B計劃解救星球的危急與文明的困境

Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble

培德女高學生聯合報告 2006年6月10日於萬佛聖城大殿

TALKS GIVEN IN THE BUDDHA HALL BY DEVELOPING VIRTUE SECONDARY SCHOOL
BASED ON LESTER BROWN'S BOOK *PLAN B 2.0: RESCUING A PLANET UNDER STRESS AND A CIVILIZATION IN TROUBLE*
ON JUNE 10, 2006

解救地球的危急 / 陳嘉凡 講譯

現在要和大家分享一些令人憂心的事實，這些事實是人類正迅速地毀滅地球。第一個事實是森林急速萎縮以及我們必須付出的代價。人類大量砍伐木材，所造成的洪水氾濫和土石流，奪走了無數的生命。在十二紀初，地球上的森林面積大約五十億公頃，到目前爲止只剩下39億公頃。從1990年開始，開發中國家砍伐木材的速度是一年1300萬公頃，平均每10年損失6%的森林。雖然人類已經在努力重新造林，但熱帶雨林極難重建，摧毀之後成爲荒地。

建築和燃燒用的木材以及紙類用品的需求量一直在增長，而2003年全球砍伐的334萬立方米的木材，一半以上都當成了燃燒的材料，這個事實嚴重的危及森林的存在以及地球上的生態。因爲森林每天放出上百萬公升的水氣到大氣層裏，這些水氣轉換成夏季的雨量，灌溉地球上的糧作，當森林失去時，雨量大爲減少，糧作也跟著減產。

第二個事實就是土壤的流失。地球表面薄薄的一層土壤，經過上億年才得以形成。這些土壤滋長植物，植物也相對的幫助土壤不致受侵蝕。不幸的是地球上，生長穀物的表土，有1/3以上在快速的流失，遠超過土壤新生的速度，使土地生產率降低。因土壤迅速減少，穀物植物無法生長，這對我們不利。全世界有1/5的土地是乾燥、陡峭、貧

Rescue the Earth Under Stress

GIVEN AND TRANSLATED BY YVONNE CHEN

What I'm going to share is some very disturbing and worrisome facts, the facts that we are rapidly destroying our planet, the Earth. The first fact is the shrinking forests and the price we have to pay for it. Tree cutting is followed by several severe flooding and heavy loss of life of man's lives. At the beginning of 12 century, the Earth's forested areas were estimated at 5 billion hectares. Since then it has shrunk to 3.9 billion hectares. Since 1990, the forests lost in developing countries have averaged 13 millions hectares a year. Overall the developing world is losing 6% of its forests per decade. Despite the fact that people are restoring forests, tropical forests that are cleared rarely recovered and become wastelands.

The use of firewood, paper and lumber are expanding. Of 3.34 million cubic meters of wood harvested worldwide in the year 2003, over half was used for fuel. Logging for lumber affects the forest greatly. Collectively, the forest pumps millions of liters of water daily to the atmosphere. The evapotranspiration translates into summer rainfall, helping to sustain crops. When the forests disappear, this rainfall declines and so do crop yields.

The second fact is the loss of soil. The thin layer of topsoil that covers the planet's land surface took eons to accumulate. Soil provides the medium in which plants can grow. In exchange, plants help protect the soil from erosion. A third or more of all cropland is losing soil faster than new soil is forming, which reduces land productivity. With soil decreasing so rapidly, crops and plants will be unable to grow on the land and we will be handicapped. Rangelands, which are too dry, too steep, or not fertile enough to sustain crop production, constitute about one-fifth of the land's surface. It supports the world's 3.2 billion cattle, sheep, and goats. These animals are destroying the land's productive vegetation. The wind then removes the soil and converts the once productive rangelands into deserts.

瘠的畜牧用地。但是全球32億的牛群、羊群卻靠這些土地上的雜草生存，導致這些畜牧用地的雜草，被牛羊漸漸吃掉，接著風吹走土壤，畜牧用地成了沙漠。

第三個事實是漁業的衰退。海洋漁獲量從1950年的一千九百萬噸，在1997年飆高到九千三百萬噸，而今天世界上75%的捕漁公司，都維持或超過了捕魚限量。隨著世界海鮮需求量的增加，增加海洋捕魚量，已經供不應求。唯有增加養殖漁場，如此一來也會因爲要消耗魚的飼料而給自然資源帶來更大的壓力。

第四個事實是動植物的消失。我們現在已經進入地球第六個大絕種時期；與前五個大絕種時期最大的不同是，這次並非自然現象，而是來自人爲。全球近一萬種鳥類中的12%，4776種哺乳動物的23%以及各類魚種的46%，已經瀕臨絕種了，這些都是因爲人類的汙染環境、過度捕殺或過度開發動物棲息處所造成。

所以看到這些令人心驚的事實，不能不相信人類在親手毀滅地球。而我們唯一的希望就是盡力去推廣素食、不殺生、資源回收與保護森林，那麼大地與人類才能有機會生存。

超越石油的巔峰

何心安 講 / 秦頡菱 中譯

石油是塑造我們廿一世紀的主要要素之一，我們從農業社會到工業社會各方面上都必須依賴石油的存在。當石油產量到達巔峰，也就是說產量開始降低，甚至停止時，世界就必須面對許多新的災害，而那時的世界就不會是現在的世界了。但不幸的是，我們正向那樣的世界邁進。

世界上共有23個領先的石油國家，其中有15個國家已經到達產量的巔峰，而其餘的八個國家也接近產量巔峰了。例如美國和委內瑞拉都已在1970年達到了巔峰，而英國以及挪威各在1999和2000年。這八個接近石油產量巔峰的國家有沙烏地阿拉伯、俄羅斯、加拿大、哈薩克斯坦、阿爾及利亞、安哥拉、中國和墨西哥。其中沙烏地阿拉伯在2005年生產了一千一百萬桶的油，俄羅斯也生產了九百萬桶。

The third fact is the collapse of fisheries. The amount of oceanic fish caught climbed from 19 million tons in 1950 to the peak of 93 million tons in 1997. Today, 75 percent of fisheries are being fished at or beyond their sustainable capacity. The growing worldwide demand for seafood can no longer be satisfied by expanding the oceanic fish catch. If it is to be satisfied, it will be by expanding fish farming. However, once fish are put into cages, they will have to be fed, which will put even more pressure on resources.

The fourth fact is the disappearance of plants and animals. We are now in the early stage of the sixth great extinction. However, unlike the five before this, this extinction is caused not by natural events, but by humans. Twelve percent of the world's nearly 100,000 bird species, 23 percent of the world's 4,776 mammal species, and 46 percent of the world's fish species are vulnerable to extinction. The threat to these species comes from environmental pollution, overharvesting, and overdeveloping habitats.

We have to believe from the above facts that mankind is leading the earth to an end. The only hope is to put every effort into promoting vegetarianism, stopping killing, recycling, and protecting our forests. Thus, the ozone layer will be improved and the climate will be stabilized. Our mother earth, and we as human beings, will then have a chance to survive.

Beyond the Oil Peak

BY JULIA HA /CHINESE TRANSLATED BY CLAIRE CHIN

Oil has been one of the key components shaping our twenty-first century and our society relies on oil for everything from agriculture to industry. When oil production peaks, or in other words slows down or even stops, the world will have to face many new and disastrous obstacles and the world will not be the way it is today. Unfortunately, that new world is where we are headed.

There are 23 leading oil producers in the world and oil has peaked in 15 of them and eight countries are nearing peak oil. Some examples of post-peak countries are the United States, Venezuela, the United Kingdom, and Norway, peaking in 1970, 1970, 1999, and 2000, respectively. The eight pre-peak countries are Saudi Arabia, which produced 11 million barrels of oil in 2005, Russia which produced 9 million barrels, Canada, Kazakhstan, Algeria, Angola, China, and Mexico.

What is worse is that many oil production companies such as Royal Dutch/Shell, Chevron Texaco, and Conoco-Phillips, reported that in 2004 they produced more oil than they

更糟糕的是，許多石油公司表示，在２００４年他們的生產量比開發量要多，這表示石油越來越難發掘了。有人預測說，世界上只剩下百分之五的石油尚未被開發。好比說，地質學家華特・楊魁斯說在２００４年，世界生產了三百零五億桶的石油，不過卻只發現了七十五億桶的新石油。

石油產量的減少，將對今日社會食物產業造成無法想像的影響。舉例來說，計畫Ｂ的作者萊斯特・布朗說美國五分之四的食物系統所耗能源都使用在運輸、處理、包裝、行銷以及廚房的準備，也據說美國食品業使用的能源相當於法國整個經濟體所使用的能源。

所以，沒有充分的油，不用提全球的食品業，單美國食物業如何生存？此外，主要的糧作像是小麥和玉米都必須經由長時間的船運來到達目的地，而新鮮的蔬果都傾向於空運；所以沒有足夠的燃料，我們又如何能使用飛機和船來繼續運輸呢？從上所說，我們的結論是爲了長久的生計，人們必須改善飲食習慣，購買更多本地生長的農作物，因爲每天要運輸全世界的蔬果糧食簡直是不太可能的；隨著石油價格上漲影響了農產品的成本，因此，食物的價格也將變得更加昂貴。

當石油即將用盡的時候，城市的生活水準將面臨急速提高。例如城市直接受到極大的影響，而遷居郊區的生活，尤其是設計不佳的郊區更是面臨慘境。住在偏遠郊區的人，他們距離工作和購物的地方，往往相隔甚遠；也就是說他們需要開長路去上班工作和購買日用所需。那麼在石油短缺造成油價高漲的時候，他們就勢必尋找其他的交通方式。

國際能源總署和美國能源部門顯示，目前在一天之內，世界就需要用到八千四百萬桶的石油。但是三十年之後，就是在２０３０年，需要量將會升到一億兩千萬桶的石油。尤其將來世界人口提高，冀望許多國家更加開發，加上高科技發展，造成能源使用密集，到時候世界將要重新調整，機票越來越貴，航空郵寄包裹已不再被考慮，生產純用汽油的車子根本不用想了。

爲解決問題，世人不但要更有效率地使用汽油，也必須開始考慮其他能源。核能因爲價昂不

discovered, meaning that it is getting harder and harder to find oil, especially since it is predicted that there is only 5% of oil left in the world to be discovered. Geologist Walter Youngquist says that in 2004 the world produced 30.5 billion barrels of oil but discovered only 7.5 billion barrels of new oil.

A decline in oil production will affect the food industry in ways unimaginable to today's society. For instance, according to Lester R. Brown, the author of the book, *Plan B 2.0*, in the United States, transport, processing, packaging, marketing, and kitchen preparation of food account for nearly four-fifths of food system energy use, and it is said that the U.S. food economy uses as much energy as France does in its entire economy. So without sufficient oil, how can the United State's food industry, not to mention the world's, survive? Furthermore, food staples such as wheat and corn usually travel long distances by ship to get to where it is wanted while fresh fruit and vegetables tend to travel by air, and so how will we continue to ship these products using boats and airplanes if there is not enough fuel? From this we conclude that in the long run, people will have to adjust their diet, consuming more of locally grown products because daily transports of fruits, vegetables, and food staples from all around the world will be nearly impossible, and food will become more costly as higher oil prices cause production costs to go up.

Urban living costs will rise dramatically after peak oil. For example, cities will be affected a great deal but suburbs, especially poorly designed suburbs, will be devastated. People living in poorly designed suburbs are also usually geographically isolated from their jobs and shops, meaning that they have to drive to get everything they need. Soon, people will have to find other types of transportation to get around as gas prices continue to rise higher and higher.

The International Energy Agency and the U.S. Department of Energy show that now the world is consuming approximately 84 million barrels of oil a day but in 2030, the world will consume about 120 million barrels a day, especially due to a projected population boom and the hope that many countries will become more developed and high-tech, thus also more energy-intensive. Our world will have to restructure itself as airline tickets become more expensive, sending packages by air is no longer an option, and production of non-hybrid cars is completely forgotten.

In order to solve this problem the world not only has to use oil more efficiently but we also have to begin looking at

太可能，煤炭又影響氣候變化太大；因此B計畫中說我們須著眼於風力、太陽能板、動力工場、地熱、水力發電、波力和生物燃料，因爲來源無盡，它們永不會匱乏。有些國家已在轉換使用再生能源，過程必定費時，但這是可行的。因此我們要站起來，做節約能源和再生能源的積極行動者；否則，明天世界可能已是極令人憂心了。

要緊的是，我們個人能做什麼來維續世界？在不使用電燈、電腦、電視和其他電器用品時即關閉，由此開始來節省能源。不開車、步行或騎機車，可使世界更好更清潔。採取這些小步驟並靠大家共同努力，我們即可挽救世界。

修復地球

米妙雲 講 / 秦頡芟中譯

當經濟上的環境支撐系統失敗時，像是農地被侵蝕、收成縮減、水平面下陷、井水乾枯、漁獲枯竭、樹林減少以及溫度上升使農作物乾枯，要成功根除貧窮是不可能的。計畫B的目標是要用全球化的努力來修復整個地球，讓它不要掉進美國水土保育協會主任柯瑞格・卡克斯所形容的毀滅漩渦裡。他說：「生態和社會方面的失敗，形成惡性循環，把各自推下漩渦陷入貧困、環境降級、不公平的社會、疾病以及暴力。」這份全球性的努力包括擴大森林保護和恢復土壤的保存與重建，符合自然界的水需求、漁業的重生以及保護動植物的多樣化。

有幾種方法能保護和恢復森林，其中一種就是減少用紙量和減少木材燃料的使用。世界上十個回收率最高的造紙國家中，中國回收紙的比率比較低，只有27 % ，而德國卻高達7 2% 。假使每個國家回收紙的比率都能和德國一樣，那麼需要作紙的木材量就會大幅減少三分之一。現在到上個世紀，人們都在使用一用就扔的餐巾紙、紙尿布和面紙等紙類用品；美國和其他許多國家都正在這方面做改進。不用這些一用就丟的物品，改用其他更經濟的產品的話，這樣用紙量就能降低許多。

一半被砍掉的林木都作燃料使用，如果發展一種不用木頭做燃料的新烹飪方法，就可以減少

other sources of energy. Nuclear power is very unlikely due to high energy costs, and coal contributes way too much to climate change. So, Plan B tells us that we must look at renewable sources of energy, such as wind energy, solar cells, solar thermal panels and power plants, geothermal energy, hydropower, wave power, and biofuels, because these sources of energy are inexhaustible, meaning they can never be used up. Some countries are already trying to convert to renewable energy and though it is definitely a long process, it is very doable. So we must stand up and become activists in conserving oil and reverting to renewable energy sources, or else tomorrow might be the day our world has been dreading.

The big question is what can we as individuals do to help sustain our world? We can start by switching off lights, computers, televisions, and other electrical devices when we aren't using them, thereby conserving energy. By walking or riding our bikes instead of driving, we can help make the world a better, cleaner place. By taking these small steps and by working together, we will be able to save the world.

Restoring the Earth

BY GOPIKA MISRI /CHINESE TRANSLATED BY CLAIRE CHIN

With the economy's environmental support systems collapsing, from the erosion of croplands, shrinking harvests, falling water tables, wells drying, collapsing fisheries, shrinking forests, to the rise in temperature scorching crops, it is impossible for there to be a successful poverty-eradication system. Plan B promotes an immense global effort to restore the earth in order not to fall into the whirlpool of destruction described by Craig Cox, the Director of the U.S.-based Soil and Water Conservation Society. "…Ecological and social collapses have reinforced each other in a downward spiral into poverty, environmental degradation, social injustice, disease, and violence." This international effort includes an increase in the protection and restoration of forests, conservation and rebuilding of soils, meeting nature's water needs, the regeneration of fisheries, and the protection of plant and animal diversity.

There are several ways to help protect and restore forests, including reducing paper use and fuel wood use. The ten top paper-producing countries have rates of paper recycling ranging from China at the lower end recycling 27% of the paper it produces, to Germany at the higher end recycling 72%. If every country recycled as much paper as Germany, the amount of wood pulp needed to produce paper would drop by one third. Many countries are trying to improve, like the United

森林所承擔的壓力；烹飪燃料可以風力、太陽能和地熱取代。森林的存在非常重要，因爲它能防止洪水、腐蝕和土石流。羅傑斯大學生物學教授裏德・方克建議在濫砍森林的地方，要種植核果植物，因爲核果是很好的蛋白質來源，並且可以轉換成乙醇能源。有許多公益的組織都在保護這些森林。

有些國家認識到林木的重要；中、俄、美、日和印度種植的樹木占了全世界的三分之二。種樹需要很多水，種樹用地通常也適合糧作。造林成功的一個例子是韓國，現在韓國土地有65%都是林地。中國也藉種樹減少長江洪泛，並考慮造林以防戈壁沙漠擴張。除了中國，阿爾及利亞和奈及利亞也考慮造林以防撒哈拉沙漠的擴張。爲了停止內蒙古沙漠的擴張，必須多種灌木，並多養乳牛取代綿羊和山羊，以增加全國歲收。綿羊和山羊吃掉地上的農作，牠們的蹄子也踩壞了表土保護層。

1930年代，美國曾受沙塵衝擊，風沙帶走了肥沃的表土。爲了留住表土，發展出農業技術。1985年美國國會通過減耕和休耕等水土保持辦法，確實減少表土的侵蝕，並控制基本農作物的再生產。國會通過這項辦法後，表土侵蝕從31億噸減少到19億噸。

另一個修復地球的方法，就是要符合大自然對水的需求。南非在1998年通過的水法案可爲其他國家榜樣。首先是基本物質的需求，例如飲水和衛生。另一個是支援河流生態系統，此將增加物種多樣化，並確保提供給社會的服務。恢復河流生態系統就是幫助恢復野生動植物的數量。水壩和其他障礙紛紛被打破以便河川歸位。

B計畫提出的最後一個建議就是要重生漁業，更成功的方法就是成立海洋

States, which has had a throwaway mentality present through the past century with disposable paper items, such as paper napkins, disposable diapers, and facial tissues. It is possible to reduce paper use greatly just by replacing these disposable accessories with more economical alternatives.

Developing alternative cooking methods using renewable sources of fuel would also lessen the load on forests. Half of the wood removed from forests is used as fuel. Alternative cooking fuels include wind, solar, and geothermal energy. Forestry is also important to prevent flooding, erosions, and landslides. For deforestated areas, Rutgers University biology professor Reed Funk suggests planting nuts, which are a good source of protein and can be converted into ethanol. Forests are protected by nonprofit organizations, one of the most rigorous international groups being the Forest Stewardship Council (FSC).

Some countries that realize that forests and trees are needed for a variety of reasons, and five of them, China, Russia, United States, India, and Japan, are responsible for two-thirds of the trees planted globally. Tree plantation requires a lot of water and the land used for tree plantations are generally suitable for growing crops. A great example of restoring forests is Korea, with forests covering 65% of the land. China has used tree plantation to lessen flooding in the Yangzi area, and is suggesting building a green wall of forestry to ward of the expanding Gobi Desert. Other than China, Algeria and Nigeria are also proposing to create green walls to try to halt the expanding Sahara Desert. In order to halt the expanding desert in Inner Mongolia, efforts need to made to plant more shrubs and to replace sheep and goats with dairy cattle to help increase the income of the nation. Sheep and goats eat the vegetation and also pulverize the protective crust of top soil with their hooves.

In the 1930s, the United States was hit with the Dust Bowl, with winds that carried off the nutritious top soil. Agricultural methods were developed to help conserve soil. In 1985, Congress passed a Conservation Reserve Program to reduce soil erosion using practices such as conservation tillage and no-till. As a result the soil erosion dropped from 3.1 to 1.9 billion tons.

Another way to restore the earth is to meet nature's water needs. Sandra Postel and Brian Ritcher describe South Africa's 1998 Water Act as a model for other countries. First is the need for basic commodities, such as drinking, cooking, and sanitation. Another is to support river ecosystems, which increases biodiversity and secures the services provided to societies. Restoring river ecosystems helps restore wildlife population. Dams and other barriers are being broken to help the river resume its original flow.

The last way to restore the earth proposed by Plan B, is to regenerate fisheries or create marine reserves or marine parks. Because there is so much fishing and not enough fish, these reserves are necessary to keep different species alive and encourage their health and quantitative growth. Fishery restoration also requires a reduction of nutrient flows from fertilizer

保育區或海洋公園。因爲捕漁作業過多，魚群不足，需要海洋保育區來保護不同的生物種類生存下去讓牠們健康成長，數量增加。此外，必須減少肥料和未經處理的下水道廢水直接流入河海裏。肥料所含養分將造成藻類大量繁殖，吸收水中所有氧氣，形成死水區，魚類完全無法生存。政府也應減少對漁業的補貼，好讓魚群有足夠的時間再繁殖。

如果要修復整個地球，每年約需要 930 億美元的經費，包括重建森林 60 億，保護土壤表層 240 億，恢復畜牧用地 90 億，重生漁業 130 億，保護生物種類 310 億，穩定水平面 100 億。如果你拿這些經費和世界上一些對人類無益處又不必要的花費比較，就會發現這9 3 0 億元是絕對該付出的，因爲，我們怎堪承受不如此做的重大代價？

穩定氣候

狄德濟 講 / 李明欣 中譯

<u>提高能源生產力</u>

某些歐洲國家跟美國的生活水準一樣，但每個人使用的能源大約只有美國人的一半。每一個國家都必須擬出自己提高能源生產力的計畫；但也該有一些共同的要素，例如使用節能的家電，使用油電車，重新設計大眾運輸工具的系統以增加效率等。

<u>使用風力</u>

風力發電成長快速的原因有六：來源豐富、廉價、用之不竭、分佈廣泛、清潔、不危害氣候。歐洲正在領導世界進入風力發電時期，有些國家像德國、西班牙以及丹麥，都有令人印象深刻的統計數字。到 2020 年，風力發電預計將滿足歐洲大約一半人口一億九千五百萬顧客的家用需求。風力發電的最大好處之一是我們有足夠的風。北達科他、堪薩斯州和德州三個地方就有足夠的風來提供全美的用電需求，風力發電是最便宜的電源之一。

<u>油電車與風力發電</u>

兩項重要技術形成強勁的新運輸能源經濟基礎：豐田製造的油電車以及設計先進的風力渦輪。除了用油電車來減少石油用量外，以風力發電來啓

runoff and untreated sewage. The nutrients lead to algal booms which take all the oxygen from the water, creating dead-zones, where no fish can live. Governments also need to reduce fishery subsidies to give fisheries time to regenerate.

The total cost of restoring the earth was estimated at 93 billion dollars per year, including the additional costs of reforesting the earth [6 billion], protecting topsoil [24 billion], restoring rangelands [9 billion], restoring fisheries [13 billion], protecting biological diversity [31 billion], and stabilizing water tables [10 billion]. If you compare this to some of the costs the world is paying that are leading us in the opposite direction and are not necessary, you will conclude that it is absolutely necessary to pay these costs, for how could we afford the consequences?

Stabilizing Climate

BY JENNIFER DEDE / CHINESE TRANSLATED BY TIFFANY LEE

Raising Energy Productivity

Some countries in Europe have basically the same living standard as in the United States, yet they use about half as much energy per person. Each individual country would have to come up with its own plan for raising energy productivity, but there are some common factors. Examples are using more energy-efficient household appliances, moving from gas to hybrid cars, redesigning public transportation systems to increase efficiency, etc.

Harnessing the Wind

There are six reasons why wind power is growing so quickly: It is 1) abundant, 2) cheap, 3) inexhaustible, 4) widely distributed, 5) clean, and 6) climate-friendly. Europe is leading the world into the age of wind energy. Countries like Germany, Spain, and Denmark all carry impressive statistics. By 2020, wind-generated electricity is predicted to fulfill the residential needs of 195 million customers, which is half of Europe's population. One of wind's greatest advantages is that it is plentiful. North Dakota, Kansas, and Texas alone could provide the United States with enough wind power to satisfy its electrical needs. Wind is also one of the cheapest sources of electricity.

Hybrid Cars and Wind Power

The basis for a new transportation energy economy is supported by two important technologies: hybrid cars by Toyota and advanced-design wind turbines. Besides using hybrid cars to reduce gasoline, wind-generated electricity to power automobiles would be the next step. Using this method, people could use electricity for short-distance travel (e.g. shopping) and save gasoline for longer trips. The total reduction of gasoline use from

動車子，將會是下一步。以此方法，人們可以用電做短程的交通，如到超市或購物，而用石油做長途的旅行運輸。用油電車及風力發電，可以將石油用量減少７０％。

陽光轉化成電力

除了風力以外，另一項取之不盡的能源就是太陽。在開發中國家，太陽能電池是另一個很有幫助的選擇，譬如在安地斯村落，他們用一個月的太陽能電池的錢，跟買一個月用量的蠟燭是一樣的。在印度的村落中，他們也用太陽能電池而不用煤油燈，因爲油價比太陽能電池更貴。

來自地球的能源

地球本身就是一個熱能的來源，這些能量通常以傳導方式或透過溫泉和天然噴泉而漏出來。地熱是無限的，只要地球在，這種熱能就在。它可用來發電，及直接給建築物、暖房，或農業用池塘加熱，同時它也是工業加工中的熱能來源。

迅速減少碳排放量

最省錢也最快速減少碳排放量的方法就是提高能源使用效率，另一個方式是開發再生能源。直到不久之前，唯一被廣泛考慮可以取代石油的是生物燃料。但現在風力發電開始受歡迎，主要因爲成本低和量大。在乙醇的來源中，蔗糖無論就土地或能源的使用而言都是效率最高的來源。唯一的問題是蔗糖和棕櫚油生長在熱帶和亞熱帶地區，這表示必須砍伐部分的熱帶雨林才能種植這兩種作物。

對美國而言，風力發電可望在新的能源經濟中成爲重要部分。風力發電可用來烹飪、取暖、冷卻、發動汽車、生產鋼鐵。對各個國家，特別是開發中國家而言，轉換能源需要更多勞力，將帶來更多就業機會。這些新的能源也是用不完的，不像現在使用的石油、瓦斯，煤。

我們如何節省能源？

身爲佛教徒，我們可做的是不要濫用能源，並善待地球，因爲我們必須將能源留給未來

both hybrids and wind-powered electricity would be 70%.

Converting Sunlight to Electricity

There is another nearly limitless source of energy beside wind - the sun. Solar cells are an extremely helpful alternative for developing countries. For example, in Andean villages the cost of a month's worth of solar cells is about the cost of a month's worth of candles. Villages in India also use solar cells rather than kerosene lamps, where the oil cost is higher than the cells.

Energy from the Earth

The earth itself is also a source of heat energy, which escapes either through conduction or through hot springs and geysers. And geothermal energy is unlimited and will last as long as the earth lasts. Geothermal energy is used to generate electricity and directly heat buildings, greenhouses, and agricultural ponds, as well as being a heat source for industrial processes.

Cutting Carbon Emissions Fast

The cheapest and quickest way to cut carbon emissions is to raise the efficiency of energy use. The other alternative would be to develop renewable sources of energy. Until a short time ago, the only widely considered substitute to oil was biofuels. But now wind-generated electricity is becoming popular, mostly because of its low cost and large quantity.

Among ethanol sources, sugarcane is definitely the most efficient source in land and energy use. The only problem with sugarcane and palm oil is that they both are grown in tropical and subtropical regions, which means that some tropical forests need to be cleared in order to grow these plants.

For the United States, wind energy will probably play a major role in the new energy economy. Wind-energy can supply electricity for cooking, heating, cooling, powering automobiles, and producing steel. For countries, especially developing ones, this energy switch will require more labor, which means more employment. These new energy sources are also unlimited, unlike the oil, gas, and coal which is currently used today.

What We Can Do About It

We, as Buddhists, can help by not misusing resources and treating our earth lightly, because we need to pass these resources on to future generations, or else they will be left with nothing. So what can we do to save energy? There are some simple steps anyone can take: **1.We can drive less.** Instead of driving, we can walk, ride bicycles, or carpool. The exercise would be healthy as well as efficient. **2. We can be aware of our surroundings.** For example, we can

的世代，否則他們將沒有能源可用。如何節省能源呢？每個人都做得到的簡單步驟是：一、少開車。我們可以步行，騎腳踏車，或者共乘汽車。運動有益健康又有效率。二、更有環境意識，例如我們可以使用日光燈取代白熱燈泡，這樣不但節約能源又省錢。三、教育大人及小孩，大家都可以學到使用再生能源可以大大節約，並讓別人也增強環境意識。四、逐漸地將我們的社區從消耗能源轉到再生能源，每一個太陽能板，及每一個節能的家電用品，都讓我們更接近一個可以完全永續（發展）的社會。

編按：本書〈計畫解救星球的危及與文明的困境〉為培德女中經濟學課陳果梅老師的補充教材。地球政策學院的創辦人與院長，也是看守地球學院院長的萊斯特・布朗，在書中形容一種環境永續的經濟；我們希望年輕的一代能幫助它實現。

由左到右謝阜庭、謝智聰、黃世民、鄭志健、謝金榮、劉親智

Left to right: Michael Hsieh, Albert Shay, Simon Huynh,Ken Cheng, Kim Vinh Ta, and Qin Zhi Lau.

use fluorescent lightbulbs instead of incandescent ones. This would save energy as well as money. **3. We can educate.** Children as well as adults can learn more about how much renewable energy can save, and share this awareness with others. **4. We can slowly shift our community from consuming energy to renewing energy.** Every solar panel and every efficient appliance brings us closer to becoming a fully sustainable society.

Editor's note: The book *Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble* was a supplemental text used in Ms. Leonie Tan's Economics class at Developing Virtue Secondary School (Girls Division). In it, Lester R. Brown, founder and President of Earth Policy Institute and founder of Worldwatch Institute, describes a vision for an environmentally sustainable economy which we hope the younger generation will help to make a reality.

由左到右狄德劑、胡適寧、謝慧英、黃愛玲和米妙雲

Left to right: Jennifer Dede, Tiffany Hu, Hue Anh Ta, Aline Huynh, and Gopika Misri.