictograms were also misunderstood and this inability to properly decipher the correct methods led to adoption of practices, which increased exposure, risks to human health and environmental contamination.

Source: *Waichman, 2007, Crop protection 26: 576-583*

Greek Farmers: Disposing of Pesticide Waste

A survey of farmers in the five regions of the rural area of Pieria in northern Greece revealed their common practices in disposing of pesticide waste. 54.9% of the farmers reported that they normally re-spray the treated field until the spraying tank is empty. 30.2% reported that they used leftover spray solutions on another crop listed on the product label. A minority, 4.3%, mentioned that they released the leftover spray solution near or into irrigation canals and streams.

As for the rinsates generated from washing the application equipment, 40.7% of the farmers reported that they tend to release the rinsates over a non-cropped area, while 30.2% dump their empty containers by their fields and 33.3% throw them into canals and irrigation channels. Some instances of burning the empty cases in an open fire (17.9%), and some instances of throwing them in common waste places (11.1%) were also reported. Training programs which raise awareness of farmers

to the potential hazards of pesticide use and especially the proper management of waste products, the importance of recycling programs and collection systems for unwanted agricultural chemicals to prevent inappropriate waste disposal, are essential for promoting safety during all phases of pesticide handling.

Source: *Christos A. Damalas, Dept. of Agricultural Development of Greece Pieria*



Source: *The Beast That Ate The Earth* by Chris Madden.

Killer Exhaust Pollution

In 2004, Toronto Public Health conducted a study that linked overall air pollution lead to 1700 premature deaths each year. The report also showed, that at least 440 of them were due to vehicle exhaust fumes. The report outlines the significant burden of illness and health-related costs associated with current levels of smog-generating pollutants, greenhouse gases and air toxics emitted by vehicles and demonstrates the potential to improve health and reduce health care costs by reducing vehicle use and emissions.

The city made a commitment to improve transportation and has begun to promote walking, cycling and public transit. The report also recommends a shift from motor vehicles to more sustainable solutions that give priority to pedestrians, cyclists and transit users. Toronto is Canada's largest city and sixth largest government. It is home to a diverse population of about 2.6 million people and the economic engine of Canada.

Source: *Toronto Public Health, News Release*, Nov. 5, 2007, www.toronto.ca

HEALTH AND ENVIRONMENT

Bioremediation of Greenhouse Gases Using Microalgae

by Dr. David Bayless, Loehr Professor of Mechanical Engineering, Ohio University

We live in a world that depends on “fossil fuels” for our energy needs – petroleum for transportation, natural gas for home heating, and coal for electricity. The release of CO₂ and other greenhouse gases as a result of our dependence on fossil fuels for energy is having a significant impact on the environment of our planet.

One method of CO₂ mitigation utilizes the oldest natural carbon management process – photosynthesis. Other chemical recycling and sequestration processes require large energy inputs (usually from fossil fuels) to separate out the CO₂ or decompose the stable CO₂ molecule. Photosynthesis, on the other hand, is a solar-powered process. In addition, photosynthetic management of CO₂ separates and recycles CO₂ in one step and results in a product (biomass) that has real economic value as a fuel, fertilizer, or feed.

Cyanobacteria....are the most efficient in converting solar energy into biomass.

Cyanobacteria (blue-green algae) are one of the oldest photosynthetic organisms and among the most efficient in converting solar energy into biomass. CO₂, water, and sunlight react in the chlorophyll of the cyanobacteria, producing complex hydrocarbons that sustain the organism. However, within natural contexts, cyanobacteria have to compete for resources (nutrients) and are negatively affected by exposure to intense sunlight which causes them to develop pigments to protect themselves – an effect called photoinhibition. Thus, in natural contexts, even one of nature’s most efficient CO₂ converting organisms, wastes 99% or more of the available energy.

To address this waste of energy, there have been attempts in the past to “engineer” the biological mitigation of CO₂ using algae, most of which have resulted in a number of well-documented failures. However, new bioreactor designs and the use of “synthetic biology” to create tailored strains of algae offer significant promise in overcoming the classic weaknesses of using photosynthetic CO₂ mitigation for industrial applications. Thermophilic cyanobacteria (blue-green algae that grow in high temperatures) will

grow attached to a vertical membrane, in a configuration that looks much like an electrostatic precipitator, the technology already used to capture particulates and other emissions from power plants. Advances in light collection and distribution technology also make it possible to expose the cyanobacteria to light levels that optimize the efficiency of photosynthesis. Finally, the increased value of the algal biomass as a source for fuel, fertilizer, or feed, makes the economics of using cyanobacteria algae to mitigate CO₂ more favorable.

Ohio University’s Coal Research Center is working towards making that vision a reality. Ohio University has developed a “carbon recycling” bioreactor that can convert CO₂ into biomass using microalgae. The system, shown schematically in Figure 1, takes CO₂ from an industrial process, such as a coal or natural gas power plant, and converts it to biomass (algae) using captured sunlight for photosynthesis.

Bioreactor Design

The process, shown in Figure 1, begins with flue (exhaust) gas that passes through the bioreactor, which houses vertically suspended membranes that are arranged to minimize the pressure drop of the gas throughout the reactor. Water is then circulated in the bioreactor to support the organisms. The circulating fluid system, a

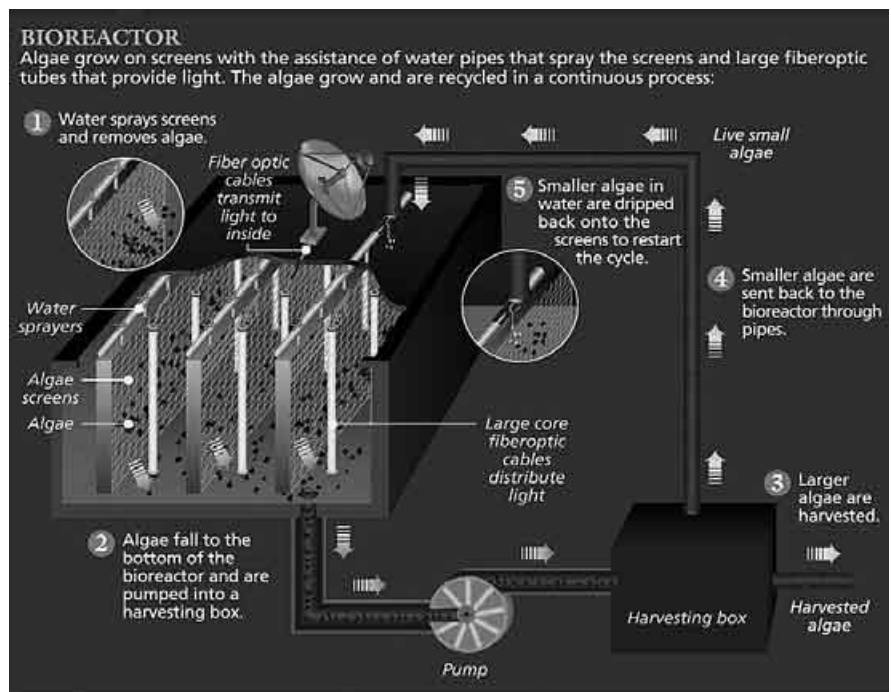


Figure 1. Schematic of the carbon-recycling bioreactor.

pump-and-gravity-fed system, delivers water containing defined levels of nutrients and soluble carbon (or void of soluble carbon) to the membrane supports.

Light provides the final ingredient to facilitate photosynthesis. The bioreactor system's efficiency increases due to the ability to use sunlight (solar photons) rather than artificial lighting. It also maximizes photon usage efficiency by controlling the light intensity to prevent photoinhibition as well as minimize the light loss due to reflection and absorption.

Sunlight contains a wide spectra of energy

The primary source for solar radiation is a set of solar tracking mirrors. The preferred design for these mirrors is in a trough-like arrangement in which a primary trough focuses light onto a secondary mirror that re-focuses the light onto an acrylic sheet. This design allows the sun to be tracked throughout the day, maximizing solar radiation, and allowing the angle of inclination to be adjusted to maximize incident light collection in all seasons. Another design is a parabolic solar collector, an example of which can be seen in Figure 2. When there are no available solar photons, photons from artificial sources can be used, thus allowing for CO₂ mitigation at all times. A further point of interest is that sunlight contains a wide spectra of energy; some of which is useless to the photosynthetic organisms, such as infrared, and some which is harmful, such as certain ultraviolet spectra. Filters remove unwanted portions of the solar spectra and allow it to be used for the production of electricity needed to power the auxiliary components of the system.

Harvesting is done to remove fully mature microalgae, to repopulate the membranes with new microalgae, and to reduce density to promote further development – all with the goal of maximizing CO₂ uptake. By using the same water distribution system, it minimizes the need for additional components. Harvesting involves increasing the water pressure, resulting in a greater flow of water per unit area of membrane and creating a gentle washing effect. Gentleness is critical to preventing shock to the organisms and keeping them in the optimal growth phase.

Photosynthetic Control of CO₂ as an Enabling Technology

One use of carbon recycling using microalgae can be to couple it with Fischer-Tropsch Synthesis (FTS) in the creation of liquid and gaseous fuels. FTS is a process that combines hydrogen (H₂) and carbon monoxide (CO) to form long-chain hydrocarbons of any desired length, producing methane (natural gas), mixed alcohols (used as a replacement for gasoline), jet fuel (JP-8),

and synthetic diesel fuel. The bioremediation of CO₂ can play an important role in the widespread use of FTS, as current FTS technology converts only about 50% of the carbon from the original feedstock (generally biomass or coal) to fuels. The remaining carbon is rejected and released as CO₂ – meaning that without technology to mitigate CO₂ emissions, FTS could actually increase CO₂ emissions rather than decreasing it. Without technology to mitigate CO₂ emissions in some fashion, capital markets fear the environmental pushback and risk associated with FTS and the billions of dollars needed to develop FTS processing facilities.

Using bioreactors, the CO₂ emitted from the FTS process could be recycled using microalgae. The microalgae, which are rich in hydrogen, could then be used as a feedstock for the FTS gasification process, creating a new and hydrogen-rich syngas for the FTS reactor, thus reducing the amount of coal (or other feedstock) needed for the process. This recycling not only reduces direct CO₂ emissions, but also creates another feedstock for fuel (such as diesel fuel or natural gas) production.

Algae and the Future of CO₂ Mitigation

Photosynthetic mitigation of CO₂ using cyanobacteria offers promise in addressing the world's CO₂ emissions. The combination of advancements in synthetic biology and engineered photobioreactors will likely see significant deployment, especially when the product of photosynthesis (biomass, fuel, feedstock) has its own economic value.

Many entities are working on the commercialization of algal-based CO₂ recycling technologies and larger-scale demonstrations are underway in various locations throughout the world. With the increasing costs of liquid fuels and rapid breakthroughs in algal genomics, additional adoption is likely in the near future. In addition, the successful economic commercialization of new solar thermal power plants which use focusing mirrors, such as those needed by photobioreactors, bodes well for driving down the costs of photobioreactors and increasing their commercialization potential. Even so, extensive development and testing will be needed before wide-scale commercialization is seen – perhaps in five to seven years.



Figure 2. Solar collector mounted above pilot-scale bioreactor.



GOOD NEWS

Greenhouse Gas Reductions and Growing Economies:

Economic development is at a peak in Salt Lake City and offers positive examples of growth where ecology minded solutions are being considered.

The wilderness, which consists of 25 square miles of steep granite, mountain brush and fir, spills from the summit of Olympus down to the eastern edge of the city. Salt Lake City has joined other cities in the West including Denver, Portland, San Francisco and Seattle in pursuing a development strategy based on ecological ideas such as energy efficiency, resource protection, land conservation and pollution prevention.

Today, the city has cut greenhouse gas emissions by 36,000 tons annually by taking small steps at such as directing every city-owned installation to switch to energy-sipping light bulbs which has resulted in a savings of \$33,000 a year. Residents are increasingly voting to spend tax money on alternatives to highways and land conservation

Source: *Sneider, NY Times, Nov. 7, 2007*

Bangkok's Global Plan to Control Mercury Pollution

From November 12th to 16th, 2007, representatives of the world's

governments met in Bangkok to develop a global plan to control mercury pollution.

These representatives made the first steps towards streamlining global solutions on mercury pollution, following the mandate of the UNEP Governing Council (GC) from February 2007. The GC had given the mandate to review and assess options for enhanced voluntary measures and for new or existing international legal instruments.

The UNEP secretariat was asked to prepare for a second meeting with an analysis on the way different financial mechanisms would apply to a protocol to the Stockholm Convention, and a further analysis on how countries could pursue the development of such instruments to control mercury pollution.

Another important request was to find an indication of which mercury control measures could be implemented at a national level and which would benefit from a coordinated international framework, whether through legally binding instruments or voluntary arrangements.

Source: *UNEP, OEWG. Nov 21, 2007*

Mercury Bans in Scandinavia

The Norwegian ministry of Environment and International Development has prohibited the use of mercury in products in light of the effects these products have on the environment. The ban came into effect on January 1, 2008. The use of mercury in dental products will also be banned especially amalgam which is in dental fillings and even some measuring instruments. The Norwegian ban is commendable as most of the mercury in Norway comes from foreign sources, and this move is an important signal to other EU countries to find alternatives to mercury.

Sweden has also banned amalgam citing environmental and health

concerns while Denmark suggests that its ban, which will come into effect on April 1, 2008 shall be successful because of the availability of composites and teeth fillings which now consist of plastics or ceramics.

Source: *<http://www.regjeringen.no/en/dep/md/Press-Centre/Press-releases/2007/Bans-mercury-in-products.html?id=495138>. Jan. 7, 2008*

Measles Death in Africa Plunge by 91%

Measles deaths in Africa fell by 91% between 2000 and 2006, from an estimated 396,000 to 36,000, reaching the United Nations 2010 goal of reducing measles deaths by half, a good four years earlier.

This significant decline in measles deaths was made possible by the firm commitment of national governments to fully implement the measles reduction strategy, which includes vaccinating all children against measles before their first birthday via routine health services and mass vaccination campaigns for providing second opportunity measles vaccination. Mass vaccination campaigns have had a major impact on reducing global measles deaths. From 2000 to 2006, an estimated 478 million children aged 9 months to 14 years received measles vaccine through campaigns in 46 out of 47 priority countries affected by the disease.

This successful reduction of measles deaths was possible through the collaborative work among national governments, the United Nations, NGO's, corporations and volunteers from local communities. A key factor has been the strong support of the Measles Initiative and the GAVI Alliance. Since its launch, the Initiative has supported vaccinations in over 50 countries and mobilized more than US \$470 million.

Source: *Joint News Release (WHO/UNICEF) Nov. 29, 2007.*



Nanosolar: Power to the People

Nanosolar coatings are as thin as a layer of paint and can transfer sunlight into power efficiently. Cost has always been the major deterrent to the mass application of solar technology which costs nearly \$3/watt. In order to compete with the energy produced from coal, solar has been in need of finding a way to shrink its costs down to \$1/watt. Nanosolar cells use no silicon as is the standard for current solar production and the efficiency of the nanosolar coatings are competitive with traditional systems as well. Incredibly, the cost to produce these solar coatings is merely 30 cents/watt.

Nonosolar Inc., has begun to build what is soon to be the largest solar plant in the world, in San Jose, USA and at full capacity, the plant is capable of producing a whopping 430 megawatts/year.

Source: *Nanosolar: Power to the People. Triple Pundit, Nov. 13, 2007.*

EU's REACH Chemical policy – Switzerland

Switzerland is considering partial adoption of the EU's REACH chemical policy, according to a report from its environment ministry. Under this adoption, REACH will be applied to chemicals produced for the EU and the domestic markets but not for exports to other countries.

The ministry has also begun to incorporate REACH into national law, by applying REACH to new substances for the domestic market only,

to all new and existing substances for the domestic market only and also to new and existing substances for the domestic and non-EU markets.

The report also acknowledged that applying REACH only to domestic markets and EU exports but not elsewhere, shall hurt Switzerland's image abroad as the alpine nation has a substantial chemical industry.

Source: *Swiss Environment Ministry Press Release, www.uvek.admin.ch/dokumentation. Dec. 28, 2007*

UNEP Meets Billion Promises

The United Nations Environment Programme (UNEP) and the World Agro forestry Centre (ICRAF) announced that the promise made last year at the UN climate convention to plant a billion trees had been met.

The enthusiasm of individuals to make a difference is underlined by figures collected by UNEP which indicate that half of all those who planted are often private citizens or households that plant one to three trees, as well as the private sector, which actively participated in the initiative.

The billionth tree planted is believed to be in Ethiopia where, and as part of the country's Millennium Commemoration 2007, close to 700 million trees have been planted alone.

Source: *UNEP News Release, Nairobi Nov. 28, 2007.*

Mercury Concentrations in Fish Respond Quickly to Increased Mercury Pollution Science

A joint Canadian-American research team has demonstrated that mercury concentrations in fish respond directly to changes in atmospheric deposition of the chemical. To directly test the response of fish contamination to changing mercury deposition, researchers conducted a whole-ecosystem experiment, increasing the mercury load to a lake

and its watershed by the addition of enriched stable mercury isotopes. The isotopes allowed the team to distinguish between experimentally applied mercury and mercury already present in the ecosystem and to examine bioaccumulation of mercury deposited to different parts of the watershed. Fish methylmercury concentrations responded rapidly to changes in mercury deposition over the first three years of study. This means that a reduction in new mercury loads to many lakes should result in lower mercury in fish within a few years, according to one of the researchers. There are currently thousands of advisories against eating fish from lakes in both Canada and the United States. The international team's research began in 2001 at the Experimental Lakes in Northern Ontario, Canada.

Source: *University of Maryland Center for Environmental Science, Study: "Mercury Experiment to Assess Atmospheric Loading in Canada and the United States (METAALICUS)".*

UN Breakthrough on Climate Change Bali, Indonesia

187 participating nations agreed to launch negotiations toward a crucial and strengthened climate change deal on December 15, 2007 in Bali, Indonesia. The decision includes a clear agenda for the key issues that are going to be discussed, such as, the action for adapting to the negative consequences of climate change, droughts and floods; the ways to reduce greenhouse gas emissions; the ways to widely deploy climate friendly technologies and also financing adaptation and mitigation measures. Participating countries have also agreed on a series of steps that can be taken immediately to strengthen their commitment to the UN Framework Convention on Climate Change (UNFCCC), such as combating deforestation in poor countries, the scaling up of investment in green

technology and enhancing funding for adaptation measures. The text does not specify or mandate emissions targets, but it does say that deep cuts in emissions will be needed to avoid the worst effects of climate change. The members also considered for the first time the possible inclusion of carbon capture and sequestration. The UNFCCC plans on four meetings to implement the Bali decisions with the earliest to be held in March or April 2008.

Source: UNFCCC Press Release, Dec 2007.

Germany to help destroy toxic chemical pile up

A hazardous chemical pile up totaling 50 tons of granular DDT in the Korogwe district of Tanzania, is to be disposed off with the aid of the German government later this year. The consignment is part of 1,200 tons of DDT dumped in various parts of the country. The chemical has remained poorly stored for more than 30 years and has resulted in grave health affects to humans and livestock in the vicinity of the dump sites.

The German Technical Cooperation (GTZ) has started to collect the toxic chemical and is repackaging it in order to ship it to Germany where it will be disposed of. A GTZ representative, Mr. Schimpf Wolfgang, said the operation is part of an environmental protection program against organic pollutants. The operation is expected to cost 250,000 Euros.

Source: The Citizen Online. Jan. 17, 2008. <http://www.thecitizen.co.tz/newz.php?id=2670>

More Did You Know

The Environmental Implications of Over Fishing

Fish, high in protein, are generally better for you than meat. However, fish are becoming scarce because of our appetite for fish and our ability to catch them. Signs of growing scarcity are indicated by smaller fish and smaller catches. Unfortunately most efforts to manage fish stocks as well as control over fishing have been unsuccessful. Wealthy countries buy fishing rights from poorer countries and then deplete the stocks negatively impacting supply. Though some fish, such as prawns, salmon and tuna can be farmed, industrial fishing is still largely a matter of hunting fish at a much faster rate than they can be replenished. In addition, farming fish depletes wild stocks insofar as most farmed fish are fed with other fish from the sea, approximately 20 tons of dead fish, ground up is needed to feed one ton of live fish.

Over fishing is not a necessity. One study conducted by researchers at Lehigh University indicates that the world's commercial fishing fleets are two to three times larger than necessary, postulating that a significantly smaller fleet, about one fourth the current size, would be sufficient to provide all of the fish the market demands. One rationale for the depletion of the fish stock is that in order to make financially viable the capital outlays in fishing rigs over fishing is essential in order to defray these costs. In essence, the amount of fishing could be greatly reduced without impacting market demand.

In addition to having an overabundance of fishing fleets, many fishers practice unsustainable fishing in order to maximize short term profits. Most fishing practices are non-selective meaning the equipment used, such as drag nets, catches any and all marine life in the vicinity of a vessel, will catch a myriad of species while only one type is kept and the rest are thrown back into the sea. However they are often returned to different uninhabitable environments and even more die prior to being thrown back, either as a result of physical trauma sustained during the catch and sorting phase or as a result of asphyxiation. Another method of fishing is bottom trolling which is commonplace in relatively shallow waters, results in the aforementioned harms in addition to destroying all marine ecosystems on the ocean floor. Coral reefs are especially vulnerable to bottom trolling.

Sadly, the aforementioned methods of fishing are the most profitable insofar as they are the least expensive to implement and result in very high yields. Consequently, change is extremely unlikely without international regulations and/or subsidies. How-

ever, although an economic solution is not complicated the difficulty with the implementation of reduced fleets and more targeted harvesting is a political question.

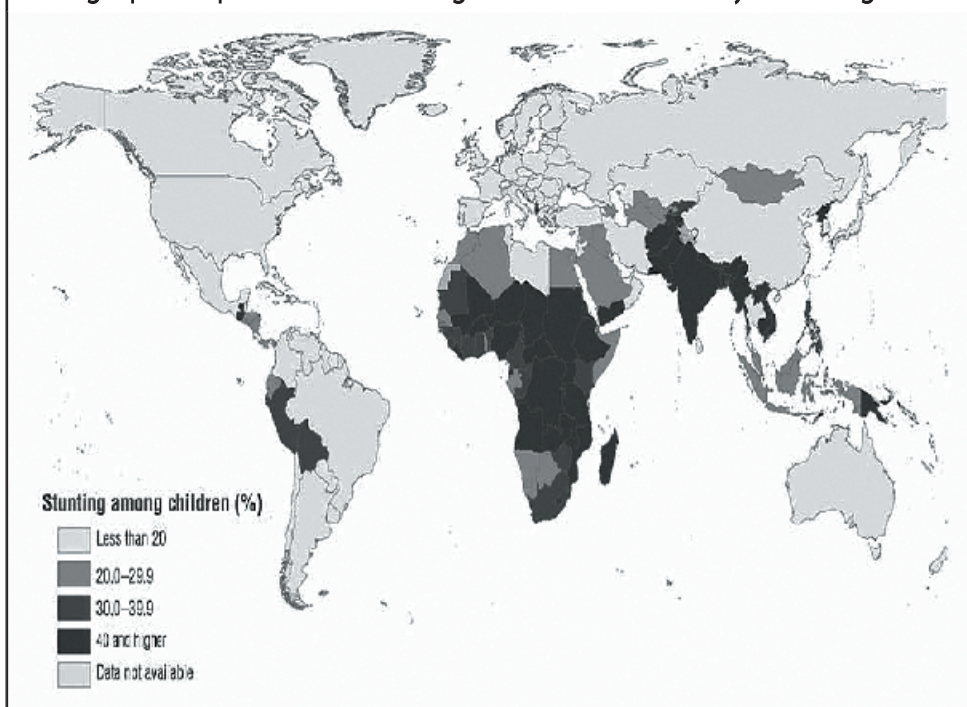
The negative effects of commercial fishing are best illustrated by the UN Food and Agricultural Organization which produces the bi-annual report, On the State of the World's Fisheries and Aquaculture. The 2006 report provides a conservative breakdown of the state of the world fisheries: 20% of fisheries are "moderately exploited", 52% are "fully exploited", 17% are "over exploited", and 7% are "depleted". An additional 1% are recovering from "depletion"

Fish farming has been hailed as a potential answer to this problem. However, upon closer observation fish farms are at least as harmful to the environment as over fishing. Fish farms require more food than they produce. While advocates may argue that the fish used to feed fish farms is fish that is not desirable for human consumption they overlook the most critical factor which is the environmental impact of over fishing even these species. Furthermore, fish farms produce massive amounts of concentrated fish waste which contain high quantities of phosphorus and nitrogen. These poison the slow moving bodies of water in which fish farms are optimally located in. Over time this results in water that is not potable and which cannot sustain life.

Fish farming has had dire consequences in China's Fujian Province where acute water shortages and sewage contamination of potable water pre-dated the introduction of large scale fish farming. Fujian's problem has gone from an issue of environmental degradation to an international issue of food safety and human health. Fujian's fish farms are so highly contaminated that the can no longer "naturally" sustain life. Farmers have been forced to use illegal veterinary drugs and pesticides to keep the fish alive. These "additives" have resulted in seafood with "poisonous and carcinogenic residue". The EU and Japan have both enacted laws barring the import of these fish which has resulted in mass consumption by the Chinese people. The level of contamination has already produced elevated rates of liver disease and incidences of cancer are occurring. As is often the case with environmental pollution the world's poorest citizens suffer disproportionately.

Sources: The New York Times. In China, Farming Fish in Toxic Waters. Dec. 15, 2007; <http://overfishing.org>; UN FAO. On the State of the World's Fisheries and Aquaculture. 2006

Geographical pattern of stunting in children under 5 years of age



Source: World health statistics 2007, WHO

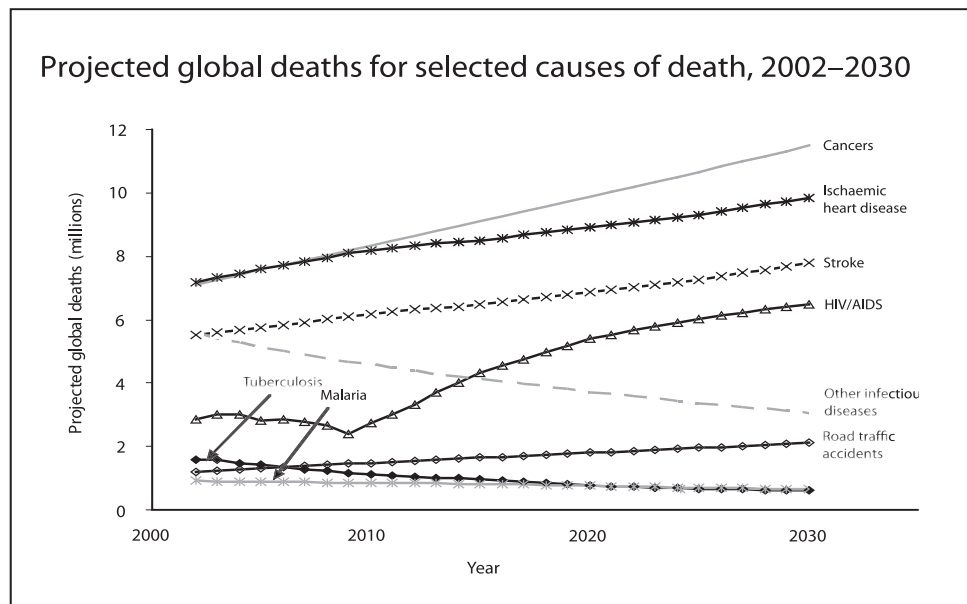
Phthalates in PVC Plastics

Phthalates used in PVC plastics are not chemically bound to PVC, and therefore, they can leach, migrate or evaporate into indoor air and the atmosphere, foodstuff, and other materials. Consumer products containing phthalates can result in human exposure through direct contact and use, indirectly through leaching into other products, or general environmental contamination. Humans are exposed through ingestion, inhalation, and skin exposure during their entire lifetime, including intrauterine development. Current human biomonitoring data show that the tolerable intake of children is exceeded to a considerable degree, in some instances up to 20-fold. However, because of their chemical properties exposure to phthalates does not result in bioaccumulation.

Source: Heudorf et al., 2007. *Phthalates: Toxicology and exposure. International Journal of Hygiene and Environmental Health. Article in Press. doi:10.1016/j.ijheh.2007.07.011*

2007: Second Warmest Year

NASA's Goddard Institute for Space Studies has declared 2007 the second-warmest year on record, tying with 1998 for the title. 2005 remains the hottest, according to the agency. Researchers said that the greatest warming occurred in the Arctic.



Source: World health statistics 2007, WHO

Results from the U.S. National Oceanic and Atmospheric Administration (NOAA) climate analysis came out with the following results for 2007. The global land and ocean surface temperature was the fifth warmest on record. Separately, the global land surface temperature was warmest on record while the

“We seek to steer our course by the star of age old values, not short term expediencies; to waste less in the present and to provide more for the future; to leave a legacy which keeps the faith with those who left the Earth to us.”
President Clinton, April 1993

global ocean temperature was the 9th warmest since records began in 1880. Seven of the eight warmest years on record have occurred since 2001, part of a rise in temperatures of more than 1°F (0.6°C) since 1900. Within the past three decades, the rate of warming in global temperatures has been approximately three times greater than the century scale trend.

Sources: NASA's Goddard Institute for Space Studies, National Oceanic and Atmospheric Administration, <http://www.grist.org/news/>. Jan. 16, 2008

Precipitation Reduced

Trends seen in meteorological data gathered on a Chinese mountaintop suggest that air pollution reduces the amount of precipitation that falls at high-altitude sites. When winds force moisture-laden air masses up a mountainside, the air cools, its water vapor condenses, and precipitation often results. This moisture-squeezing effect seems to be faltering in some areas. Many mountainous areas in the Western United States, especially those downwind of major urban areas, have experienced as much as a 25 percent drop in precipitation in recent years.

Source: *Science News*, Vol. 171, no. 10, 2007

“Labor to keep alive in your breast that little spark of celestial fire called ‘conscience’”

George Washington,
First President of United States

Safe Drinking Water for All: Not Likely In the Near Future

Lack of safe drinking water and sanitation is one of the major causes of disease and death worldwide.

Every year over 5 million people die from water-related diseases: some 3 million from diarrhea and around 2 million from malaria. Women in developing countries walk many kilometres a day to fetch often unsafe supplies of water for their families and about a third of the world's people are expected to suffer from chronic water shortages. Incidence of disease and death around the world could be cut by three quarters if there were adequate supplies of safe drinking water and adequate sanitation. However, at the present rate of investment safe drinking water will not be provided to all the peoples of Asia before 2025, in Latin American and the Caribbean before 2040 and Africa before 2050.

Source: *Our Planet*, UNEP, Volume 14, No.4



VOICES

17th International Conference on Health and Environment: Global Partners for Global Solutions 2008

World Information Transfer will hold its 17th International on the themes of “Youth Action” and “Post Traumatic Stress Disorder after Chernobyl” at UN Headquarters in New York on April 23rd and 24th, 2008. Registration is mandatory. The conference is for free.

Contact: witNYC@gmail.com

35th Annual International Conference on Global Health

Community Health: Delivering, Serving, Engaging, Leading will take place on May 27-31, 2008 at the Omni Shoreham Hotel, Washington, D.C. Special Discounted Hotel rates at Conference Venue.

Contact number:
1-888-444-6664.

World Watch Institute: Population Crisis and Sustainable development

According to the United Nations me-

dium-scenario projection, the human population is on track to reach almost 9.2 billion by 2050, up from 6.6 billion today. Although this suggests a decline in the fertility rate, if fertility rates stop falling – as is occurring in some countries today – the world population could exceed 11.9 billion in the same period.

Stabilizing the world population is a difficult but essential challenge and the larger the population, the greater the strain on the environment, economics and society. An increase in a couple's access to sound information, health services and a range of contraceptive options could help slow population growth. Plus, access to voluntary family planning allows women to time their births and choose the size of their families. For this to succeed we must address critical issues like the empowerment of women and the linkages between population growth and climate change.

Source: *World Watch Institute*, www.worldwatch.org

“The vast majority of human beings dislike and even dread all notions with which they are not familiar. Hence.... at their first appearance innovators have always been derided as fools and madmen.”

–Aldous Huxley, novelist (1894-1963)



UM... EXCUSE ME, SIR, ISN'T THAT YOUR TRAIN?

Source: *Environmental Defense. Solutions*. Vol. 36, No. 4 July-August 2005



Japan: The Ukita family of Kodaira City. Food expenditure for one week: 37,699 Yen or \$317.25



Ecuador: The Ayme family of Tingo. Food expenditure for one week: \$31.55



Bhutan: The Namgay family of Shingkhay Village. Food expenditure for one week: 224.93 ngultrum or \$5.03



Chad: The Aboubakar family of Breidjing Camp. Food expenditure for one week: 685 CFA Francs or \$1.23

Source: *What's In A Meal?* Jim Prevor, January 4, 2008

Quality of Life 1990 and 2007

1990 was the beginning of a new decade following the dramatic change in the political blocks in 1989. The Soviet block fell followed by the Berlin Wall and the European nations began gearing up to become a unified power. The index reflected the following criteria: cost of living (maintaining a comfortable lifestyle), economy (GNP), freedom (political and civil rights granted to citizens), political stability (level of turmoil and the chances of political upheaval), health (infant mortality rate and the average life expectancy), infrastructure (transportation, communication facilities available per capita) and culture (rate of adult literacy).

TOP 10 COUNTRIES

Rank	1990	2007
1.	United States	France
2.	Canada	Australia
3.	West Germany	Netherlands
4.	Australia	New Zealand
5.	Switzerland	United States
6.	Iceland	Switzerland
7.	Italy	Denmark
8.	Luxembourg	Italy
9.	Netherlands	Luxembourg
10.	New Zealand	Argentina

WORST 10 COUNTRIES

Rank	1990	2007
1.	Mozambique	Iraq
2.	Mauritania	Somalia
3.	Central African Republic	Yemen
4.	Mali	Sudan
5.	Djibouti	Afganistan
6.	Niger	Iran
7.	Ethiopia	Sierra Leone
8.	Burkina Faso	Djibouti
9.	Afghanistan	Haiti
10	Chad	Liberia

FOOD FOR THOUGHT

Country	1990 Score	2007 Score
Germany	88	78
Italy	85	80
United States	92	84
Mexico	63	75
Poland	58	70
Egypt	55	54
Japan	81	75
Chad	13	46
Ecuador	57	72
Bhutan	26	58

*Rankings out of 100 points with 100 points being the best

Source: *The Economist Quality of Life Index.* 1990 and 2007

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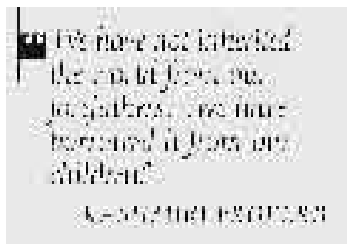
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Mission Statement**

World Information Transfer, Inc., (WIT) is a not-for-profit, non-governmental organization in General Consultative Status with the United Nations, promoting environmental health and literacy. In 1987, inspired by the Chernobyl nuclear tragedy, WIT was formed in recognition of the pressing need to provide accurate actionable information about our deteriorating global environment and its effect on human health. WIT exercises its mandate through:

- **World Ecology Report (WER).** Published since 1989, the World Ecology Report is a quarterly digest of critical issues in health and environment, produced in four languages and distributed to thousands of citizens throughout the developing and developed world.
- **Health and Environment: Global Partners for Global Solutions Conference.** Since 1992, WIT has convened what we believe to be one of the world's premier forums for the presentation of scientific papers by international experts on the growing clinical evidence supporting the link between degrading environments and diminished human health. The conference has been convened as a parallel event to the annual meeting of the UN Commission on Sustainable Development. The scientific papers presented at the conference are available on WIT's web site.
- **Health and Development CD ROM Library.** This project consists of a library of CDs each of which focuses on a subject within the overall topic of Development and Health information. Our Human Information CD ROM Library offers one bridge across the "digital divide" for both developed and developing countries. The project is continuous with future topics being developed.
- **Health and Development CD ROM Library for Ukraine.** In conjunction with UNDP, WIT has developed a country specific library disc for distribution in schools and centers in Ukraine.
- **Humanitarian Aid.** WIT provides humanitarian relief to hospitals and orphanages in areas devastated by environmental degradation. Our shipments have included medical equipment for pediatric medical facilities, computer and telephone systems, clothing, toys, prosthetic devices for gifted children.
- **Internship Program.** WIT provides an internship program for young people interested in international diplomacy, international health, and sustainable development.
- **Scholarship Program.** With the support of the K. Kovyshchyn Foundation, WIT offers scholarships to intellectually gifted university students in need of financial assistance to continue their studies in areas related to health and environment.
- **www.worldinfo.org** WIT provides through its web site up to date science based information on the relationship between human health and the natural environment, including the papers from the WIT's annual conference, the archived World Ecology Reports, and our new Ecology Enquirer, an e-newsletter written by our Interns targeted to young people.
- **Centers for Health & Environment.** The aim of the Centers is to promote research, education and solutions. The first center was opened in Ukraine in 1992, and the second center opened in Beirut, Lebanon in 1997 at Bir Hasan, United Nations Street, Al-Salaam Building.

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Food for Thought:



Germany: The Melander family of Bargteheide
Food expenditure for one week: 375.39 EU or \$500.07



Italy: The Manzo family of Sicily Food expenditure for one week: 214.36 Euros or \$260.11



United States: The Revis family of North Carolina
Food expenditure for one week \$341.98



Mexico: The Casales family of Cuernavaca. Food expenditure for one week: 1,862.78 Mexican Pesos or \$189.09

Continuing on page 14



HOW YOU CAN HELP:

WIT is a non-profit, international, non-governmental organization in consultative status with the United Nations, dedicated to forging understanding of the relationship between health and environment, among opinion leaders and concerned citizens around the world. You can help us with your letters, your time, and/or your donations.

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"Never doubt that a small group of thoughtful committed citizens can change the world. Indeed it's the only thing that ever has."

— MARGARET MEAD

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