

Development as if the world mattered

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Introduction

The world desperately needs a new model of development. Most of the world's people are stuck in poverty, and all major ecosystems are in decline. Spending more money, however, will not by itself solve the problems. The answer must include fundamentally rethinking international development so that it implements world best practice in sustainable development technologies in ways that promote the creation of locally controlled, viable private sectors.

The Challenge

In 2000, all 191 member states of the UN endorsed the Millennium Development Goals. These set quantifiable targets for eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality and empowering women, improving maternal health, reducing child mortality, combating HIV/AIDS, malaria and other diseases, ensuring environmental sustainability and developing a global partnership for development by 2015.¹

Some progress has occurred. Between 1990 and 2002 average incomes increased by approximately 21 percent. The number of people in extreme poverty declined by an estimated 130 million. Child mortality rates fell from 103 deaths per 1,000 live births a year to 88. Life expectancy worldwide rose from 63 years to nearly 65 years. An additional 8 percent of the developing world's people received access to water. And an additional 15 percent acquired access to improved sanitation services.²

But implementation has been far from uniform across the world or across the Goals. Huge disparities exist across and within countries. Poverty remains significant in rural areas and urban poverty is vast, growing, and underreported by traditional indicators.³ Environmental progress, especially in the realm of climate change has been very limited.

The answer must include fundamentally rethinking international development so that it implements world best practice in sustainable development technologies in ways that promote the creation of locally controlled, viable private sectors.

Many analysts agree that the world will fail to meet the Goals. In 2002, Relief Web announced that progress in reducing hunger had virtually halted. The UN Food and Agriculture Organization estimates that there were around 840 million undernourished people in 1998-2000, 799 million in the developing countries, 30 million in the countries in transition and 11 million in the industrialized countries.⁴ “In the worst affected countries, a newborn child can look forward to an average of barely 38 years of healthy life, compared to over 70 years of life in 24 wealthy nations.” One in seven children born in poor countries where hunger is most common (29,000 a day) will die before reaching the age of five.⁵

Cut the statistics any way you like, the situation is grim: Over 4 billion people live in developing countries, with half of the world’s population living on less than \$2 a day. UNICEF statistics show that almost 4,000 children die each day because they lack access to safe drinking water or sanitation.⁶ Eight million die a year because they are too poor to stay alive.⁷ In the past 50 years, almost 400 million people worldwide have died from hunger and malnutrition, or three times the people killed in all wars in the 20th Century.⁸

Jeffrey Sachs, the Director of the Millennium Development Project, created to implement the Goals, in his brilliant recent article in Time magazine stated, “This is a story about ending poverty in our time. It is not a forecast. I am not predicting what will happen, only explaining what can happen.” He goes on to say, “...Our task is to help people onto the ladder of development, to give them at least a foothold on the bottom rung, from which they can then proceed to climb on their own.”

He advocates an approach he calls Clinical Economics, based on providing clean water, healthy soils and a functioning health care system with the same enthusiasm that development experts have insisted that poor nations reform their economic systems. He calls for an approach like clinical medicine and likens the structural adjustments of programs like the International Monetary fund to the 18th century medicine that applied leeches to sick patients. He sensibly calls for providing the basic necessities of life to the poor around the world as the basis of development.

Sachs’ analysis of the classes of poverty, and what causes them is brilliant, but his article says little about how to go about lifting people from poverty. His recipe: the wealthy nations should meet their development pledges.⁹

But unless there are changes in how development money is spent, and how development is done, such increases will not result in measurable decreases in poverty. And a rapidly growing world rapidly increasing its wasteful consumption would doom us all.

If the developing world seeks to lift itself out of poverty in the same inefficient way that the west has done, it will require three more earth’s worth

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of resources to meet the needs of the world's consumers.¹⁰ Part of the reason that the world oil prices are now at record heights is that China has entered the world oil market. If the Chinese used oil at the same rate as Americans, by 2031 China would need 99 million barrels of oil a day. The world currently extracts 79 million barrels per day and may not be able to lift more. If China's coal burning equaled current U.S. levels (nearly 2 tons per person) China would use 2.8 billion tons annually – more than the 2.5 billion tons the entire world now uses.¹¹

In April, the United Nations released the Millennium Ecological Assessment. The study, by 1,360 experts in 95 nations who drew on the work of 22 national science academies from around the world, reported that a rising human population has polluted or over-exploited two-thirds of the ecological systems on which life depends, ranging from clean air to fresh water, in the past 50 years.

“At the heart of this assessment is a stark warning,” said the 45-member board of the Millennium Ecosystem Assessment. “Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted.”

UN Secretary-General Kofi Annan added, “The study shows how human activities are causing environmental damage on a massive scale throughout the world, and how biodiversity – the very basis for life on earth – is declining at an alarming rate.” Even if slow and inexorable degradation does not lead to total environmental collapse, the Assessment found, the poorest people of the world are still going to suffer the most.¹²

One of the most serious challenges is that of climate change. In January 2005, Dr. Rajendra Pachauri,¹³ the chairman of the official Intergovernmental Panel on Climate Change (IPCC), told an international conference attended by 114 governments, “Climate change is for real. We have just a small window of opportunity and it is closing rather rapidly. There is not a moment to lose.” He concluded, “We are risking the ability of the human race to survive.” Pachauri agreed that the impacts of climate change will fall disproportionately on the poor.¹⁴ Many observers have issued similar or graver statements.

At the same time, however, books like the just released, *Natural Advantage of Nations*,¹⁵ the international bestseller, *Natural Capitalism*¹⁶ and a staggering array of others prove how the rapidly emerging best practice in sustainable technologies can meet basic human needs around the world and solve most of the environmental problems facing the planet *at a profit*.

The planet faces unprecedented perils. We have the answers at hand and we are failing to implement them. What is wrong with this picture?!

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Development done wrong

In the West Central Highlands of Afghanistan runs a diversion canal for a micro-hydro electric power plant that is emblematic of what's wrong, what the opportunities are and what needs to be done.

I know this because, in December 2004, lost and in a major winter storm that was settling over the Hindu Kush, I was taken in by an Afghan family who told me about it. I walked the old ditch to the penstock. Abandoned since the Soviets stripped the turbines from it, the diversion could supply a megawatt of power to the city of Bamiyan and to the thousands of rural people around it who now live in darkness when the sun leaves the sky.

On my return to Kabul, I asked the contractors responsible for bringing power to Afghanistan whether we might get the repair of the Bamiyan plant put high on their priority list

To their credit, they didn't see why not. But this Afghan micro-hydro rig is a good example of development opportunities and challenges around the world. It could sustainably bring power, critical for development, to that region of the poorest country in the world outside of Africa. However, the people with the resources to make it happen have other demands on their attention. Presidents Bush and Karzai have made a multi-million dollar deal to build a massive powerline from the north to Kabul. One government proposal calls for spending \$2.7 billion to build coal plants across the north of the country to feed more power into that tenuous line.¹⁷

The plan is flawed on several levels. Given the volatile regional security situation, and the ready availability of unexploded ordinance, it is not clear how long the line would operate. The money to build it will mostly be spent on western contractors. And any resulting power will only go to the people of Kabul and perhaps a couple of other cities, less than 20 percent of the population. Indeed around the world one quarter of all development capital goes to building large central power plants, that rarely benefit the poor.¹⁸ But such high profile projects generally do get built.

To be sure, reliable power would dramatically improve the lives of people in Kabul. Life in the capital city without electricity is hard. And costly. At present, U.S. taxpayers are spending \$4 million a month buying diesel from Pakistan to run the North Kabul Power plant, which delivers power one night out of three – for six hours, if the recipients are lucky. Most of the city (and all rural areas) that can afford it relies on small diesel generators, whose exhaust mingles with dust from unpaved roads, and the smoke from wood and charcoal that provide 85 percent of the energy in the country, to utterly foul the air of Kabul. Even a fraction of this money, diverted to enabling local businesses to begin providing solar electricity, would result in more reliable power at roughly the same cost, while building viable local

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businesses, creating jobs, reducing dependency, and cleaning the environment.

But what about the other 80 percent of the population? What about my friends outside of Bamiyan? Using outdated technology and conventional thinking rather than best practice will ensure that Afghanistan remains the 6th poorest country in the world. It will also waste the hard-won legitimacy of the Karzai government, and expose the country to the influence of warlords who are counting on Karzai to remain the “Mayor of Kabul”.

Afghanistan must rebuild everything, providing housing, energy supply, food, water, sanitation, transportation, healthcare and security. At present however, official proposals for reconstruction make little effort to use state of the art sustainability technologies, despite the fact that the more appropriate technologies work better and are better suited to poor, widely distributed populations. Instead, most of the reconstruction projects wind up using cast-off equipment and approaches from Pakistan or the West simply because they have a lower up-front cost (though they commit the operators to pay higher running costs for the life of the project) or because vendors are more familiar with them. Existing reconstruction efforts approach each problem in isolation, missing opportunities to use whole-systems design to solve multiple problems with the same resources.

Massive central station power generation options not only require millions in funding from western donors, and western contractors to install them. The plants require a steady supply of coal or oil, fossil fuels that contribute to climate change, and whose availability and cost are indeterminate. Profits from building the plants and supplying the fuel line the pockets of large western companies. When these companies leave, little local capacity will have been created to offset the enormous debt by which the country will find itself burdened. The resulting power will have to be subsidized, as the urban poor cannot afford what it would take to pay off the cost of the power plant. They use the resulting energy wastefully. Demand rises for this artificially cheap power. Ministers beg for more donor money to pay the Bechtels of the world to build ever more power plants. And my friends in Bamiyan will continue to live in the dark.

Around the world, aid money tends to create perverse versions of a welfare society, dependent on big western contractors and foreign NGO's. When the money runs out and the westerners leave, the people struggle on in poverty. Each “crisis du jour” repeats the process—money pours in to aid the afflicted people, but winds up in the pockets of developing country contractors. They deliver big power stations, conventional capital intensive water delivery systems, water treatment facilities, car based infrastructure, corporate health care models and inefficient tract housing development, approaches that are rarely best practice in the west, and are frequently wholly inappropriate to conditions in developing countries.

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This contrast between Bamiyan micro-hydro rig and the Presidentially-mandated power line from the North are a microcosm of the sorts of allocations now made in the name of international development and poverty reduction around the world. They help to explain why little poverty is alleviated and the less developed countries remain on the international dole. Kabul, the epicenter of the international development community has been transformed from the city of gardens to a traffic-choked Mecca for development mercenaries, carpet-baggers and the “White Land Cruiser Brigade”. Western contractors vie for the billions being spent for powerlines, IT infrastructure, water projects, and building booms. Property prices have been bid up to the standard of Aspen or Tokyo.

The Afghan government recently acknowledged this. In April 2005 on the eve of a donor conference in Kabul President Karzai criticized the aid community “for squandering the precious resources that Afghanistan received in aid from the international community.”¹⁹

At stake is over \$10 billion dollars already pledged by the international donor community. The Karzai government wants to control the flow of that money. The NGO’s answer that the non-profit NGO’s are the most cost effective deliverers of services and that without them the Afghan humanitarian crisis would have been far worse. Indeed Karzai praised the “good work” of those NGOs serving the country’s development and humanitarian needs.

But there is no doubt that much of the money that should be spent to leverage the creation of Afghan capacity, to build a viable local private sector, has gone into the pockets of western companies and contractors. If Afghanistan manages to put the brakes on this sort of squander, the companies will just go elsewhere – it’s hard to get staff to agree to a post in Kabul anyway, unless you pay them several hundred thousand dollars a year.

Towards a New Strategy of Development

Consider another model of development. Imagine, a world in which no family needs to burn smoky dung or wood or oil lamps for light, where wireless digital communications are available to everyone, and where women and young people have illumination to become literate, to be able to see a brighter future reflected in the solar cells that power this vision. SELCO, India, the Solar Electric Light Company,²⁰ sells solar electric panels that provide lighting and electricity to poor villagers, at monthly prices comparable to using traditional, less effective sources. Through its network of 25 centers across India, SELCO provides infrastructure solutions to underserved households and businesses. It has brought reliable, affordable, and environmentally sustainable electricity to 35,000 homes and businesses since 1995. Providing solar lighting and electricity, clean water and wireless communications, SELCO empower its customers by providing complete packages of products, services and consumer financing.

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With solar power villagers can get communication technology, clean drinking water, refrigeration, power for clinics and other development technologies. SELCO gives examples of how with the ability to light even one bulb, villagers can provide light for silk worms, for looms, and moveable lights that can go room to room as needed. This gives them the basis for an income source that enables them to begin to climb Jeff Sachs' development ladder.

SELCO's system is entirely market based. It does not require government subsidies, yet it is lifting thousands of people from poverty vastly more effectively than most of the aid programs around the world. Since 1995, SELCO's 165 employees have sold light and electricity to more than 150,000 people and built annual sales to \$3 million.

SELCO offers individual homes and businesses advanced, inexpensive lighting, electricity, water pumping, water heating, communications, computing, and entertainment. Their systems do not require connection to a larger network. SELCO meets its customers where they live, partnering with rural banks, leasing companies, and micro-finance organizations to provide the necessary credit.

The company's founder, Dr. Harish Hande, suggests that development experts rethink their definition of what poor people can afford. He argues that the poor actually spend a great deal of money on kerosene lamps, diesel for generators, and batteries for flashlights. They are capable of paying for a solar installation that would displace the more wasteful options, if institutions will lend for this at rates that they can repay. If people are told that the solar installation will cost them \$30 a month, they tend to say that it is too expensive. But if asked to pay \$1 a day, they agree, "Yes, we can do that." In the SELCO model, the purchaser pays 20% down. SELCO provides financing that enables the buyer to pay off the system in 4 years at \$10 - \$20 per month. The financing matches a person's ability to pay

Paul Polak of International Development Enterprises adds another dimension to SELCO's work. A designer of technology for people at the bottom of pyramid making he calls for the world's best designers to focus their energy of on the issues of rural poor. But he points out that design is only a quarter of the challenge. The real job is marketing, actually getting the growing number of appropriate technologies now available around the world to the people who need them, and in ways that they can afford to implement.

He cites what he calls the "Don't bother" trilogy. If you have not had conversations with at least 25 poor people about whether the design will meet their needs, if you cannot sell at least a million of the devices and if the device will not pay for itself in the first year after a poor person purchases it, don't bother.

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The poor particularly need technologies that enable them to make a living that can raise them out of poverty. Most of the rural poor live on tiny farms from which they seek to eek out a subsistence living. To produce higher value, marketable, labor intensive crops, they urgently need such technologies as affordable ways to irrigate small plots, value added processing for their produce and markets for these crops. Polak advises that the design criteria should be “the ruthless pursuit of affordability to meet their needs.” People who live on the edge are very smart, he says. They survive under conditions that would defeat westerners accustomed to a higher standard of living. But to do this they have a very high discount rate: 100% a year. Given their very high cost of capital, they readily trade off quality for low cost.²¹

This model of development starts its business planning from the bottom up. It asks how much does a farmer have to spend? What will your product do to increase an urban dweller’s income?

This has been the approach of such groups as the Intermediate Technology Development Group, which has for years worked in “hopeless” situations like the Sudan, assisting villagers to preserve food 10 fold longer through evaporative cooling, providing irrigation and energy technologies, and locally developed financing programs. It is the work of Engineers Without Borders, that brings sustainable technologies to individual villages, implementing them in conjunction with the villagers, who plan and construct the energy, water, sanitation, school or bridge projects. A heart-warming number of little groups around the world do this successfully in the most poverty stricken areas of the planet.

But such groups are rarely chosen to advise the development agencies, or to receive the massive aid contracts. What is needed is to merge the massive funding, and institutional capacity of the big donor agencies with the on-the-ground capability of the development technology groups.

My work in Afghanistan is a case in point. After 25 years of war, much of the country’s infrastructure is in ruins, or was never completed. In the wake of 9-11, the international community, recognizing the threat to world peace of a devastated Afghanistan, pledged billions of dollars to rebuild the country. This has created a unique, but narrow window of opportunity to rebuild the country using the growing body of best practice in sustainable technologies.²²

With leading international practitioners of sustainable development we are outlining a strategy to ensure that donor money can leverage the creation of local capacity, of viable, locally-owned private businesses able to sustainably meet the needs of Afghans even after the International eye has moved on.

In Afghanistan, where success is important not only to the Afghans, but a matter of American national security, it is urgent that Afghan reconstruction

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creates a robust infrastructure that delivers profitable and stable businesses as it rebuilds the entire economy.

USAID's own guidelines state, "Environmental sustainability is integral to USAID's overall goal. To meet this goal environmental considerations shall be incorporated into results planning, achieving and monitoring."²³ Little effort is being made by USAID, however, to enable local businesses to sell renewable, distributed generation, even though many American and European examples (below) show that these technologies are more reliable, and more cost effective. This may be starting to change. In spring 2005, Asian Development Bank announced a Technical Assistance program to promote the use of renewable energy.

In contrast, USAID is financing the construction of new medical clinics with no thought to insulation, solar orientation or other green building technologies that would enable the clinics to heat, cool and power themselves. Forty clinics were supposed to have been constructed, but so far only one has been completed, and with no energy budget, the doctor had to beg for a tiny diesel generator and the fuel to run it.

Conversations with the architect hired to assist this program revealed a pervasive unwillingness by U.S. contractors to implement green building practices, even though many U.S government buildings must now, by law, be constructed to these standards and doing this would enable the clinics to run more effectively and at lower cost.

Afghanistan has little money, but is rich in wind, sunshine and flowing water. Technologies using such distributed, renewable resources are the only approach that makes sense for meeting the needs of dispersed villages. A particularly appealing option is the use of biodiesel, or diesel made from vegetable oil. Sunflowers or other oil-rich crops grown to provide biodiesel would reduce the costly imports of diesel from Pakistan now used for transport and generators, and could be an alternative for farmers now growing poppies, currently 60 percent of the Afghan economy.

Renewable options are not only the best choice for developing countries; they are now the fastest growing form of energy supply around the world, and in many cases are cheaper than conventional supply. Solar thermal is outpacing all conventional energy supply technology around the world. Modern wind machines come second, delivering almost 8 gigawatts of new capacity a year, or more than nuclear power did at the peak of its popularity. The next fastest growing energy supply technology is solar electric, even at current prices.²⁴

Renewables can now be cheaper than conventional fossil fuels in market price, and are far less expensive when environmental costs are considered (estimates are that coal electricity should be priced \$0.16/kWh higher to include environmental costs; nuclear \$.09/kWh).²⁵ Just running a coal plant

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costs 5¢ to 6¢. And the wind power is free forever more, once the turbine is constructed. Solar is more expensive, although I spoke recently to an entrepreneur who states that within four years he can deliver amorphous thin-film solar at 3¢ a kilowatt hour. The company would be interested in licensing this technology to Afghans so that the panels and attendant jobs could be produced in Afghanistan. A wind company with a new type of wind machine that can be built by any competent metal fabricator is similarly interested in licensing its technology. A solar powered Internet Service Provider is very interested in bringing this business to Afghan companies. Such renewable technologies lend themselves to construction and delivery by small to medium sized enterprises, the sorts of locally owned businesses that can then go on bringing power to their country long after the development agencies and western money have gone home.

These technologies are what the best companies and communities around the world are implementing. In 1989, Sacramento California, shut down its 1,000-megawatt nuclear plant. Rather than invest in any conventional centralized fossil fuel plant, the local utility met its citizens' needs through energy efficiency, and such renewable supply technologies as wind, solar, biofuels and distributed technologies like co-generation, fuel cells, etc. In 2000 an econometric study showed that the program has increased the regional economic health by over \$180 million, compared to just running the existing nuclear plant. The utility was able to hold rates level for a decade, retaining 2,000 job in factories that would have been lost under the 80% increase in rates that just operating the power plant would have caused. The program generated 880 new jobs, and enabled the utility to pay off all of its debt. The Governor of Pennsylvania recently announced the opening of a factory to make wind machines. Creating 1,000 new jobs over the next five years, it is the biggest economic development measure for Johnstown, PA, in recent memory. The City of Chicago underwrote Spire solar to open a manufacturing plant in Chicago. The City wanted the jobs and to be able to install solar on municipal buildings. California has announced that it will spend over \$8 million installing solar in 2006, and create a \$1.5 billion investment fund to help environmentally responsible companies that are developing cutting-edge clean energy technologies. Germany recently installed a 10-megawatt solar power plant. The European Union plans to be half renewable by 2050, getting 10 percent of its electricity and 20 percent of its energy from renewables by 2010.

In January 2005 I met with officials at the Energy Ministry, including Ismail Khan, the new Minister of Energy and Water. Minister Khan has since expressed great interest in renewable energy, but lacks the consulting expertise, and has few resources with which to pursue a more appropriate energy strategy for the country. In similar conversations, the Dean of Engineering at Kabul University showed great enthusiasm for a program to train renewable energy technicians, but has no resources to undertake such a program, though the Asian Development Bank may begin to fill this gap.²⁶

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At the moment, the Engineering Department does not even have functional computers for its students.

Collectively, the array of sustainability practices such as efficient and renewable energy supplies, green building technologies, efficient water treatment and delivery systems, and sustainable approaches to providing food and health care can do a better job of meeting development needs in Afghanistan than the conventional approaches offered by the western consulting firms with whom USAID typically contracts.

Sustainable solutions are easier for local small businesses to deliver than the conventional approaches favored by USAID's usual contractors. If some of the money now going to conventional solutions were diverted to financing, training and supporting local entrepreneurs, Afghans could meet basic human needs while protecting and enhancing not only their natural capital but also their social fabric.

Afghanistan is lucky. It has money. And it has visionary men like Ali Azimi, a Senior Advisor for the Asian Development Bank, who over Christmas, went to Manila, where he secured the grant to bring solar energy, wind power and micro-hydro to Afghanistan. The ADB press release states:

The grant would demonstrate how solar energy could enhance the quality of life in poor, remote villages, which could not be connected to wider power grids.

Most of Afghanistan's population have no access to modern energy sources like electricity and gas and are forced to rely on traditional fuels like firewood. This depletes the country's forests, damaging the environment, the ADB said.

However, the country has a great potential for solar power since the sun shines for about 300 days a year in Afghanistan.

The grant would be used to provide solar systems to communities on a pilot basis and to train 10 people from different ethnic groups as solar technicians at a training centre in India.

Upon returning to Afghanistan, they would train 10 additional people from their communities.

It is hoped that solar energy systems in Afghanistan could be used to provide lighting for literacy programs, provide water for clinics and to power water pumps and irrigation systems, the bank added.

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But in the rest of the world the usual development scenario is playing itself out. I returned from Afghanistan in January 2005 to a phone call from Dr Bernard Amadei, the saintly founder of Engineers Without Borders asking, “Come with me to Washington. The Engineering Societies have asked us to come and talk about how to do the tsunami reconstruction.” Bernard,” I answered, I kind of have my hands full with Afghanistan....”

“That’s the point,” he argued, “The approach you are putting forth there is the same approach that is needed for rebuilding from the tsunami. We have the chance to do it right the first time.”

So we went to D.C. We listened to a beleaguered official from U.S. Agency for International Development, who had literally been plucked several days before from Afghanistan and flown to D.C. to marshal resources for the Indian Ocean crisis. He asked the audience to give him a week to get organized before deluging him with bids. Instead he became the epicenter of a feeding frenzy as representatives of Bearing Point, Halliburton and all the big infrastructure purveyors ignored his plea and thrust their glossy brochures upon him.

But we also convinced the U.S. Engineering societies that *their* money would be better spent with Engineers Without Borders, working village by village to bring sustainable technologies to meet basic human needs and to implement them in ways that build local capacity, and leverage the donor money to create viable local private sector, capable of delivering these services long after the world aid community has moved on to the next crisis du jour.

“The approach you are putting forth there [Afghanistan] is the same approach that is needed for rebuilding from the tsunami... we have the chance to do it right the first time.”

ENDNOTES

¹ <http://www.unmillenniumproject.org/goals/index.htm>

² ibid

³ ibid.

⁴ www.fao.org

⁵ <http://www.reliefweb.int/rw/rwb.nsf/0/66128cb39e211242c1256c530030b60e?OpenDocument>

⁶ <http://www.unicef.org/sowc05/english/statistics.html>

⁷ Jeffrey Sachs, The End of Poverty, Time Magazine, 14 Mar 2005

⁸ Bread for the World Institute (BFWI), <http://www.bread.org/>

⁹ At the first World Summit for Sustainable Development in Rio in 1992, the world's nations committed to give 0.7 percent of their GDP to "Official Direct Aid". OECD statistics (16 April 2004) show that while the U.S. is the world's largest donor of aid in absolute dollar amounts - \$16 billion in 2003, with an additional several billion pledged just for Afghanistan. But the U.S. is one of the smallest donors in percentage terms, giving only 0.14 percent of its GDP. In contrast Denmark gives 0.80 percent of GDP. That \$16 billion is only one-thirtieth of the \$500 billion that the U.S. will spend on the military in 2005.

¹⁰ Global Footprint Network <info@footprintnetwork.org>

¹¹ "Learning From China, Why the Western Economic Model Will not Work for the World", www.earth-policy.org/Updates/2005/Update46.htm, Lester R. Brown, March 9, 2005

¹² "The State of the World? It Is on the Brink of Disaster?" *The Independent UK* http://www.truthout.org/issues_05/040105EA.shtml, Wednesday 30 March 2005

¹³ What makes Pachauri's noteworthy is that he was put into his position by the Bush administration as a Chairman who would not make climate an issue. "A memorandum from Exxon to the White House in early 2001 specifically asked it to get the previous chairman, Dr. Robert Watson, the chief scientist of the World Bank, "replaced at the request of the US". The Bush administration then lobbied other countries in favour of Dr. Pachauri - whom the former vice-president Al Gore called the "let's drag our feet" candidate, and got him elected to replace Dr. Watson, a British-born naturalised American, who had repeatedly called for urgent action." Global Warming Approaching Point of No Return, Warns Leading Climate Expert By Geoffrey Lean, *The Independent on Sunday U.K.*, 23 January 2005

¹⁴ Alex Kirby, "Aid agencies' warning on climate," BBC News website, 20 Oct 2004, <http://news.bbc.co.uk/1/hi/sci/tech/3756642.stm>

¹⁵ Hargroves, K, Smith, M, 2004, *The Natural Advantage of Nations*, Earthscan, 2005

¹⁶ Hawken, P, Lovins, A. and Lovins, L. H., *Natural Capitalism*, Little Brown, 1999

¹⁷ Moh'd Humayon Qayoumi Ph.D., P.E., "Afghanistan Electricity Sector Reform: Road Map" Society of Afghan Engineers Annual meeting, Aug 2004

¹⁸ Amory's paper

¹⁹ http://www.reuters.co.in/locales/c_newsArticle.jsp::42503834:0c65e33e18629?type=worldNews&localeKey=en_IN&storyID=8070285

²⁰ <http://www.selco-intl.com/>

²¹ Personal communication, Paul Polak, Entrepreneurship education for a sustainable future, 16 March 2005

²² See Hawken, P, Lovins, A. and Lovins, L. H. (1999) *Natural Capitalism*, Little Brown; Hargroves, K, Smith, M, 2005, *The Natural Advantage of Nations*, Earthscan, '

²³ Section 204.2 of USAID guidelines: <http://www.usaid.gov/pubs/ads/500/578.pdf>

²⁴ Solar photovoltaic prices are falling rapidly. A company in California is introducing a new production process that will reduce prices to 3¢/kWh within four years. They would be interested in licensing this technology to Afghans so that the panels and attendant jobs could be produced in Afghanistan. A wind company with a new type of wind machine that can be built by any competent metal fabricator is similarly interested in licensing this

technology. A company with a solar powered Internet Service Provider is likewise very interested in doing business with Afghan companies. The world leader in biological waste water treatment is willing to go to Afghanistan and teach how to build such treatment plants.

- ²⁵ (1) Average utility costs of coal-fired electricity produced in the US are \$.05-.06/kWh whereas wind was \$.0324/kWh.
- (2) Austin Energy (TX) was charging its customers only \$.0285 for wind energy compared to \$.0280 for its "regular" electricity as of January, 2004.
- (3) In the UK, 1000 megawatts of wind was bid in 2004 at only 2.8 pence/kWh or less.
- (4) A further advantage for wind is its price stability – the federal Energy Information Administration estimates that fuel costs are about half the operating costs of coal powerplants and 90 percent of natural gas plants.
- (1) See also Carol Werner, Environmental and Energy Study Institute, "Subsidies: Historic, Current, and the Skewing of Market Signals," July, 2005, that cites a 1990 PACE study pegging external costs from coal electricity production for only SO_x, NO_x, particulate and CO₂ emissions at 2.8-6.8 cents/kWh, available from www.eesi.org. Estimates of the external environmental and social costs of gasoline usage by range from \$4.60-14.14 per gallon – see International Center for Technology Assessment, "The Real Price of Gasoline", 1999.
- (2) Coal prices from A. Lovins et al., *Small is Profitable*, Rocky Mountain Institute, 2003, p. 352. Wind prices from Randy Swisher, American Wind Energy Association, interviewed in *E Magazine*: "Randy Swisher: A Force for Wind", January-February 2005, citing an IRS study of 2003 prices due to its tracking of production tax credits.
- (3) American Wind Energy Association, Wind Web Tutorial, "Wind Energy Costs," sourced September 2005 from http://www.awea.org/faq/tutorial/wwt_costs.html. The price of wind is after production tax credit valued at 1.7 cents/kWh provided by the US federal government through 2006.
- (4) British Wind Energy Association, "BWEA Briefing Sheet: Wind and the UK's 10% Target," Nov. 2004, available from www.bwea.com.
- U.S. Department of Energy, Energy Information Administration, "Annual Energy Outlook 2005", Market Trends: Electricity Demand and Supply. Sourced September 2005 from: <http://www.eia.doe.gov/oiaf/aeo/electricity.html>.
- ²⁶ In conjunction with Bernard Amadei of Engineers Without Borders, I am working to bring a renewable energy training program to the University of Kabul, along with a curriculum in other sustainable technologies.