Eco-friendlily Yours: The way forward*

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"The nation behaves well if it treats resources as assets which it must turn over to the next generation increased, and not impaired, in value."

Theodore Roosevelt, 1910, 26th U.S. President.

"When the wind rises, some people build walls. Others build windmills."

Chinese proverb.

The Environment

When it comes to the environment, everyone owns, and therefore no one owns. As a result, everyone has an "incentive" to pollute, to use the free disposal system that is available and let someone else downstream or downwind, or someone in the future bear the cost of cleaning up. Capitalism cannot deal with pollution because it cannot establish the ownership rights to clean the environment. Therefore, it is only through some form of mutual understanding, such as government regulation and collective efforts, that such ruinous acts can be controlled.[1]

In any mention of environmental issues, two countries almost cannot avoid being mentioned in the same breath: China and India, or we shall just call that huge landmass Chindia. These two countries are developing fast, and are expected to emit vast amounts of carbon into the air. Southeast Asia, being composed of nations of much smaller sizes—population-wise and landmass-wise—pollutes in different ways, such as deforestation.

Deforestation, during which carbon stored in trees is released into the atmosphere, now accounts for 20% of the world's greenhouse gas (GHG) emissions. And Indonesia releases more carbon dioxide (CO_2) through deforestation than any other country. Within Indonesia, the situation is most critical in Riau, which is roughly the size of Switzerland. In the past decade, more than 60% of the province's forests have been logged, burned and pulped due to generous government concessions to log and establish palm oil plantations. The rate of this deforestation is rising as oil prices reach new highs, leading more industries to turn to biodiesel made from palm oil, which, in theory, is eco-friendly. But its use is causing more harm than good because companies slash and burn huge swaths of trees to make way for palm oil plantations. (See Figure 1).

Chopping down and burning trees contribute some eight billion tons of CO_2 to the atmosphere each year. That is a huge amount, more than 16% of the total human GHG emissions—more than comes from either agriculture or transportation. And yet it is largely unnecessary. "Unnecessarily" destroying forests is probably one of the maddest forms of interfering with the climate that we humans have yet devised.

But it is also in Riau that a new global strategy for conserving forests in developing countries might begin. A small area of Riau's remaining forest will become a test case if an international carbon-trading plan called REDD—Reducing Emissions from Deforestation and Forest Degradation —is adopted.

*This article is based on a forthcoming book in Hal's series of "Yours" books: Hwa A. Lim, Eco-friendlily Yours: Energy, biofuels, green and clean technologies, (2010, eBook), and references therein.

Figure 1. Deforesting is critical in the Riau province, 60% of the forests have been logged. (Right) The vicinity of Kuala Lumpur, the capital city of Malaysia, veiled in smog formed from debris of deforestation fires in Indonesia that got swept into Malaysia across the Straits of Malacca. The government of Malaysia declared it unsafe to stay outdoors for unnecessarily long durations, and schools in affected areas were closed. This photograph was taken when the author was driven from the site of his lecture at a chamber of commerce to his hotel. (Source: Hal archive. August 2006).

REDD would involve payments by wealthy countries to developing countries for every hectare of forest they do not cut down. Indonesia, caught between its own financial interest in the palm oil industry and the growing international demands for conservation, has been promoting the carbon-trading plan.

But there are plenty of skeptics, who doubt it will be possible to measure just how much carbon is being conserved, and who question whether the lands involved can be protected from illegal logging and corruption.[2]

Carbon Footprint

A new concept has thus entered the lexicon of environmentalism: the carbon footprint.

In Table 1 is a number that will help you put all those carbon footprints in perspective. The U.S. emits the equivalent of about 118 pounds of CO_2 per resident everyday, a figure that includes emissions from industry. Annually, that is nearly 20 metric tons per American—about five times the number per citizen of the world at large.

With the awareness of carbon footprint, for manufacturers it means that at one point it was *organic*, then came *fair trade*. Now manufacturers of everything from milk to cars are starting to tally up the *carbon footprints* of their products. That is the amount of CO_2 and other greenhouse gases (GHGs) that get coughed into the air when the goods are made, shipped and stored, and then used by consumers.

Country	Tons per Capita
Qatar	48.32
Australia	19.02
U.S.	19.00
Canada	16.52
Germany	10.00
Japan	9.49
U.K.	8.86
France	5.97
China	4.27
Mexico	3.97
India	1.13
World	4.2

Table 1. A sampling of various nations' CO_2 emission from fossil fuel combustion., in annual tons per capita. The emission includes CO_2 emission from fossil fuel combustion throughout each economy, including industry. The figures are from year 2006. (Adapted from International Energy Agency).

So far, these efforts raise as many questions as they answer. Different companies are counting their products' carbon footprints differently, making it all but impossible for shoppers to compare goods for the *good* of carbon footprint. And even if consumers come to understand the numbers, they might not like what they find out. For instance, many products' global-warming impact depends less on how they are made than on how they are used. That means the easiest way to cut carbon emissions may be to buy less of a product or use it in a way that is less convenient.[3]

Let us take a closer look at the ubiquitous car and the consumable milk to highlight two of the aforementioned points—ambiguities in carbon footprint estimates and the way of use to reduce carbon footprint.

Cars

The simplest statistic in the carbon-footprinting game of the car may be this: For every mile it travels, the average car in the U.S. emits about one pound of CO_2. Given typical driving distances and fuel-economy numbers, that translates into about five tons of CO_2 per car per year.

A study by the University of Michigan's Center for Sustainable Systems found that, over its expected 120,000-mile life, an American-made mid-size sedan emits the equivalent of about 63 tons of CO_2. That number includes all emissions, from the making of the car's raw materials, such as steel and plastic, through to the shredding of the car once it is junked.

The vast majority of those emissions—86%—came from the car's fuel use. Just 4% of emissions came from making and assembling the car. That means consumers can lower their footprint by buying a car with better fuel economy, such as a Toyota instead of a SUV; or use the car less.

Milk

Several studies of milk's carbon footprint are under way in the U.S. Each has come up with a different number, largely because each is counting things differently.

A recent study by National Dairy Holdings, a Dallas-based dairy, found that the carbon footprint of a gallon of its milk in a plastic jug is either 6.19 pounds or 7.59 pounds. The difference rests in what kind of cases the jugs are placed in during transport from the milk-processing plant to the distribution center. Plastic cases, because they take more energy to produce, yield more CO_2 emissions than do cardboard ones.

But National Dairy Holdings' study does not count all the emissions created by a gallon of milk. It includes those from the cows themselves (more than half of the total), from the processing of the milk and from the transport of the milk to a distribution center. It does not count the emissions earlier in the process: growing the cows' feed. Nor does it count the emissions later in the process: transporting the milk from the distribution center to the store and refrigerating it there.

Aurora Dairy Corp.'s Aurora Organic Dairy, a small organic-milk producer based in Boulder, Colorado, is finishing a more-complete study of the carbon footprint of its milk. Its study, done by researchers at the same University of Michigan's Center for Sustainable Systems, attempts to include emissions all the way from growing the cattle feed to refrigerating the processed milk in the store. The preliminary findings are that producing a half-gallon of Aurora's milk generates the equivalent of 7.2 pounds of CO_2. That is essentially the same amount as the National Dairy Holdings study concluded for an entire gallon of its milk. But the National Dairy Holdings study left out much of the process that the Aurora study included.

Both studies found that the single biggest chunk of emissions from milk production comes from all that action in the cow's gut—the complex anaerobic (without oxygen) methane-producing system in the ruminant.[4]

The above examples amply demonstrate that a consensus in counting carbon footprint is still lacking. This leaves quite a lot of room for interpretation, sometimes to the point of being contentious, as the following example from international trade illustrates.

Biofuel

Touted as a eco-friendly substitute for coal and oil, biofuels—which include ethanol made from corn or sugarcane and biodiesel made from soybean, rapeseed and oil palm—cut down emissions of GHGs, which contribute to global warming. However, the high-energy cost of making biofuels, expansion of farmland to grow biofuel crops, and fears over soaring food prices have dampened enthusiasm over vegetable oils as substitutes for fossil fuels.

Oil palm is still grown on peat forests although it is known to be unsuitable for agriculture, because the land can often be had for free or cheaply. Plus, loggers can harvest the timber first. "Peatlands are the world's most important natural sinks and stores of carbon. But when peatlands are drained for cultivation, the peat dries up and breaks down, releasing stored carbon into the atmosphere. This offsets any benefit derived from using palm biofuel," says wetlands scientist Faizal Parish, director of Global Environment Centre.

In the case of palm diesel, European consumers have pressured their governments to not import the biofuel for fear that oil palm farming will accelerate deforestation and destroy habitat for wildlife such the orangutan. There are also studies showing that biodiesel derived from crops grown on peat forests adds to - not reduces - CO_2 emissions.

The European Union (EU) has said that it will only use sustainably produced feedstock for biofuel. Thus European consumers are also demanding "carbon neutral" biofuels—which means that even their processing and transportation must not be adverse to the environment. With the eco-friendliness of palm diesel in doubt, the European Commission is eyeing other greener biofuels, including "second generation" ones such as renewable synthetic natural gas and hydrogen-based solutions.[5]

Some in the palm oil sector insist that the ecological concerns are misplaced and a guise for trade protectionism to safeguard local seed oil production. Land cultivated with oil palm in Malaysia, for example, grew from 0.64 million ha (1 hectare (ha) is 10,000 square meters) in 1975 to one million ha in 1980 to the current 4.16 million ha. The Plantation Industries and Commodities Ministry insists that the expansion occurred in logged forest and in cocoa and rubber

Figure 2. Jatropha is not edible, but is laden with oil. It is a hardy perennial shrub and may be cultivated almost anywhere. (Right) The nuts are more than 30% oil, which burns with a clear flame.

plantations in their second or third planting cycle. The industry is aiming to produce more on less land by improving yields.

But environmentalists still eschew the whole biofuel idea, saying it does not discourage driving and its production leads to other social and environmental impacts, including rising food prices and pollution. Some ethanol plants in the U.S., for instance, run on natural gas and coal, hence offsetting any cuts in CO_2 production resulting from biofuel use. What is needed, they argue, is simply a drastic reduction in the consumption of energy or to make fuel from non-food crops and agricultural waste.

An example of the latter is the biomass cogeneration plant (the physical plant, not the green kind) in Tuas, Singapore. Singapore is producing 1,000 to 1,500 tonnes of waste wood, including horticulture waste, everyday. The end goal is to have a perpetual business that will get rid of all the waste and at the same time doing it in such a way that it will make business sense—by turning wood waste into fuel chips.[6]

Waste is a relatively small contributor to emissions at around 1.2 billion tons CO_2eq (carbon dioxide equivalent) per year, which is just a few percent of the global total. Still, it is also easily reduced. Most of the emissions come in the form of methane from landfill sites. The methane is relatively straightforward to capture and can often be used to generate electricity. Even more important, though, are the indirect emissions from waste, which are much harder to quantify, but likely to be very substantial.

Non-food plants with possibilities include jatropha and switchgrass; both are perennial plants tolerant of many soil types. Some oil-containing algae are also promising options.[7]

The flowering bush of jatropha, native to Central America, has long been used as live fencing and/or to prevent soil erosion in dry regions around the world. But it is the deadly black nuts that have caught the attention of scientists who say that it could help produce bio-diesel. The nuts are more than 30% oil, which burns with a clear flame, producing a fraction of the emissions of traditional diesel. As a bonus, the oil can be used in simple diesel engines without refining, just by mixing it with fuel. Residue from the pressed nuts can also be burned for fuel: cake from 2,000 acres (800 hectares) of pressed nuts could power a one-megawatt electricity plant. (See Figure 2).

Food Fuel Feud—The F³ Issue

With vegetable oils finding a new use as car fuel, we may end up facing a food shortage or paying more for food. Soaring demand for corn, sugarcane, rapeseed and palm oil to make biofuels has driven up prices of these crops, and that of food made from them.

In January 2007, Mexicans took to the streets when the price of tortillas tripled to 15 pesos (RM4.90) a kg because of soaring corn prices. The Government intervened and capped prices. Brazil, the world's largest exporter of sugar, converts half of its crop into ethanol for cars, contributing to a doubling of the world sugar price over the past two years. The U.S. Department of Agriculture (USDA) in April 2007 warned that record high corn prices, caused in part by the crop's diversion into ethanol production, is likely to produce a sudden drop in the supply of meat. The U.S. accounts for 40% of global corn harvests, thus higher corn prices there will send ripples worldwide.

Lester Brown, a well-respected conservationist and president of the Washington-based Earth Policy Institute, probably sums up the F³ situation best: the grain required to fill a SUV (sports utility vehicle) tank with ethanol could feed one person for a year. This will set up a global competition between rich car users and poor food consumers.

The Way Forward

If such is the case—F³ issues and environmental damage—why is the world still so energy-hungry? The answer is productivity boosts wealth. (See Figure 3).

The world's industrialized countries gained their wealth and advanced state of development

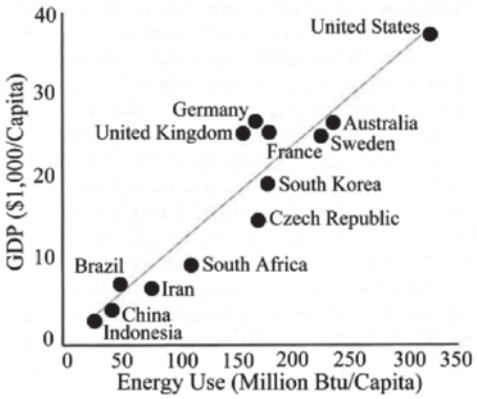

Figure 3. The more energy a nation uses, the richer it gets. Powered machines boost productivity, which boosts wealth. (Source: CIA World Factbook).

largely by exploiting cheap fossil fuels at an early stage; now developing countries are trying to catch up. There is no reason to deprive the latter of opportunities to become industrialized and wealthy nations. Ultimately, when the tide rises, every country—Asian, African, Latin American—has to rise with the boat. In fact, many of the unnecessary wars in different parts of the world are a direct/indirect consequence of poverty. To be able to catch up, they need energy—and often lots of it—to power their country.

Tackling environmental change will thus require the cooperation of the entire world, but some countries will play a greater role than others. In particular, the most important changes will need to come from two sets of players: the industrialized world, which has the richest economy and bears the greatest historical responsibility for the emissions to date; and the handful of most rapidly developing countries that are likely to contribute the most to future rises in emissions as they play catch up.[8]

Perhaps it is human nature to forget what has gone before and focus on what is to come, or perhaps it is a convenient escape for those who live in industrialized countries. Either way, the latest fashion in the industrialized world is to declare that there is no point in reducing emission since any reduction will be swamped by the vast increases to come in rapidly developing countries such as China and India (Chindia).

It is true that these countries are responsible for most of the recent spurt in GHG emissions, and that they make up a substantial proportion of the global total. However, most of them are also acutely aware of the dangers likely to come from climate change. In fact, these countries are already going to great efforts to deal with their emissions, often under very difficult circumstances.

Very importantly, these countries tend to produce only very small amounts of GHG per individual citizen and have been responsible for very little of the current concentrations of GHGs in the atmosphere (See also Table 1). Unfortunately, in the prevailing heightened awareness of eco-friendliness and cutthroat global competition, a common thread among them is their development needs tend to swamp all other political and economic considerations.

Green Dragon—Wind-win Situation

As the U.S. takes its first steps toward mandating that power companies generate more electricity from renewable sources, China already has a similar requirement and has been investing billions to remake itself into a green energy superpower.

Through a combination of carrots and sticks, Beijing is starting to change how the country generates energy. Although coal remains the biggest energy source and is almost certain to stay that way, the rise of renewable energy, especially wind power, is helping to slow China's steep growth in emissions of global warming gases.

While the U.S. House of Representatives approved in July 2009 a requirement that American utilities generate more of their power from renewable sources of energy, China had imposed such a requirement almost two years earlier. In 2009, China surpassed the U.S. as the world's largest market for wind turbines—after doubling wind power capacity in each of the four years prior. (See Figure 4).

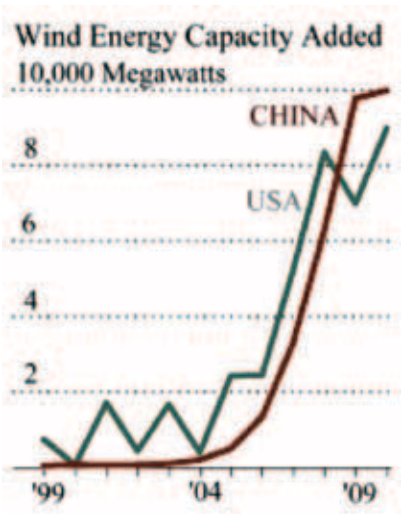

Figure 4. China is surpassing the U.S. in total installations of wind turbines.
(Source: Global Wind Energy Council).

State-owned power companies are also competing to see which can build solar plants fastest, though these projects are much smaller than the wind projects. And other green energy projects, like burning farm waste to generate electricity, are also sprouting up.

An exemplary case is an oasis town deep in the Gobi Desert, Dunhuang, along the famed Silk Road and the surrounding wilderness of beige sand dunes and vast gravel wastelands. It has become a center of China's drive to lead the world in wind and solar energy. (See Figure 5).

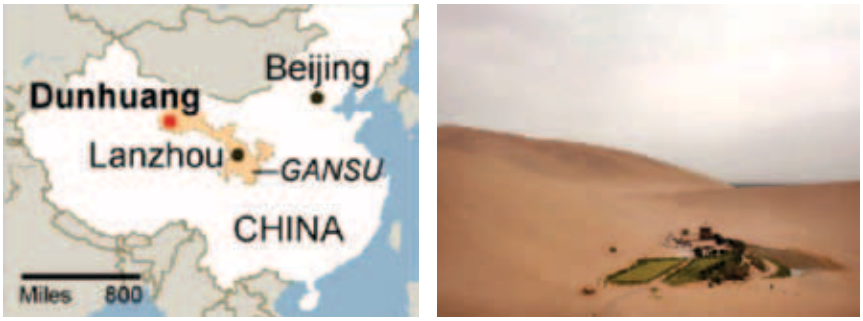

Figure 5. One of the largest wind farms in the world is being built in this arid part of China. (Right) Dunhuang, an oasis town in the Gobi Desert, has become a center of China's wind and solar energy.

A series of projects is under construction on this nearly lifeless plateau to the southeast of Dunhuang, including one of six immense wind power projects now being built around China, each with the capacity of more than 16 large coal-fired power plants. Each of the six projects totally dwarfs anything else, anywhere else in the world.

China will invest more money in renewable energy and nuclear power between now and 2020 than in coal-fired and oil-fired electricity. But that does not mean that China will become a green giant overnight. For one thing, Chinese power consumption is expected to rise steadily over the next decade as 720 million rural Chinese begin acquiring the air-conditioners and other power-hungry amenities already common among China's 606 million city dwellers.

As recently as the start of 2009, the Chinese government's target was to have 5,000 megawatts of wind power installed by the end of 2010, or the equivalent of eight big coal-fired power plants, a tiny proportion of China's energy usage and a pittance at a time when China was building close to two coal-fired plants a week.

But in March of 2008, as power companies began accelerating construction of wind turbines, the government issued a forecast that 10,000 megawatts would actually be installed by the end of 2010. And just 15 months later, with construction of coal-fired plants having slowed to one a week and still falling, China would have 30,000 megawatts of wind energy by the end of 2010—which was previously the target for 2020.

A big impetus was the government's requirement, issued in September 2007, that large power companies generate at least 3% of their electricity by the end of 2010 from renewable sources; 8% by the end of 2020. The calculation excludes hydroelectric power, which already accounts for 21% of Chinese power, and nuclear power, which accounts for 1.1%.

In comparison, the House bill in the U.S. resembles China's approach in imposing a renewable energy standard on large electricity providers. But the details make it hard to compare standards. The U.S. House bill requires large electricity providers in the U.S. to derive at least 15% of their energy by 2020 from a combination of energy savings and renewable energy—including hydroelectric dams built since 1992.

There is also a distinction between China and the U.S.: Chinese power companies are eager to invest in renewable energy not just because of the government's mandates, but also because they are flush with cash and state-owned banks are eager to lend them more money. And there are few regulatory hurdles.[9]

India

The Indian Federal Planning Commission set up an expert committee to study and recommend measures to promote the development of biofuels. The committee suggested the government launch a nationwide biofuels mission with a special focus on encouraging the plantation of jatropha and karanj.

The Indian national fuel mission would be launched in two phases: Under the first phase that would be a demonstration phase, jatropha and karanj plantation would be undertaken in 400,000 ha of government-owned land. In the second phase, jatropha would be planted in 11.2 million ha of both the government and private land to increase the production of biodiesel. The mission aims to achieve a target of 20% blending of biofuels with gasoline and diesel.

India has in place a program for sugarcane-based ethanol, but it has done little to develop other sources of renewable energy such as biodiesel, for which the country has a large potential. The federal government recently invited the sugar industry to participate in the programs it plans to launch for the promotion of biofuels. Responding to the government's call, the sugar industry, particularly in the southern parts of the country, organized seminars to raise awareness of the importance of jatropha plantation and its contribution to the country's much-desired goal of energy security.

Notwithstanding the government's plan of action for the biofuel sector, India still lacks

a national biofuels policy. If such a policy is put in place, it could help to resolve the disparity in prices of biofuels. Private players who want to pump money into the domestic biofuels sector are apprehensive because the rates set by government-controlled oil companies for the delivery of biofuels are low. The rate fixed by the oil companies is more than 50 cents.[10]

Who Pays

The world's major industrialized countries will clearly need to take the lead in tackling climate change. Together they have been responsible for almost all of the current climate problem. These are the countries that bear the brunt of collective responsibility for climate change. In 2004, the combined emissions of developing and least developed economies (which comprise some 80% of the world's population) accounted for 73% of emission growth but still only 41% of total global emission, and just 23% of cumulative emissions since the mid-18th century.

Most analysts agree that the burden of payment should fall most heavily on the world's richest countries, which are not only in the best position to pay but have also been, historically, the main cause of the greenhouse problem. All have embraced this responsibility in principle. Most, but not all, have begun to act.

But the cost will not fall evenly. There is an irony associated with the greenhouse problem: solutions that actually save money (such as insulating homes) tend to fall on the rich nations, whereas the solutions that cost the most (such as capturing carbon from Indian or Chinese power plants or preventing deforestation in Brazil or Indonesia) fall on the poorer nations, who have done the least to create the problem in the first place. Any arrangement for who pays, and how, will have to ensure that money from the richer nations passes effectively to the poorer ones, especially targeted toward cutting emission in the most economically efficient way possible.

In principle, the cap-and-trade scheme allows funds to be transferred between nations. The "cap" part is that every participant in the scheme has a limit on how much it can emit in a given year. The participants are then awarded a set of permits equal to that cap. The "trade" part is that anyone going over that limit can buy permits from anyone who has emissions to spare.

That is the principle of the cap-and-trade scheme. But in practice, we need to go further to ensure that money flows from rich countries to poorer ones. This is the only way to encourage developing countries to leapfrog the old, bad polluting habits of the industrial world and invest directly in low-carbon habits instead—which is something the entire world needs them to do.

Since the air does not care where the GHGs come from, developing nations is where the cheapest and easiest opportunities are to make a difference.

Social Network

The world's population currently stands at more than 6 billion. By the middle of the century there will be more than 9.5 billion. Even without the problem of climate change we would be finding our resources running thin; with it, the population boom becomes even graver.

Thinking this way presents the human race as one massive blob. But in fact, it is as individuals that we live our lives and make our choices, from such activities as switching on a light, to driving around, sometimes needlessly. Choices like these have driven the world's economies ever upward in the 20th century. They have also led to spiraling greenhouse emissions. Now we, the individuals, will all have to adapt our choices to the new realities of the 21st century.

It is easy to believe that global warming is somebody else's problem. Other people—those already in existence or those in the future—will suffer and other people will come up with the solution. However, this is far from the truth. *Global* warming is a truly *global* problem. None of us is safe from the effects, although some of us have a better chance of adapting to them. We are all part of the problem, and each of us will need to be part of the solution.

Let us learn something from Web 2.0—the power of social network. On Skype, people can make free or low cost calls in exchange for sharing some of their personal bandwidth to help others make calls. This idea is similar to someone generating power for his home with solar roof panels and selling what he does not need back to the grid. With Skype, it is a highly competitive market, but its founders Janus Friis and Niklas Zennström have proven they got community. In today's power-to-the-people (power of the authority type) Web era, that makes them a force that cannot be ignored; in today's power-to-the-industrialized (power of the energy type) eco-friendly era, the community is not a force to be ignored, either. Indeed, if you think about it, the Web community is a subset of the eco-community, since not everyone is a Web surfer! Now it is evident that which power—eco-power or Web-power—is more powerful if it is properly unleashed?

We, the People

We have discussed how much of the answer of the problem of environmental change will need to come from the top down, from governments, industries, and major international agreements. But none of this will happen unless we, the people, push from below. Through the choices we make about more or less every aspect of our personal lives: we can drive producers and manufacturers along sustainable pathways, exercise our choice in our ballots in elections, and lead eco-friendly lifestyle. We are the ones who have the power to change.

So in "The Power of Green", Thomas L. Friedman, in referring to the candidates in the U.S. 2008 presidential election, said, "That's why I say: we don't just need the first black president [referring to Barack Obama]. We need the first green president. We don't just need the first woman president [referring to Hillary Clinton]. We need the first environmental president. We don't just need a president who has been toughened by years as a prisoner of war [referring John McCain] but a president who is tough enough to level with the American people about the profound economic, geopolitical and climate threats posed by our addiction to oil—and to offer a real plan to reduce our dependence on fossil fuels."[11]

In this eco-friendly era, renewable energy sources are getting a lot of attention as a way to reduce the impact of energy use on the environment. Nonetheless, even enthusiastic supporters of alternative energy agree that energy efficiency is the "low-hanging fruit" in reducing GHG emissions and avoiding looming energy shortages. These eco-fficiency efforts may start in power companies, energy consumers like international and government organizations, all the way down to the individual people.[12]

Many of the measures we, the individuals, need to take—such as making our homes more energy-efficient—seem familiar, but together these choices add up to something momentous. And with social networks, we can spread eco-fficiency awareness very effectively, and stay informed. It needn't be emphasized that even in social networks, we the people make up the members of the network. Together, this eco-fficiency awareness and information flow will bring about nothing less than a global change in culture, and the consequence is global energy conservation.

Until now we have all treated energy as something that is almost free and infinitely available. The U.S. goes to wars to defend it, and in the process of spreading military footprint, creates carbon footprint in its wake.

We wasted resources and ignored the perils of digging ever deeper into our planet's capital. We got ourselves into where we are now. To pull ourselves out of this mess we will all need to change our attitude and realize how precious our energy resources really are.

See what happened in the April 20, 2010 BP Deepwater Horizon explosion? It is a mile underwater, 50 miles from shore, where successive efforts involving containment domes, "top kill", "junk shots" failed, and ten of thousands (~60,000) of barrels of oil hemorrhaged into the Gulf of Mexico, each day! Think of the ecological effects to come.

BP, which had dropped its original name "British Petroleum" and switched to the tagline "Beyond Petroleum", is now "Bad Petroleum" with a $20 billion escrow account to help oil spill victims. ■

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Hal has served as a bioinformatics expert for the United Nations, a review panelist for the U.S. National Cancer Institute, and as an expert consultant for McKinsey, Prudential, VAXA, Eli Lilly and Company, Monsanto and Company, Dupont CR&D, and Robertson Stephens. He was appointed a member of the International Expert Panel for BioValley Malaysia in March 2004.

His career started with short stints at the Strong Memorial Hospital, New York, then at the Laboratory for Laser Energetics (LLE) at the University of Rochester, and later computational work using computers at the John von Newmann Center at Princeton University. In 1995, he advanced his career to California after having been at Florida State University as a tenured faculty and program director for eight years. In May 1996, he was on the BioMass Panel organized by the American Association Advancement of Science (AAAS) at Stanford University.

Hal currently resides in Santa Clara, "The Heart of Silicon Valley"[SM], California, USA, which has one of the highest concentrations of high-tech companies in the world.

The author Dr. Hwa A. Lim, listening and in deep thoughts while consulting with then Malaysian Palm Oil Board chairman, Tan Sri Dr. Yusof Basiron at the Tan Sri's office. (Hal Archives, Kajang, Malaysia, 2004).