

SUBSIDIZING UNSUSTAINABLE DEVELOPMENT

Undermining the Earth with public funds

By

André de Moor

Institute for Research on

Public Expenditure

and

Peter Calamai

Foreword by

Maurice F. Strong

Chairman, Earth Council

Commissioned

by the

Earth Council

ABOUT THE ARTIST

Like William Blake, Frank Mayrs (1934-1994) could see "a world in a grain of sand and a heaven in a wild flower." His creativity was boundless, exploring all media from painting to videography.

For more than three decades, he helped present Canada's face to the world, and to Canadians, through his positions as a designer with several federal government agencies. His flare and attention to detail ensured the success of the Canadian pavilion at Expo 70 in Osaka and the pavilions for Canada, the Northwest Territories and Hong Kong at Expo 86 in Vancouver.

But while Frank was a designer by profession, by desire he was a painter.

In 1985 he left the government to paint full time, and the next 10 years were a supernova of creativity. With his artist wife Patricia, Frank nurtured an interest in film-making and travelled extensively throughout the Arctic.

Frank Mayrs was born in Winnipeg, one of six children, including three brothers who also paint. He died in the Gatineau Hills that he loved.

— Peter Calamai

The painting on the cover, Gatineau, is an acrylic on canvas. It is in a private collection, as are many others by Frank Mayrs. His work is also held by the Vancouver Art Gallery, the Royal Bank of Canada and the Art Bank of the Canada Council.

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The **Earth Council** is an international non-governmental organization formed shortly after the Earth Summit to follow up and monitor implementation of the Rio Agreements. Its mission is to support and empower people in building a more secure, equitable and sustainable future. To achieve its mission, the Earth Council has developed strategic programs and partnerships to “operationalize” sustainable development in collaboration with a variety of partners and sponsors. This report on economic incentives is a product of the Council’s program to promote economic reforms required for sustainable development, including improved economic instruments, the removal of inefficient subsidies and the integration of sustainability criteria into economic policies.

The **Institute for Research on Public Expenditure** is a private, independent non-profit centre dedicated to applied research into public expenditure and government policy. It was founded in 1968 by the Dutch Association for Public Finance in response to the rapid growth of the public sector during the 1960s and growing concern over the effectiveness and efficiency of rising levels of public expenditure. Its mission is to deepen the understanding of socioeconomic and administrative aspects of government policies and to promote public interest. To this end, the IRPE disseminates the results of its research, issues a public finance journal and organizes conferences. The IRPE is assisted by an advisory board of public finance professors and senior managers from the public and business sector, including the Ministry of Finance and the Dutch central bank.

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Valuable advice and guidance have been given by representatives of the United Nations and the International Monetary Fund and from various institutes such as the Dutch Central Planning Bureau, Energy 21, Netherlands Energy Research Institute, International Institute for Sustainable Development, Stockholm Environment Institute, Worldwatch Institute, Wuppertal Institute, and of course within the Institute for Research on Public Expenditure. Many, many others have contributed in their individual capacity as well. To all, I am greatly indebted; all their contributions have been invaluable and improved the insights in the report.

I hope that these analyses and suggestions will contribute to the debate and mobilize public and political support for a real and fundamental policy change towards a more sustainable future, in line with the vision of the initiator of the project, Emile van Lennep.

Peter Calamai: Writing a popular version of a specialist study is a task fraught with pitfalls. I am greatly indebted to André de Moor, for his never-flagging patience and good humour in dealing with a non-economist. For access to research materials and photographs, my thanks to the library staff of the International Development Research Centre; for peerless final editing, a tip of the hat to J.A.(Sandy) McFarlane; for guidance and assistance with varied issues, my gratitude to Michael McCracken of Informetrica in Ottawa, Walt Petterson in London, David Satterwaite of the International Institute for Environment and Development in London, Liisa Tuominen of the *Ottawa Citizen*. The wise counsel, insight and editing skill of Jim MacNeill were invaluable. The errors and omissions are all mine.

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Foreword

By Maurice F. Strong
Chairman, Earth Council

Governments of both developing and industrialized countries have long made a practice of extending subsidies, direct and indirect, to certain sectors and products for which they considered it in the national interest to provide special incentives. These range from agriculture, energy, natural resource development, transport, water and fisheries to a variety of manufactured goods and commodities. The recent movements towards more open, market-oriented economies, free trade and budgetary austerity have resulted in some modifications and reductions in these subsidies. But they continue to exact a heavy cost from people as taxpayers and consumers while distorting markets and undermining economic efficiency.

In principle, there can be no question that subsidies can be a useful and beneficial means of providing incentives to meet objectives that governments believe are economically or socially desirable. But in practice such subsidies tend to become deeply entrenched in the expectations and interests of those who benefit from them, long after they have served their original purposes; there is also great resistance to any attempt to change these subsidies, even when their costs have reached a point where they far outweigh any conceivable benefits.

Recently it has become apparent that in many cases such incentives also exact a high cost in environmental and social terms which undermines the prospects for effecting the transition to sustainable development. The extent of this is brought out persuasively in this study by André de Moor of the Institute for Research on Public Expenditures commissioned by the Earth Council with the support of the Netherlands government and the World Bank, which is the subject of this report. Led by the distinguished Dutch Economist and Minister, former Secretary-General of the OECD, Emile van Lennep, it focused on four sectors — energy, road transport, water and agriculture — in which such perverse incentives have become pervasive. It demonstrates dramatically how in so many cases the subsidies provide disincentives to sustainable development while denying to the poor the benefits which better deployment of these resources could produce. At a time when new funding is becoming more and more difficult to come by, this study makes it clear that there is an immense potential for redeployment of existing resources to provide positive incentives and support for sustainable development while improving economic efficiency and competitiveness.

Sadly, Emile van Lennep passed away just after he chaired an important meeting in Washington convened by the Earth Council and the World Bank at which a small group of leading experts reviewed the draft report. This version reflects the resulting revisions. We are fortunate that Dr. James MacNeill, former Secretary-General of the World Commission on Environment and Development (the Brundtland Commission) who has been deeply involved in the project from its inception, has taken over the chairmanship of the steering

committee of the project as it moves into its second phase. But I want to record here our profound and enduring gratitude for the enlightened vision and wise leadership of Emile van Lennep which made this project possible and saw it through to completion of the first phase which has produced this report. Phase Two will be carried on, inspired by his vision, within the framework of the Emile van Lennep Program established by the Earth Council in his honour.

January, 1997

Stalking the elusive subsidy

(a guide to the nature of the beast)

1

Definition: *A subsidy is any measure that keeps prices for consumers below the market level or keeps prices for producers above the market level, or that reduces costs for consumers and producers by giving direct or indirect support.*

There is nothing inherently bad about subsidies. They can encourage the development of solar power, accelerate the adoption of less polluting technologies by industry and direct money efficiently to society's poorest. They could, in effect, play a crucial role in helping development around the globe become more sustainable.

But largely they don't. Many of today's subsidies encourage practices that are economically perverse or trade-distorting or ecologically destructive or socially inequitable. Sometimes several of these harmful things at once. And most subsidies hinder progress towards sustainable development, the Brundtland Commission goal of meeting the needs of the present generation without compromising the needs of future generations.

Yet far too few people are aware of this dominant dark side of subsidies. Partly that's because of their natural camouflage, what Barbara Ward and René Dubois once called "disguisedly subsidized consumption." Partly it's because many subsidies were originally intended for goals that were beneficial, even laudable. And partly it's because the world is addicted to subsidies, and denial is a sure mark of addiction.

It's a serious addiction. By the cautious calculations of this study, the world is spending at least \$700 billion a year (and maybe \$900 billion) on subsidies in just four economic sectors: water, agriculture, energy and road transportation. Since that amounts to somewhere between three and four per cent of Gross World Product — and close to current global spending on armaments — it seems worthy of attention from governments on the dollar value alone. Especially since the evidence indicates that a lot of those dollars are wasted because the subsidies no longer serve their original purposes.

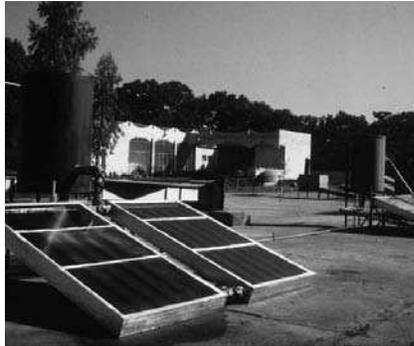
However, there's an even better reason to take a cold, hard look at subsidies — the fate of sustainable development on Spaceship Earth. As the world has learned in the past 10 years, practising sustainable development takes a lot more sweat and toil than professing it. The challenge is learning how to balance environmental and economic considerations in everyday decision-making. This balancing is especially difficult because one of the key controls — the price and incentives system — has been badly distorted by massive subsidization. Result: Rice growers in Southeast Asia over-irrigate their fields, because subsidies cover most of the cost. Drivers in southern California continue to funnel onto congested thruways, because subsidies take care of more



Subsidies introduced for laudable goals, such as creating jobs in the resource sector, often end up being ecologically destructive and economically perverse.

than half the cost of their daily commute. Uneconomical and highly polluting coal is still mined in Germany as back-door welfare support for the miners.

But we're getting ahead of our story. First comes an expedition through the steamy jungle of economic theory. We're tracking that most elusive of quarries — the subsidy. To do that, we must hack our way through some dense thickets of economic jargon, trying to collect four essential items for our backpack — a benchmark, a yardstick, a checklist and an identification guide. These are the basic concepts that eventually will allow us to distinguish a harmful subsidy from a beneficial one. Start, however, at the beginning, with the critical importance of getting prices right. (For full details of the study methodology, see *Perverse Incentives* by André de Moor, listed in Further Reading.)



The market's price for solar panels does not reflect the value of producing energy in an environmentally friendly fashion.

THE ECONOMICS JUNGLE

Prices are the most efficient information system; they largely determine decisions by producers and consumers. When prices do not reflect the full costs and benefits of production and consumption, the true facts about resource scarcity and environmental values aren't made known. Nor are the true costs of producing or consuming goods and services. With nothing better available, people are forced to base their decisions on this erroneous information, causing the overuse of some resources (with a related degradation of the environment) and the underuse of other resources. So there is a direct causal connection between mispricing and unsustainable development. Now to trace mispricing to its lair by looking at the link with two well-known kinds of failures — market and policy.

A **market** failure results when the price of goods does not reflect either the full costs (such as pollution from the production process) or the full benefits (such as the chance provided by solar cells to use a renewable energy source). Other examples are the failure of markets to reflect the real value of wetlands or the well-known "tragedy of the commons" which can lead to the exhaustion of shared natural resources, like high-seas fisheries. A different kind of failure occurs when government interventions distort the market. The result is a **policy** failure. Policy failures can arise from sectoral subsidies, taxation policies, price controls or regulations.

There's a sharp distinction between the two kinds of failure. A **policy** failure refers to the distortionary effects of active government intervention. A **market** failure, on the other hand, implies a lack of government action, but does not imply that the markets cannot work. On the contrary, governments could often play an active role in helping the markets to function properly (*see Chapter 6*).

If governments want to promote sustainable development, they have to make sure that prices and incentives are right. That job requires identifying subsidies, measuring them and assessing their impact. And those tasks require: a benchmark, a yardstick, a checklist and an identification guide.

SELECTING A BENCHMARK

In theory, the best benchmark for helping identify a subsidy would be something economists call **marginal private costs**. That's a mouthful of jargon for a relatively simple idea: the cost of producing one more hamburger in a fast-food outlet that turns out thousands a day. Of course, that extra hamburger costs the franchise owner only a tiny bit more to produce. Those few extra pennies are the **incremental** or **marginal** cost. And since we're not including the cost to society (like added pollution from more cooking, or one more wrapper littering the roadside), only the **private** costs of the fast food company are being considered (like wages, buns and sides of beef.) When the hamburger is sold, the marginal profit should be the difference between the selling price and the **marginal private** cost. If the profit is more, there's a subsidy somewhere.

Great in theory. Unfortunately, not enough statistical information is available for marginal costs to be useful in practice. A more feasible approach is to use prices based on **opportunity costs** — another mouthful of jargon with a relatively simple meaning. Think **alternative** cost rather than opportunity cost. What a customer will pay for a hamburger in our fast-food outlet depends on what he can get for the same money elsewhere. This **alternative** cost of fried chicken or someone else's hamburger determines the price for our hamburger. Similarly, the cost of paying our hamburger-flippers is determined by what they could earn working in a hardware store or another fast-food outlet. So the cost of our labour also depends on an **alternative** cost.

For some goods and services, **world prices** are a quick and easy substitute for prices based on opportunity costs. And a sure benchmark to define a subsidy. Any domestic price below the world price level indicates a subsidy somewhere, since domestic producers could get more selling on the world market. But some goods and services (like land and some personal services) aren't traded on the world market and therefore have no world market price. For these, the preferred benchmark would be **long-run marginal costs**. Remember that marginal is just another way of talking about the cost of producing an extra item (like a hamburger). In the short run, these marginal costs might be high, if you had to pay overtime or find new capital to expand; in the long run, however, the extra equipment would be depreciated and the labour force optimized. So any price below the long-run marginal cost would point to a subsidy. For most things that aren't traded on world markets, a benchmark almost as good as long-run marginal cost is the average cost of producing one item. If the selling price is below that average unit cost of production, there's a subsidy.

A benchmark is for comparison purposes; it gives us something to measure *against*. But what is our yardstick? What do we measure subsidies *with*? Back to the dense thicket of economese.



Some things aren't traded on the world market like a village celebration in Benin.

MEASURING A YARDSTICK

Several indicators have been developed by economists to reveal how much the various forms of government support, including subsidies, depart from a level playing field. Such indicators include two elements: the **relative price impact** and the **associated transfer of income**.

The former looks at the effect of price changes that arise from government intervention; what's important here isn't the absolute size of the change but how the price for one resource (say labour costs) is changed relative to the price for another (say borrowing costs). So increasing the minimum wage or cutting the prime lending rate will each have an impact on the relative prices for labour or capital. And the combination of labour and capital chosen to increase production — a process called the “allocation of resources” — depends on this **relative price impact**.

The **associated transfer of income** has a more indirect effect. Getting a government subsidy means a producer can afford to pay a little more than a competitor for labour, capital or raw materials. So that producer can now command those resources, which is a definite tilt in the playing field. That extra income is “associated” with the activity or product that the government wants to subsidize; also, most of it will wind up in the producer's pockets rather than being passed along, say to workers.

For the purposes of this study, the best practical yardstick combining these two elements is the **Producer Subsidy Equivalent (PSE)**, developed by the OECD, the Organization for Economic Co-operation and Development, a consultative group of 28 industrialized nations. The PSE covers five categories:

- market price support;
- direct payments;
- reduction in the cost of inputs, like low-interest loans affecting the cost of capital or the use of cheap prison labour;
- general services, such as sales through a government marketing board;
- other indirect support.

The PSE has another big advantage: The OECD has already used it to study the agriculture and energy sectors, two areas of concern here.

We now have a benchmark and a yardstick in our jungle backpack. How about a checklist of the different types of subsidies? Fortunately, the OECD has already hacked back a lot of that undergrowth too; this checklist is based largely on that body's pioneering work:



Subsidies can reduce certain costs of production, tilting the playing field against others.

CHECKING THE CHECKLIST

budgetary subsidies	<p>a. direct subsidies e.g. grants or payments to consumers or producers.</p> <p>b. budgetary effect of tax policies e.g. tax credits, exemptions, allowances, exclusions and deductions, rate relief, tax deferrals, preferential tax treatment.</p>
public provision of goods and services below cost	e.g. provision of infrastructure and complementary services and government R&D expenditures.
capital cost subsidies	e.g. preferential loans, loan or liability guarantees, debt forgiveness.
policies that create transfers through the market mechanism	<p>a. domestic-oriented policies e.g. price regulation, quantity controls, government procurement policies, legislation.</p> <p>b. trade-oriented policies e.g. import and export tariffs and non-tariff barriers.</p>

This subsidy checklist is organized according to the *method* of transfer, which divides subsidies into four main categories. That's straightforward enough, but the checklist also includes both **on**-budget and **off**-budget varieties of subsidies. Simply put, an **on**-budget item is anything that shows up as an expenditure or transfers actual money, like cutting taxes. An **off**-budget item is anything that changes net financial assets or liabilities, like a loan without affecting the budget balance, or which uses the state's regulatory or persuasion powers.

The **first category** of budgetary subsidies involves with a government's accounts, the formal statement of revenues and expenditure. Direct subsidies are found on the expenditure side, and their measurement is straightforward. On the revenue side, there may also be subsidies arising from tax policies, such as the huge tax breaks for the oil industry outlined in Chapter 4.

The **second category** covers the support when governments provide goods and services below cost. For example, our study demonstrates that most car users don't pay anything near the real cost of their travel. Not only do governments extensively subsidize road services like policing, they often don't even collect enough in transportation levies and gas taxes to cover the costs of building and maintaining the highways. (*See Chapter 5.*)

In the **third category** are capital cost subsidies, almost all of which do not appear in government accounts. A classic example would be the soft loans and low interest rates that have encouraged overuse of irrigated water in many countries, as Chapter 2 demonstrates. Loan guarantees for dubious private ventures fall into this same category.



Soft loans and low interest rates have encouraged the overuse of irrigated water.

Finally, the **fourth category** contains subsidies resulting from policies that create off-budget transfers through the market mechanism. Agriculture abounds with instances of these, both domestic and international; see Chapter 3 for examples like minimum price guarantees for home-grown produce and tariffs against imported foodstuffs.

Now our jungle backpack contains a benchmark, a yardstick and a subsidy checklist. All that's needed is a way to distinguish the beneficial subsidies from the harmful ones — an identification guide.

TELLING THE GOOD FROM THE BAD

The key issues are to assess whether subsidy policies are actually serving their original purpose or have become counterproductive — and at what cost and with what effect on sustainable development. We make this judgment by evaluating their economic, environmental and social impacts. For instance, economic impact can be gauged by effects on income or by growth in a country's economy measured in terms of the Gross Domestic Product (GDP). Reduction of emissions or depletion of natural resources will help assess the environmental implications. Loss in purchasing power or the distribution of benefits between rich and poor may be considered to determine the social impact.

Merely tracking down subsidies and measuring their impact is a grueling enough task, as our safari through the economics jungle showed. Actually trying to reform them is, for politicians, like swimming across a river teeming with hungry crocodiles. Recall the photographs from 1992 when protesting farmers dumped piles of rotting vegetables, bloated animal carcasses and leaking bags of grain in public places throughout France because agricultural subsidies were being slashed.

So the political and international impacts of subsidies must be evaluated as well. It is almost always easier to introduce a subsidy than to remove one. Eliminating subsidies raises heavy opposition from vested interests and groups that benefit from the subsidy. As a researcher with the Worldwatch Institute wrote recently: "The subsidized and the subsidizers came naturally to support one another, in a resilient feedback loop." Opposition is equally vocal on behalf of producer and consumer subsidies, even though they originally were created for different reasons. Producer subsidies are usually initially motivated by concerns for employment and removing them is believed to threaten jobs. Subsidies to consumers are often aimed at supporting the poor, and reducing them will likewise cause wide protest.

Considering the usually heavy opposition, enormous political will and courage are required to reduce subsidies. But there is also the chance of a large political payoff. Since most subsidies are financed through either taxes or deficits, reducing them frees up funds. These can be used for deficit reduction, returned to the private sector through tax cuts or directed towards financing sustainable development. This revenue-creating capacity is politically very attractive, particularly where countries are running a deficit, because this "found" money can help smooth the transition and mobilize public support for subsidy reform. Funds generated from subsidy removal can also be used to develop alternative policies that target the original objectives of subsidies more cost-effectively, for instance by switching to direct income support.

It is almost always easier to introduce a subsidy than to remove one.



Another major impact of subsidy reform is in the area of international competitiveness. Conference upon conference, and treaty after treaty in recent years have tried to produce level playing fields. Yet all too often subsidies remain the biggest lumps on those flattening fields. Years of addiction to subsidies have convinced many policy-makers that removing them would fatally damage the relative competitiveness of their country or irreversibly harm the competitive position of the supported industry. So no one country dares act first, for fear of being alone.

Subsidy reform can trigger a political backlash as the French government found in 1992 when farmers erupted in protest over a major subsidy reduction.

Is restoring equilibrium to the price mechanism worth this much trouble? Definitely yes. Interventions that use the market, rather than trying to replace it, can play a vital role in sustainable development because they help reconcile environmental concerns and development needs. In particular, economic incentives are ideal for shifting behaviour as well as production and consumption patterns towards sustainability; cost-effective and flexible, these policies can also correct markets and adapt easily to changing circumstances. That is why world leaders at the 1992 Earth Summit in Rio showcased economic instruments as promising tools for environmental policy.

To promote sustainable development, it is essential that government policy establish the right incentive structure. To start, governments should identify the existing policy distortions — interventions that warp the economy and subsidize waste and environmental degradation. With this information, governments can begin to reduce subsidies that have adverse effects on the environment and on the overall efficiency of the economy.

The following chapters illustrate how to identify such perverse subsidies in four key sectors of the economy. The concluding chapter provides a practical strategy for their removal. But the political will necessary for both identification and removal can't be created by studies or reports. It must come from policy-makers and private citizens believing that sustainable development is the only equitable and just course. There is only one Earth, for this generation, and for generations to come.

Water, water, everywhere

(but not a drop to waste)

2

A paradox: Water is the most essential substance for life on Earth, yet it is among the least valued by governments and market forces. Without water, plants cannot use the sun to convert carbon dioxide into carbohydrates — the basis of our food chain; without safe water, a person perishes in days; without sufficient water, mighty civilizations quickly shrivel and vanish.

From the very beginning, humanity has appreciated the vital importance of water in principle but has been reckless about its use in practice. The earliest surviving narrative, *The Epic of Gilgamesh*, chills readers with a cataclysmic flood engineered by the gods, seemingly angered over irrigation and damage to small rivers. It is historic fact that about the time *Gilgamesh* was written in the third millennium BC, the Sumerian cities of Mesopotamia began a fatal decline, partly because poorly managed irrigation had poisoned their croplands with salt. A similarly reckless attitude towards water still prevails today, 5,000 years later, with results that could be equally disastrous unless the world mends its ways.

Start by understanding the conundrum of global water supply and demand. While the Earth from space appears awash with blue, less than one per cent of all the water on our planet is both fresh and available (that is, not frozen in polar ice caps.) We receive this water through what scientists call the hydrological cycle — water evaporates from oceans and seas, falls over land as rain or snow and, enriched with silt and minerals, eventually flows back to the oceans through rivers and aquifers, porous layers of sediment underground. As scientists are fond of saying, the oceans water the continents and the continents nourish the oceans.

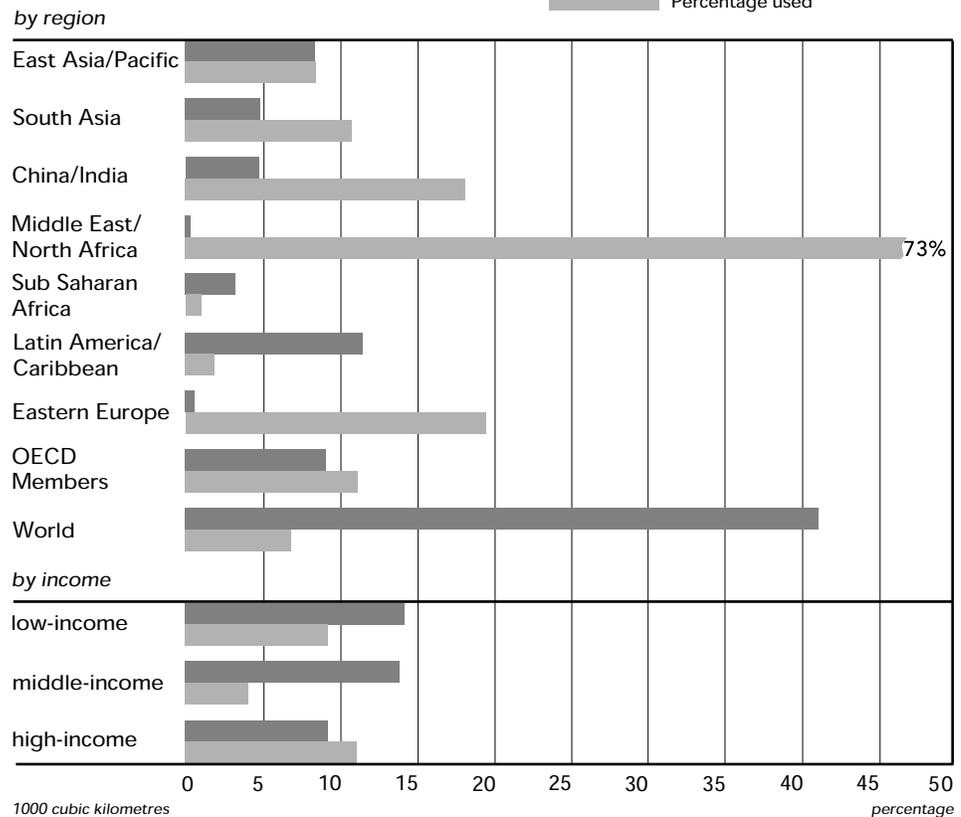
The hydrological cycle delivers roughly 40,000 cubic kilometres of fresh water as an annual renewable supply. But almost two-thirds of this precipitation is taken up by trees and plants and returned directly to the atmosphere; another 2,000 cubic kilometres is too remote geographically to be of much help. Still, what's left for our use as a stable, renewable, easily accessible supply seems a lot — 12,500 cubic kilometres a year, enough fresh water to flood all Europe to a depth of slightly more than a metre. More than half of that is already being used, often wastefully, and global demand has been doubling every 20 years. Add to this pressure on the total supply the uneven distribution of available water around the globe (see *Figure 1*) and you have some idea of the conundrum.

It's not simply that water is scarce across some entire regions, such as the Middle East and North Africa. It's also scarce in cities inside countries that, theoretically, have enough water overall (300 cities in China have experienced water shortages). It can even be scarce for some groups in a water-rich city, such as the poor, but not for others. That's just the scarcity of quantity. As well there's a scarcity of quality, of access to safe water, that also traces a patchwork pattern across maps.



Oxen turn waterwheels today in the Middle East as they have for centuries.

FIGURE 1: Water available and proportion used, 1990



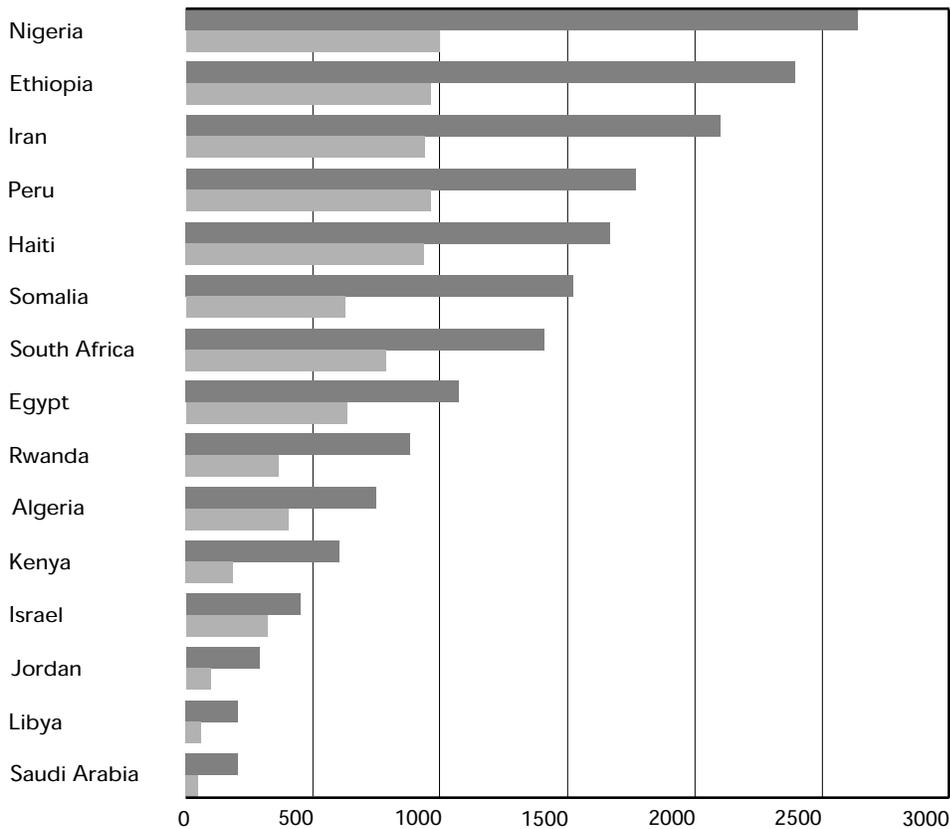
Rice irrigation is a heavily subsidized use of water throughout Asia.

a Total annual internal renewable water resources refer to the average annual flow of rivers and aquifers generated from rainfall within the country. Large seasonal variations may be concealed in annual data.

NOT ENOUGH WATER

First, the question of quantity. The experts label as water-stressed any countries with annual supplies of 1,000 to 2,000 cubic metres per person; countries with below 1,000 cubic metres are considered water-scarce. At the start of the 1990s, two dozen countries were in this water-scarce category, with a combined population of more than 200 million; within a generation, another dozen will join their ranks (see Figure 2). In the face of such scarcity, some countries withdraw more than their available annual water resources. How is this possible? Water withdrawal can exceed 100 per cent because excess water might be taken from a lake or river shared with another country or from an aquifer that doesn't replenish each year, known as fossil water. It's like running up an overdraft at the bank — in this case a continuing overdraft. Some striking annual water-withdrawal percentages: Libya (404 per cent), Qatar (174 per cent) and Saudi Arabia (106 per cent). Other countries like Egypt, Israel and Jordan are soon expected to be using all their renewable water resources.

FIGURE 2: Selected water-scarce countries, 1990 and 2025 (water supply in cubic metres per person)



Source: See endnote

These percentages and per capita figures camouflage a crucial fact: More than two-thirds of the water taken from the world’s rivers, lakes and aquifers is currently used for agriculture. To produce one tonne of grain requires 1,000 tonnes of water. Merely to meet the food requirements of the 2.6 billion new mouths projected for this planet by 2025 will require new water supplies equal to the flow of a dozen Nile rivers.

But competition for any water is growing; as urbanization and industrialization spread through the developing countries, the cities and factories divert water that once irrigated rice paddies and fields of grain. To put competing water interests in perspective, consider that the amount of water required each year for a hectare of irrigated rice land is enough to support 100 nomads with 450 head of cattle for three years, 100 rural families for four years, 100 urban families for two years or 100 luxury-hotel guests for 55 days.

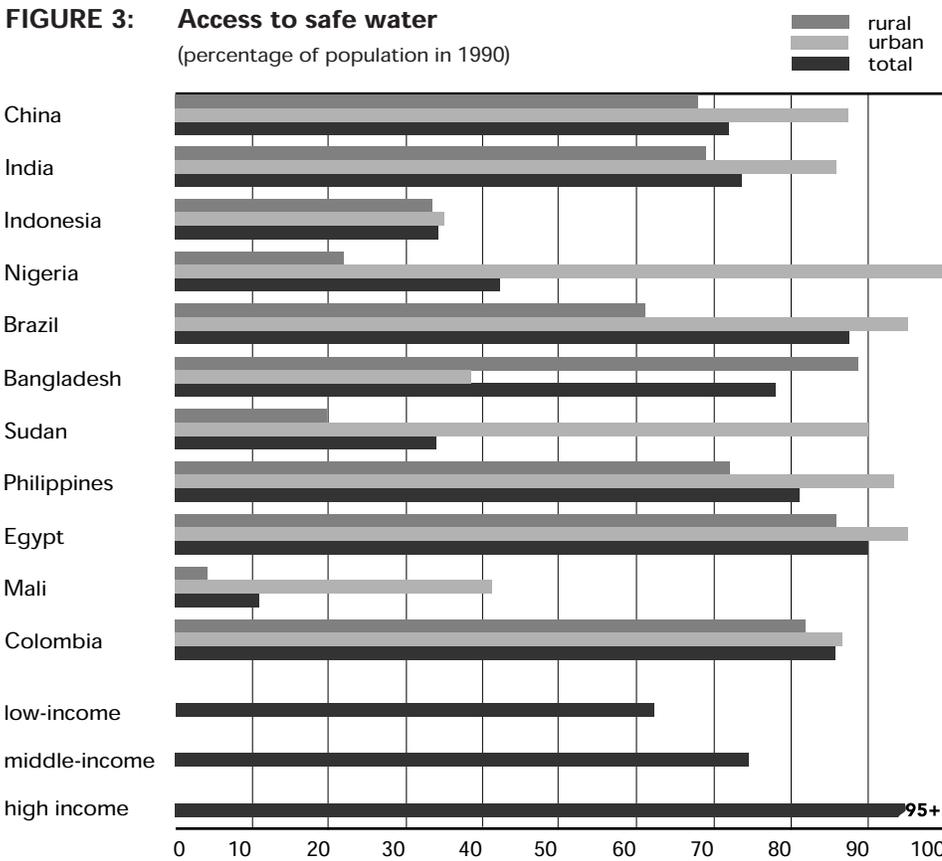
Of course, there wouldn’t be quite the water scarcity in developing countries if so much didn’t simply “disappear,” from leaks, from theft and from free delivery to non-paying customers. Countries like Bangladesh, the Philippines and Thailand experience water losses of 50 per cent. In Middle East countries like Jordan, Yemen and others with rising water scarcity, more than 40 per cent of the available water cannot be traced. According to the World Bank, nearly two-thirds of all water losses in these countries could be avoided, equal to increasing their actual water supplies by one-quarter.



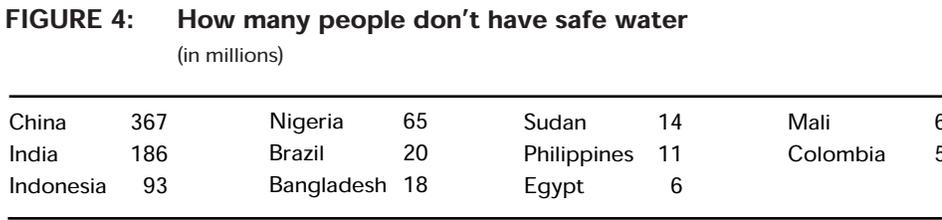
Leaks from farm holding tanks, like this one in Senegal, contribute to water scarcity.



Pollution from industrial wastes is widespread in many Western countries



In 1980, an alarming two-billion-plus people did not have enough safe water. The 1980s were proclaimed as the International Drinking Water Supply and Sanitation Decade, and 1.6 billion people were provided with adequate water, particularly in rural areas, where access to safe water doubled from 30 to 63 per cent. Despite this progress, only a few developing countries reached the objective of supplying water for all citizens (see Figure 3). By 1990, more than 1.2 billion people still lacked access to adequate water — most in Asia (China and India) and sub-Saharan Africa (see Figure 4).



ENVIRONMENTALLY OVERDRAWN

Of all the environmental impacts associated with water, the health toll from water polluted by human and animal waste is the most visible and most costly. The World Bank estimates that safe and adequate water and sanitation supplies would avoid two million deaths of children from diarrhea each year and hundreds of millions of infections from roundworm, schistosomiasis and other water-borne diseases. Water pollution from industrial waste also harms aquatic life in rivers and lakes with severe economic consequences for fisheries.

Less visible but no less serious is the contamination of groundwater, both by improper use of chemicals and hazardous wastes and by poorly managed irrigation. Each time irrigation water passes through the soil, it picks up mineral salts; these become more concentrated through evaporation in reservoirs. If not enough water is applied to flush these salts, then fatal chemical concentrations quickly build up at the plant roots. Ten per cent of the irrigated land in Mexico and India is damaged by excess salinity, 21 per cent in Pakistan, and roughly a quarter of irrigated land in China and the United States. The annual increase in the area of salt-afflicted land is quickly approaching the increase in land newly brought under irrigation.

Salinization carries a big price tag: Mexico loses a million metric tons of grain a year because of soil salinity, enough to feed five million people. Pakistan today spends more on pumping out salt-laden water than on irrigation. And there's a historical cost as well — perhaps a fifth of the arable land in present-day Iraq, site of the ancient Sumerian civilization, has been permanently destroyed by high salinity.

Excess pumping of groundwater amounts to depleting your resource capital, as opposed to pumping only what the hydrological cycle will naturally replenish, which is like living off the interest. Not only does this abuse permanently reduce the available water supply, it can also lead to land subsidence and water-logged soil, increasing erosion. And it's a global phenomenon: Aquifer depletion in North Africa currently amounts to 10 cubic kilometres a year, and water tables in India and China have also fallen sharply. But the world's biggest natural underground reservoir — the Ogallala-High Plains Aquifer System in the U.S.A. — has also witnessed the biggest modern environmental vandalism. Since the early 1960s, farmers have been pumping out 20 to 40 times more water than nature has been putting back in; the result has been enormous wealth for a favoured few in the states of Texas, Colorado, New Mexico, Kansas and Oklahoma, and enormous insecurity for future generations.

Insecurity can also develop when water is shared by two or more countries, with the concern rising as levels drop for the downstream states. The former UN secretary general, Boutros Boutros-Ghali, when foreign minister of Egypt, noted: "The national security of Egypt is in the hands of the eight other African countries in the Nile basin." More than 40 per cent of the world's population lives in river basins shared by more than one country, and countries like Egypt, Hungary, Botswana, Cambodia and Syria all receive well above three-quarters of their available water supplies from the river flows of upstream countries. As water scarcity rises, so could the potential for international disputes and hostilities.



Egyptian women washing clothes in a contaminated canal risk schistosomiasis infection from snails.

The costs of subsidies

It's time for a reality check: Aquifers are being drained, rivers are drying up, more than a billion people still don't have access to safe water, and vast tracts of irrigated land are being lost to salinity; over all, water is being lost in flood proportions and used inefficiently and for low-value purposes. And what are governments doing? Subsidizing this ecological vandalism, natural resource waste and economic perversity by selling water well below actual supply cost, much less market value. The message of a subsidy is clear: There's plenty of water; don't worry about conservation or higher efficiency or recycling. Let's look in detail at subsidies for drinking water and irrigation.



Agricultural waste, like the run-off from pig-rearing, is a problem in both industrialized and developing countries.

OECD COUNTRIES

Studies have found that user charges are usually high enough in Western industrialized countries to cover the annual operating and maintenance costs of public water supplies. Yet subsidization of capital costs through grants is common, usually amounting to a minimum of one-fifth of the total financing bill and often rising to two-fifths. For irrigation projects, however, subsidization of capital costs can reach four-fifths. In the U.S., one study found, such subsidies conferred supernormal profits — which economists carefully call “economic rents” — of as much as \$500 per irrigated hectare.

In Australia, water charges are largely nominal in the major agricultural region, the Murray-Darling river basin. In the United States, the federal government actually incorporated a two-stage subsidy in the way it set prices for irrigation water. First, the contractual water prices were based on an irrigator's ability to pay rather than on the actual cost of supplying the water. Second, no interest was charged on the loans to fund construction costs. Researchers calculated a water subsidy of nearly \$100 million for 17 projects alone. The annual irrigation subsidies for the whole country from such underpricing have been estimated at between \$2 billion and \$2.5 billion. Furthermore, subsidized irrigation stimulates farmers to grow surplus crops, for which the federal government, until recently, operated acreage-reduction programs. U.S. farmers thus received a double subsidy, through irrigation and through farm support programs.

Even with such huge subsidies, irrigation projects are often still not economically viable. Consider the Animas-La Plata dam project in Colorado. Three-quarters of the \$710 million total cost is going to provide irrigation water to farmers, who would repay only three per cent of construction expenses. Government auditors have stated that the project will deliver less than 40 cents in benefits for every dollar spent. Or take the California Central Valley Project, where 70 per cent of the profits from what is supposed to be the richest farmland in the world at one point came solely through taxpayer subsidization.

DEVELOPING COUNTRIES

The World Bank estimates that governments recover about a third of the cost of providing drinking water services in developing countries, sticking themselves with an annual underpricing bill of some \$13 billion. This bill is sure to grow, since cities are burgeoning and the unit costs of new water supplies will soon double and even triple, without including environmental costs. Recent water works in Amman, for instance, involve pumping water about 40 kilometres to the Jordanian capital and up an elevation of 1,200 metres. Imagine stacking the two Petronas Towers of Kuala Lumpur — the world's tallest buildings — atop one another, adding something like New York's Chrysler Building and then carrying buckets of water up stairs to the very top. That's the energy required to pump water up a height of 1,200 metres. No wonder that the cost of water to Amman will jump from 41 cents per cubic metre now to \$1.33, within the cost range for desalinating seawater.

As noted earlier, the World Bank estimates avoidable water losses in developing countries at about a quarter of the total water supply. Avoidable losses are effectively subsidies, a transfer of resources; sooner or later, they will have to be covered by the public budget. The revenue forgone from illegal connections can be calculated at \$5 billion, while the budgetary savings from reducing leakage are estimated at an additional \$4 billion. In summary, subsidies and potential budgetary savings in the drinking water sector in developing countries currently amount to \$22 billion, with no provision for future rising costs.

The questionable finances of drinking water services pale, however, compared to those for irrigation. A 1986 study estimated cost recovery in developing countries for irrigation no higher than 10 to 20 per cent. Actual revenue was often not sufficient to cover even operating and maintenance costs, let alone capital costs. More recent investigations suggest little has changed: Farmers in perpetually parched Tunisia pay no more than a seventh of the cost of the irrigation water they receive. Based on a cost recovery rate of 20-25 per cent and total costs of about \$25 billion, subsidies to irrigation in developing countries can be tentatively calculated between \$20 billion and \$25 billion annually.

In total, subsidies for drinking water and irrigation in developing countries amount to \$45 billion per year.

Reforming subsidies

Start with the realization that, for economists anyhow, water can run uphill — if that's where the higher prices are. Also understand that managing water systems is no longer a job exclusively, or even primarily, for engineers; the necessary skills today are also those of diplomats, economists, ecologists and systems analysts. Finally, realize that much of the world's current food production already depends on water uses unsustainable in the medium term. Now look at the impact from removing the subsidies themselves.



Drinking water projects are often heavily subsidized but usually benefit the richer parts of the community.

ECONOMIC AND ENVIRONMENTAL IMPACT

There are almost no studies about the large-scale impact of removing water subsidies for the simple reason that few governments have had the necessary political will to act. One *theoretical* study, however, predicted that there might be an economic cost to drastically overhauling the subsidies in Morocco's agricultural sector. While water use would be slashed by about a third, both real GDP and real income could fall by as much as one per cent. Since 92 per cent of all Morocco's water is already used in agriculture, with only 10 per cent cost recovery, and since a water deficit is projected soon for the country, that one-per-cent drop might be thought bearable in the circumstances. But the researchers also predicted that the GDP decline could be transformed into an *increase* if water subsidy reform were part of a larger trade liberalization movement.



In Calcutta, men wash themselves at a street pump. Yet the poor are willing to pay for reliable water service.

On a scale somewhat smaller than an entire country, empirical research is much more plentiful, if only slightly more helpful. Studies have shown that water supply projects achieve only half the average rate of return of World Bank projects generally. In strict economic terms, then, the Bank could get a lot more development bang for its bucks by investing in other areas.

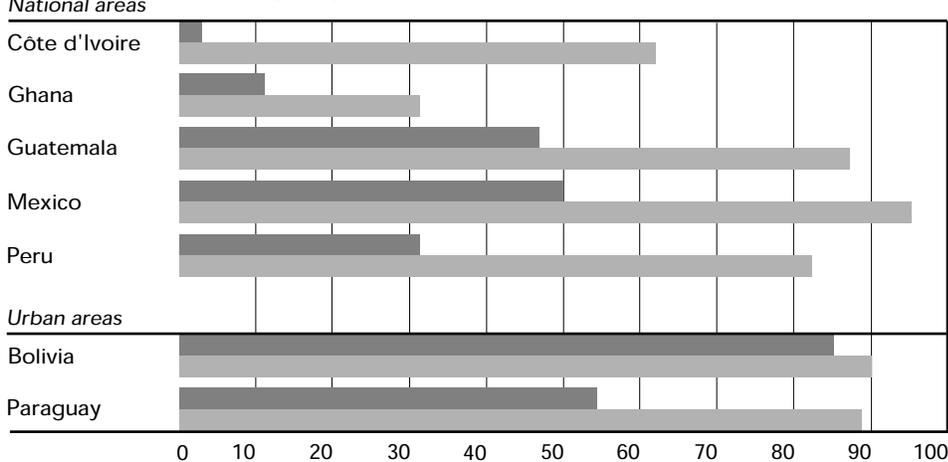
Other studies point to an environmental payoff when prices for irrigation water are tied to the volume actually used or applied in incremental tiers. This is to be expected since research had already found large price elasticities for agricultural water; a 10 per cent hike in price could be expected to trigger a drop in demand of 15 to 20 per cent. The environmental payoff comes in a push for greater efficiency throughout the entire system. For example, cost-conscious farmers are less liable to overuse water, thus reducing the risk of soil salinization and waterlogging.

SOCIAL IMPACT

There is a double misconception in the widespread belief that water subsidies are necessary to support the poor. First, it is fallacious to assume that the poor need low water prices because they would not be able to pay high prices. In a multicountry study of rural water demand, the World Bank found that the willingness of most people, and in particular the poor, to pay for water services is often very high, if the service is reliable. In fact, poor people are already paying more. The price of privately sold water, on which poor people rely, is typically between \$2 and \$3 per cubic metre, 12 times higher on average than the price of piped city water. The latter is subsidized, the former isn't.

Second, it is fallacious to assume that water subsidies mostly benefit the poor. Quite the opposite: Subsidies for drinking water favour the rich disproportionately, since they have more ready access to public water supplies. Between 80 and 90 per cent of the richest fifth of the population in some developing countries have access to the public water supply, compared with at most 30 to 50 per cent of the poorest fifth (*see Figure 5*). As a result, poor people, usually not connected to the water system, spend up to 20 per cent of their budget on water bills, proportionately three times more than richer groups.

FIGURE 5: Who gets subsidized water services (percentage of group)



Irrigation water subsidies also tend to benefit the rich more than the poor. Well-off farmers are simply in a better position to take advantage of the opportunity: They already occupy the most prosperous lands and have access to the credit to invest in wells and pumps. In the village of Bhadresar in Gujarat, India, upper castes owned 120 of the 128 electric pumps in 1988.

The evidence reveals a vicious circle. When water services are heavily subsidized, their quality is low and service expansion relatively slow because of lack of resources and their inefficient use. The consequences are that the rich benefit while the poor still have relatively high water expenses. At the same time, the health of the poor suffers most from low quality water services.

The main conclusion is that low water prices generally do not benefit the poor. However, this does not necessarily imply that water subsidies are bad and should always be avoided. Instead, they have to be changed to target the financing needs of the poor more cost-effectively. Governments may, for instance, choose to subsidize micro-credit, or issue subsidized water stamps for the poor or apply “lifeline” water pricing (a low rate for a basic service level and an increasing rate above). When carefully implemented and targeted, such reforms of water subsidies may very well improve the lot of the poor.

The consequences are that the rich benefit while the poor still have relatively high water expenses.

Lessons for sustainable development

Humanity began by believing that because water fell freely from the skies, it was a free good. Later, when water had become a symbol of ritual purity, it was felt it should not be tainted by grubby mechanisms of the market. Even today, some cultures ban the buying and selling of water. However, as this chapter demonstrates, we must redefine our relationship with water if we are going to protect the purity, security of supply, equitable access and efficient use of water that are important to all the peoples of Earth.

That redefining has to start with introducing demand-management policies for water to compliment the traditional supply-oriented thinking. This new unified policy approach should help in the most difficult question: the equitable reallocation of water between different users, and different uses. But the task does not stop there. Reforms to current pricing and incentive measures, institutional changes, technical improvements and education and information are all needed to promote sustainable water development and use. Such sweeping change will go more easily if governments and organizations keep in mind some proven principles drawn from real-life experiences in developing and developed countries.



In Brazil, water is stored in a tree reservoir. Villagers like these must be part of water management schemes.

First, recognize that water has an economic value in all its competing uses, whether those devised by nature or by humanity. It follows that a greater use of economic instruments in water policies is desirable; sound water pricing in general, and subsidy removal in particular, will achieve more sustainable patterns of water use. Water prices should at least cover operating, maintenance and capital costs of systems, earning an appropriate rate of return. Moving toward sound water pricing also will generate the new resources necessary to expand water services, giving access to the poor and other marginal groups. Eventually, social and environmental costs should be incorporated as well.

Treating water as an economic good also necessitates the reform of irrigation policies. Begin by removing subsidies and then adjust pricing to encourage sustainable practices. Similarly, a demand-oriented approach means the water use must not only be effectively metered but competently policed as well; this is one of the surest ways to reduce water losses. And demand can be reduced through improved technology, such as low-flow devices in showers and toilets and better surveillance and control in agriculture.

Yet it is always essential not to lose sight of the user. In fact, few of the above measures will bear fruit unless decisions are made at the lowest possible level with all key shareholders taking part in overall management. This philosophy ensures that pricing will be flexible, tailored to individual groups, and designed to make sure the poor can afford their basic water needs.

None of this will be easy, and some will tax both our institutions and our patience. But it is a noble task, ensuring the sustainability of water, the very elixir of life. As the Greek poet Pindar noted in the fifth century BC,

Water is the most precious of all the elements,
Just as gold is the most valuable of all goods,
And just as the sun shines brighter than any star.

Agriculture: the bountiful earth

(and how to keep it that way)

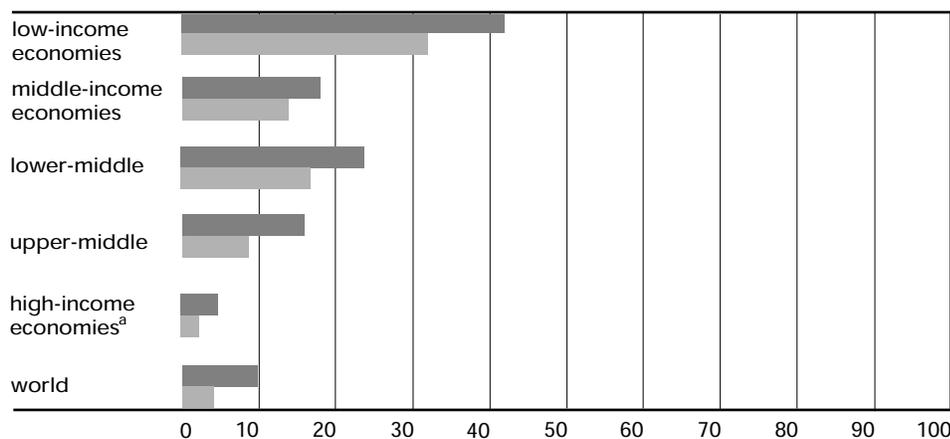
If water is the elixir of life, then grain is most assuredly the staff of life. It's also the mainstay of agriculture, since grain still provides more than half of humanity's daily calories. The domestication of wild grains — wheat, rye, barley, oats, millet and spelt — gave birth to agriculture 15 millennia ago on the shores of the eastern Mediterranean. And also independently in other regions, historians speculate. This emergence of agriculture in places as far apart as the valleys of the Tigris and Euphrates, the Indus, the Yellow River and the Nile is not as odd as it first sounds. Agriculture, after all, stems from making use of the immediate environment: land, wood and water. Little wonder that cultivation, herding and harvesting have so permeated the world's religions, cultures and history: Agriculture was the first engine of economic development.

With the Industrial Revolution began a decline in the relative economic importance of agriculture which has accelerated during the past 25 years (see *Figure 1*). While the world's economy grew by 3.7 per cent annually from 1965 to 1990, agriculture grew at an annual rate of merely 2.1 per cent. More telling is the race between two other statistics: population growth and food production. Throughout the fifties, sixties and seventies, the news was largely good, with the Green Revolution — improved seeds, intensive cropping and extensive use of fertilizers, pesticides and irrigation — bringing leaps in agricultural productivity. In 1969, one in three persons on Earth faced chronic hunger; today, one in five does.



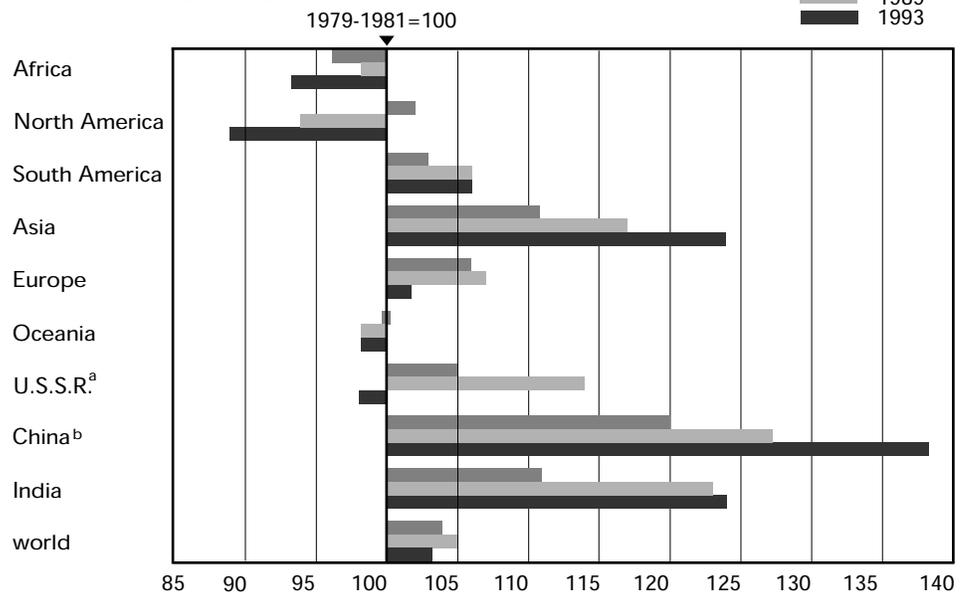
In the Andes of Peru, the potato is a crucial source of daily calories.

FIGURE 1: Declining economic importance of agriculture (as percentage of Gross Domestic Product) ■ 1965
■ 1990



a OECD countries only, 1992

FIGURE 2: Just barely keeping up: food production per capita compared to 1979-1981



a 1991 for most recent year
b 1992 for most recent year



The Ethiopian highlands are one of the few places in Africa where wheat grows well.

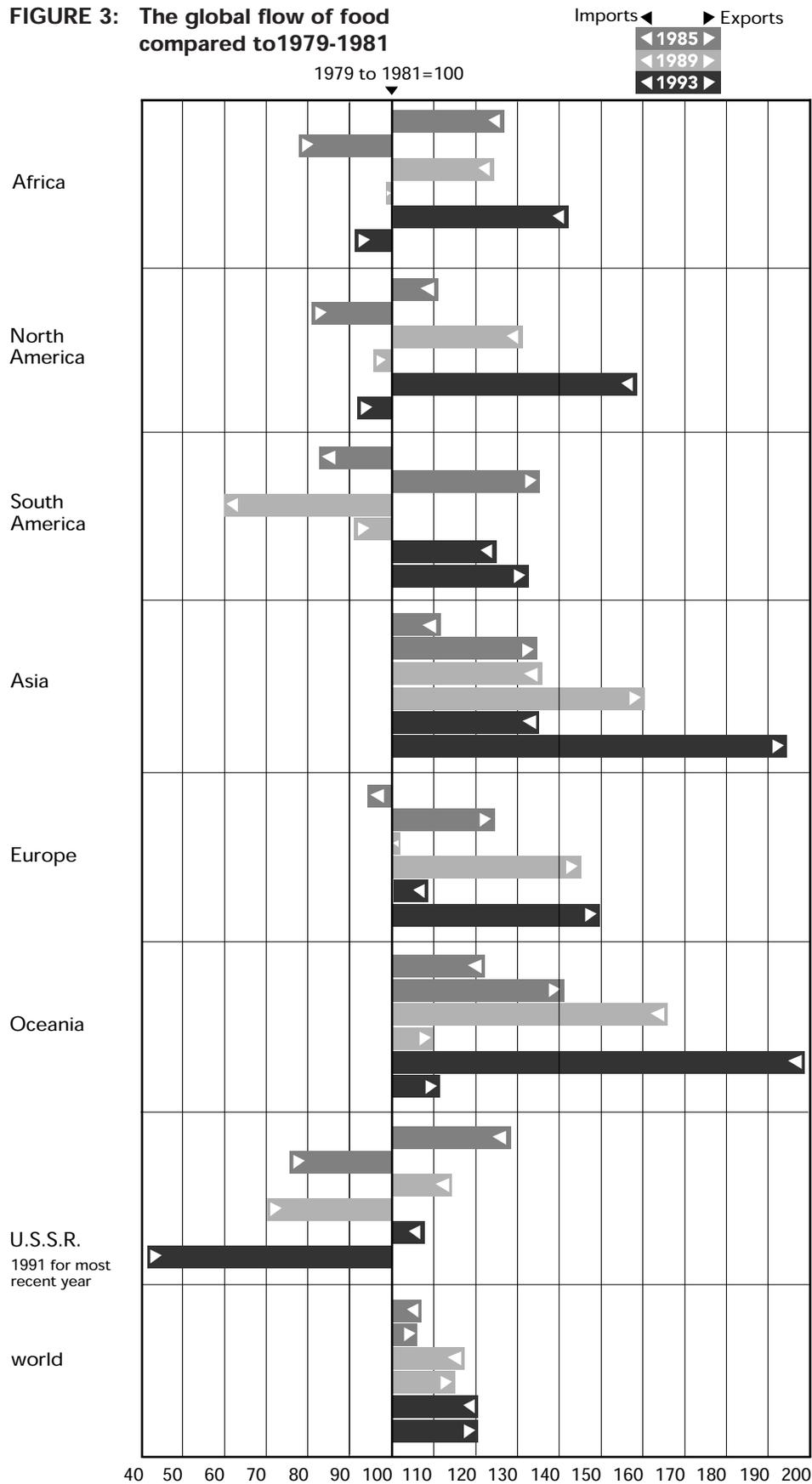
Lately, however, population has been pulling ahead in this race, adding 90 million more mouths to feed every year. As Figure 2 shows, the 30 per cent growth in global food production from 1980 to 1993 has barely kept pace with population growth over all; it's fallen behind most in Africa, where some 15 countries today face chronic famine. Even more troubling has been the recent steady drop in per capita grain production, by 13 per cent since 1990. This fall can be traced to smaller harvests following a general decline in fertilizer use, especially after fertilizer subsidies were removed in the former Soviet Union.

Changes in population, income and food production help determine the flow in agricultural trade. On average, food imports have increased by 1.5 per cent annually between 1980 and 1993 (see Figure 3), even more in Africa and North America where per capita food production has declined. Exports of food have dropped dramatically in the former Soviet Union, but risen in Asia and, to a lesser extent, Europe. In Africa, the drop in both the volume of food exports and in their prices has cut export earnings of many countries and worsened their external debt.

GRIM PROSPECTS?

While the Green Revolution seemed to rout the prophets of mass famine, the victory may have been only temporary. As we have seen, recent trends in agriculture are not encouraging. The FAO optimistically forecasts that increased yields will generate two-thirds of the projected growth in agricultural production in most developing countries until the year 2010, with expansion of arable land and more intense cultivation accounting for the rest. Land expansion for agricultural purposes, however, usually comes at an ecological cost: It often involves cutting down forests, and land without trees often cannot sustain agriculture for long.

FIGURE 3: The global flow of food compared to 1979-1981



Per capita production of grains, such as this millet being harvested, has been dropping in Africa

The FAO's rosy scenario is for the global picture only. Somewhat less clear is the availability of food for specific regions and countries. There are three kinds of potential barriers: physical (infrastructure, marketing and storage), economic (too poor to buy enough food) and political (national instability). Current forecasts indicate a tremendous challenge ahead to improve food availability, and even the FAO's optimistic projections will still leave 400 million people undernourished two decades from now.

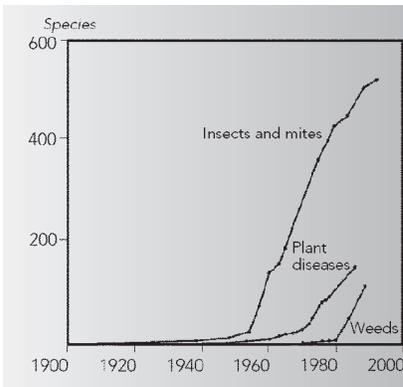
Equally important is the challenge of increasing global agriculture production without continuing the unsustainable demands made on the environment in recent decades — practices often spurred and propped up by subsidization. There's not much point in feeding the nearly eight billion passengers expected on Spaceship Earth by the year 2020 if the spaceship is damaged beyond repair in the process. Some damage is already close to irreparable, such as the declining fertility, widespread contamination and mass erosion of soil.

This gloomy assessment is possible only because the United Nations coordinated scores of researchers to produce the first account of global soil degradation in 1990. The study found that about one-quarter of the degraded soils around the world have resulted from poor agricultural practices — overgrazing, curtailing fallow periods and cultivating hillsides without erosion precautions. In the most extreme cases, degraded topsoil simply blows away on the wind, tens of tonnes per hectare in one year. (Nature creates roughly a tonne of topsoil per hectare per year, so a generation's inheritance is being lost annually in such widespread erosion.) Overuse of land or cultivation of marginal lands usually involves extensive irrigation and overuse of fertilizers and pesticides, all aggravating soil degradation. Another environmental legacy of such exploitation can be desertification, if the loss of vegetation or deforestation is severe enough.

Yet the complex relationship between agriculture and environment is surely not only negative. Agriculture might produce environmental benefits as well, such as conserving the rural landscape, biodiversity and ecosystems. Consider, for instance, two possible effects of taking land out of cultivation. On the one hand, there may be environmental benefits, while on the other, this preservation could equally lead to overexploitation of the land remaining in cultivation.

The costs of subsidies

Governments have never made any apologies for intervening heavily in the agricultural sector, ostensibly for the best of reasons — safeguarding an adequate and reliable food supply at reasonable prices to consumers and maintaining farm income. More recently, the promotion of regional development and environmental protection have become explicit objectives. Yet pursuing all these policy goals simultaneously is proving difficult and very costly.



Pesticide-resistant species since 1908

Source: State of the World, 1966

FIGURE 4: Total transfers from agricultural policies in OECD countries
(in billions of U.S. \$)^a

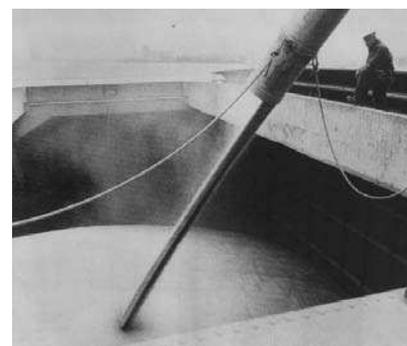
	1986-1988	1990-1992	1993	1994 ^e	1995 ^p
transfers from taxpayers	123	148	170	162	168
transfers from consumers	170	195	196	192	189
subtotal	293	343	366	354	357
budget revenues ^b (subtract)	14	16	29	19	21
total transfers	279	327	337	335	336
in % GDP	2.5	2.1	1.9	1.8	1.7
per capita	341	382	385	379	378
per hectare	236	277	288	286	287
% producer subsidy equivalent ^c	45	42	42	42	41

- a 1994 is estimated (e) and 1995 is provisional (p).
b Includes estimated revenues from tariffs on imported commodities. This component needs to be subtracted from transfers from taxpayers and consumers to obtain total transfers.
c % producer subsidy equivalent expresses producer subsidies as a percentage of the value of production.

OECD COUNTRIES

Agricultural support measures in the Western industrialized countries are many and varied. About 60 per cent of total assistance is dedicated to supporting market prices, although this proportion is slowly dropping as governments shift towards straightforward budgetary payments. Examples of market support include export subsidies, import taxes and intervention prices; non-price support measures include subsidies for inputs such as fertilizers and pesticides, as well as for inspection services, research and training. Total transfers from taxpayers and consumers reached \$335 billion in 1995, equal to 1.7 per cent of GDP. In earlier terms, OECD agricultural support policies were the equivalent of transferring \$16,000 to each full-time farmer, or an additional \$1,500 on the annual food bill for a family of four. (See Figure 4 above.)

Over all, agricultural subsidies to producers amounted to \$182 billion in 1995 (see Figure 5 on next page). Livestock products receive 60 cents of every dollar of producer subsidies, with milk getting the largest share; the remaining 40 cents was spent subsidizing crops, with half devoted to rice, for which subsidies can amount to 90 per cent of the value of production. In relative terms, agricultural support is highest in Switzerland, Norway, Finland and Japan; these countries provide the most support per capita, per full-time farmer, per hectare of agricultural land and as a percentage of production. In absolute terms, the biggest subsidizers are the European Union, the U.S.A. and (again)



Export sales of grain through a government agency are just one of the many hidden subsidies enjoyed by agriculture in industrialized countries.

FIGURE 5: Agricultural subsidies in OECD countries, 1995

	Billions of U.S. \$	Producer subsidy equivalent
milk	52	60
beef and veal	35	40
rice	34	93
other	62	
total	182	41
livestock	106	38
crops	77	47

Japan. Both New Zealand and Australia have modest support levels, measured either relatively or absolutely.

This continued high level of support, measured in almost every way, emphasizes the addictive hold of subsidies, despite the noble founding principles of bodies like the European Union. While there is a wide variation among countries, total agricultural transfers in the OECD have increased from the mid-1980s to the mid-1990s in absolute terms, per capita, per full-time farmer and per hectare.



With famine relief common in the last few decades, food prospects are grim for much of Africa.

DEVELOPING COUNTRIES

A big problem in developing countries has been deliberate discrimination against agriculture through various macro-economic policies and interventions. A 1992 World Bank study concluded that agricultural producers in 18 developing countries effectively paid an average 30 per cent tax between 1960 and 1984 because of direct and indirect government policies. Many developing countries, like the 18 under study, have overvalued their currencies because of large budget deficits and their desire to protect domestic manufacturers. These rates hurt agriculture by raising domestic prices relative to world prices and by reducing the purchasing power of farm households. Such indirect interventions accounted for three-quarters of the tax on agriculture in the World Bank study; direct interventions such as export taxes and food crop quotas were less important.

As a result of this discrimination, income transfers out of agriculture have been enormous, averaging 46 per cent of agricultural GDP annually. The rationale behind these policies was to use the revenue from taxing agriculture to force the pace of manufacturing, since many economists believed agriculture was unresponsive to price changes. In fact, the World Bank study found that growth rates — over all and for agriculture — were highest in those countries that least discriminated against agriculture. There is no hard evidence to show whether agriculture is still so heavily taxed today, but many of the underlying policies persist.

To compensate farmers, governments in developing countries have generally turned to subsidizing credit and agricultural inputs such as irrigation, fertilizers and pesticides. In some cases consumers have also been supported by policies that keep food prices low. These food subsidies have been a major drain on public budgets in food-importing countries. Together these producer and consumer subsidies accounted for almost five per cent of annual government spending over 25 years, implying subsidies of roughly several billions of dollars each year.

And that's not all. Pesticides benefit from both price and non-price subsidies in developing countries, including preferential tax treatment for pesticide research. An early and comprehensive study calculated average subsidy rates of nearly 50 per cent for pesticide use. Another researcher estimated that developing countries spent \$4 billion on pesticides in 1990. Some quick arithmetic produces a tentative estimate of \$2 billion annually for pesticide subsidies. Governments in developing countries also heavily subsidize the use of fertilizer, at rates ranging from 50 to 90 per cent. In India, the bill for fertilizer subsidies soared from \$1-billion-plus in the early 1980s to \$2.5 billion in 1992.

Despite all these examples, there are no recent, comprehensive statistics on total agricultural subsidies in developing countries. A cautious back-of-the-envelope calculation produces a rough estimate of \$10 billion annually.



The overuse of pesticides for rice, encouraged by heavy subsidies, has often had disastrous results.

Reforming subsidies

The gains in agricultural production over the past decades have been impressive. Even more impressive — and unacceptable — has been the cost: the degradation of soil, the deliberate impoverishment of some farmers and just as deliberate enrichment of others, the pesticide poisoning of water, air and soil. It is a price the Earth cannot sustain. And subsidies are a big part of the problem.

ECONOMIC IMPACT

OECD subsidy policies focus on price support to farmers, measures that are particularly distorting because they raise domestic produce prices for farmers, spurring increased production. Moreover, such support also encourages farmers to use more agricultural inputs, just as does directly lowering the costs of inputs.

Numerous empirical studies have concluded that consumers and taxpayers in Western industrialized nations stand to gain substantially more from subsidy removal than farmers would lose. Indeed, if subsidy reform is well conceived and managed, farmers need not lose at all. For proof, look no further than the poor efficiency of OECD agricultural transfers in actually achieving the original objective of maintaining farm income. The transfer efficiency ratio — defined as the ratio of income gained by the farm household to the costs borne by consumers and taxpayers — is very low, because higher output (produce) prices encourage farmers to spend more on inputs. Furthermore, there are opportunity costs when resources are diverted to the production of sub-

sidized commodities. Finally, terms of trade are likely to worsen as a result of agricultural protectionism, making imports cost more.

Even with a generous interpretation, the transfer efficiency ratio in the OCED is no better than about 0.2, meaning that for every \$5 of support from either taxpayers or consumers, only \$1 ends up as additional farm income. Of the \$4 remaining, 25 cents reflects the extra costs to consumers and taxpayers from income losses and export subsidies, \$1 covers the opportunity cost of diverted household resources and \$2.75 is spent by farmers to purchase additional inputs. In other words, consumers and taxpayers in Western industrialized countries divert \$335 billion each year to transfer \$66 billion to farmers.



Development aid can combat creeping deserts, a major threat to arable land in Africa and elsewhere.

There is a better way. An OECD study analyzed the transfer efficiency of competing policy options and concluded that direct income support was tops in seven out of 10 categories. More specifically, direct support deters trade the least, has the least impact on resource allocation and puts more money into the hands of the intended recipients. Input subsidies, the preferred choice of many governments, have been judged the most distorting.

An added benefit of OECD subsidy reform would see developing countries grow more of their own food. Why? Because a permanent reduction in protectionism in industrial countries should lower the artificially maintained domestic food prices in developed countries and increase both food prices and their stability in developing countries. Together these developments would stimulate the growth of agricultural productivity in developing countries while lowering it in industrial countries. Several scenarios of trade liberalization agree generally that prices on the international market for meat, dairy products and sugar would rise, anywhere from 10 to 90 per cent.



Overgrazing by cattle often causes severe soil erosion.

Recently, detailed studies in both the U.S.A. and Europe have come to similar conclusions: Severing the connection between support payments and agricultural production is the most promising policy option. This “decoupling” will reduce the fiscal burden, increase the efficiency of agricultural production without necessarily harming farm income, and definitely benefit the environment. Farmers will choose to invest their time, money, land and other resources based on real prices, without distorting subsidies. Decoupling has an even greater chance of success if the biggest agricultural subsidizers — the European Union, Japan and the U.S.A. — embark on the reform together. Linking any remaining producer support to a sound conservation approach on the farm would further enhance environmental gains.

There is also plenty of scope for improving agricultural performance in developing countries. Although the subsidization of agricultural inputs may partly compensate financially for the taxation of output, both approaches create distortions and inefficiencies in agricultural production. Artificially lowering the costs of such essentials as pesticides and fertilizers through subsidies mostly encourages farmers to use more than they need. Some analyses indicate that such input subsidies are the most distorting, with the largest economic costs and much of the payment leaking away before reaching the target; their removal would benefit both agricultural production and the public budget.

ENVIRONMENTAL IMPACT

The environmental benefits from breaking the link between subsidies and agricultural production are undeniable, even if their precise nature and size can't be calculated in advance. Too much depends on how individual farmers react to new, higher prices that will vary with specific crops and products. Yet the direction is clear. Instead of subsidizing farmers to maximize the exploitation of their lands, the incentive structure should support and encourage them to conserve. The result: more efficient production and less exploitation of land.

Reducing subsidies for inputs is also likely to be environmentally positive; the evidence indicates that excessive use of pesticides, fertilizers and other agricultural inputs generally damages the environment and, ultimately, reduces agricultural productivity. A classic example of such unintended consequences occurred in Indonesia when overuse of pesticides routed the natural enemies of the brown rice planthopper, until then a minor pest. In what the Worldwatch Institute calls "a two-year feeding frenzy", the bug ruined some \$1.5 billion worth of rice, prompting the government in 1986 to cancel pesticide subsidies. The good news is that pesticide applications each season then plunged to half previous levels and the treasury pocketed the \$100 million in former annual pesticide subsidy payments. And rice production still grew by three million tonnes over the next four years.

SOCIAL IMPACT

A common political justification for agricultural support policies is to "protect the family farm" by maintaining farm income. In fact, most subsidies do nothing of the sort, since they are based on how much is grown, not on the size of the farm. And even then they are inefficient. For every \$5 of support from either taxpayers or consumers in Western industrialized countries, only \$1 ends up as additional farm income. Furthermore, the largest subsidy benefits go to large agricultural producers who are commonly the richest farmers. In the United States, more than a third of government payments in 1991 went to the wealthiest five per cent of farms, with annual gross cash income of \$250,000 or more. Small farms with a cash income below \$40,000 got only 17 per cent. In developing countries, input subsidies, particularly for irrigation and pesticides, also tend to benefit large farms. And wherever equipment or credit subsidies favour large mechanized farms, their removal would not particularly hurt small farmers.

Nor can the current multi-billion-dollar levels of agricultural support in Western industrialized countries be justified on equity grounds. Once off-farm earnings are included, OECD farmers collectively have a higher net worth than the average household. But there is one legitimate equity concern too often given short shrift. Landless people, including the urban poor in developing countries, are likely to be the losers from any multilateral subsidy reform. They would be confronted with higher domestic food prices without (unlike farmers) any increased means to pay. Specific compensation, such as food stamps, would be needed to ensure their access to food.



Cultivation of marginal lands, often encouraged by subsidies, can bring mass erosion.

Lessons for sustainable development

A touch of humility is not amiss when making recommendations about the future of agriculture. That web of life is complex indeed. Who could possibly have predicted that the introduction of sugar cane by Christopher Columbus would have produced such environmental and human catastrophe? The cane plantations became the first wave in the assault on the tropical rain forests of the New World and also the excuse for the enslavement of tens of millions of Africans as plantation labour.

Yet parts of the path towards environmentally sustainable agriculture are clearly illuminated. OECD countries not only need to reduce their level of agricultural support, as they have committed to do, but they must quickly find the political will to decouple subsidies from agricultural production. This could imply replacing production-linked programs with direct payments to needy farmers or linking support to sound conservation practices. Similarly for developing countries: Instead of subsidizing agricultural inputs, move towards assisting farmers directly.

Here, then, are three stepping stones on the path to sustainable agriculture:

- In general, subsidies should promote conservation rather than encourage exploitation. All agricultural production should be made subject to the polluter-pays principle.
- Europe, Japan and the U.S.A. — the three major OECD blocks — should lead the way towards “multilateral decoupling” and join other industrialized nations in opening their agricultural markets to developing countries, as they have pledged under international agreements.
- Developing countries should remove subsidies for agricultural inputs and allow production prices to rise to world levels. At the same time they must ensure that poor landless people can afford to eat, for instance by targeted compensation through food stamps.

These reforms alone cannot guarantee that Spaceship Earth will be able to feed more than two billion additional passengers by 2020 in an environmentally sustainable manner. What is guaranteed, however, is that without them, without an end to such perverse subsidies, the agricultural cycle of renewal and hope born every Spring will be shattered beyond repair. Persephone, the symbol of renewal in ancient Greek legend, will not appear but languish forever in the dark realms of the dead.



Emergency grain shipments have so far managed to head off mass starvation in the Horn of Africa.

An all-consuming energy

(and the need to curb it now)

From the Shinto myths to the legends of the Karuk Indians of California, from the gods of the ancient Greeks to those of Polynesia, the tale is the same: To obtain fire, you must suffer. Izanagi, the August Female of the Japanese creation story, is mortally wounded giving birth to the god of fire. In Polynesian legend, the guardian of the sacred fire, Mahuika, engulfs in flames her own son, and eventually the world.

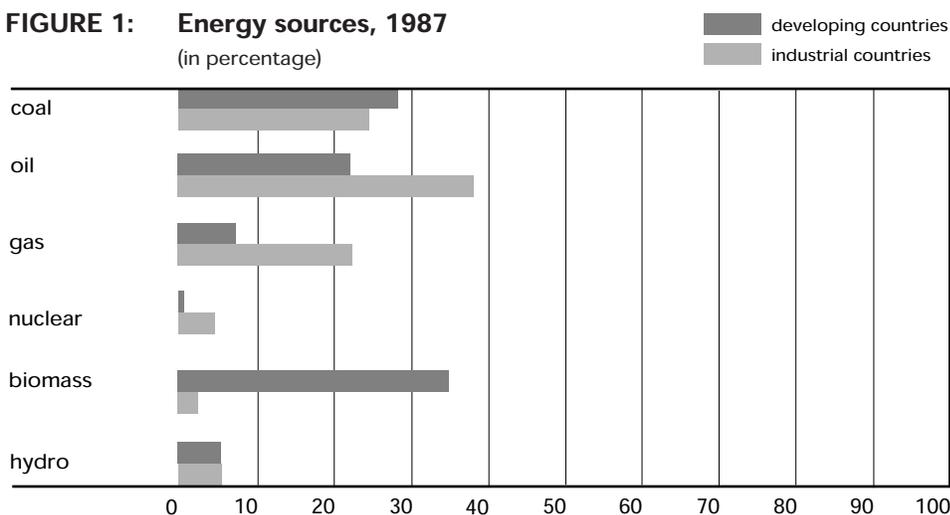
Fire was the stuff of frightening legends and strict religious observance for early civilizations because it provided the only light against the night and warmth against the cold. It still does for the poor in today's world, with the burning of wood, animal dung and stalks accounting for a third of the total energy consumed in developing countries (see Figure 1).

But almost everything else about energy use has changed dramatically in the past 100 years. First came the spread of electricity in the industrialized world with Thomas Edison's original power station in 1882, followed quickly by a global trade in petroleum through the great oil companies (the Seven Sisters), the "Atoms for Peace" of nuclear power and, finally, the emergence on the world scene of natural gas as an abundant and low-cost fuel. Over the past 50 years, global energy use has quadrupled, driven primarily by the seemingly insatiable appetite of the wealthy industrialized world for oil. Yet demand for oil is more price-sensitive than once thought. After the first oil shock in 1973-74, a blue-ribbon panel of economists forecast that demand in the industrialized West would drop no more than two per cent for every 10-per-cent rise in the price. In fact, the price/demand ratio was more than twice that from the mid-seventies through the mid-eighties.



The spark from Edison's original power plant has spread around the world.

FIGURE 1: Energy sources, 1987
(in percentage)



Commercial energy use and income levels, 1992

Energy use per capita
(Based on kilograms of oil equivalent)

low-income countries	338
middle-income countries	1812
of which lower middle	1891
upper middle	1658
high-income countries	5101
world	1447

Still, global energy demand is expected not only to continue growing but to accelerate as commercial energy consumption in low- and middle-income countries closes the gap with the richer nations (*see list in outside margin*). Industrialization in developing countries meant during the same mid-seventies to mid-eighties period that a 10-per-cent rise in income produced as much as a 20-per-cent increase in electricity use or 15-per-cent greater consumption of natural gas.

These demand-favouring relationships for both price and income have led some economists to predict that the world will be consuming six times as much total energy after the next 50 years have passed. But others favour lower growth forecasts, pointing out that how people and corporations spend their income in the future may be altered by factors not reflected in these current ratios, such as materials substitution and saturation (even if your income doubles, you may already be driving your car as much as you want to).

One reason for the seemingly inexorable growth in demand is that energy, especially cheap, readily available energy, is often the key to economic development. That link is evident in the ranking of the main energy-consuming sectors: electricity, industry, transport and households; fully a third of commercial energy is used to generate electricity, with coal accounting for a large part. Not as evident is another link, one foreshadowed by the suffering that fire brought in the ancient myths and legends: the mounting environmental toll from such all-consuming energy.

ENVIRONMENTAL TOLL

There are two main environmental issues for energy: specific pollution problems from energy use and the depletion of non-renewable resources. In general, the non-renewable forms of energy — coal, oil and natural gas — are more polluting than the renewable forms — solar, wind and water. In a class of its own is nuclear power, which has a theoretically high renewable component and negligible air pollution, but potentially huge problems with safety generally, the safe disposal of waste and the ever-present danger of weapons proliferation or another disastrous accident like Chernobyl.

Specific problems from energy production and use include:

- global warming resulting from the build-up of greenhouse gases such as carbon dioxide and methane;
- damage to property, forests, lakes and biodiversity caused by acid rain or dust, soot and ash;
- biodiversity loss from resource extraction;
- declining water quality, resulting from mine drainage and run-off, oil spills, acid deposition, fallout and sludge;
- health problems from inhaling air pollutants such as sulphur dioxide, nitrogen oxides and particulates;



No place is safe from dust and soot, not even Cairo's historic old quarter.

- fatal respiratory infections for millions annually who inhale smoke from indoor cooking;
- specific diseases like the black lung of coal miners;
- safety risks primarily associated with nuclear energy and waste;
- land-use conflicts from coal mining and hydro energy;
- dust and soot problems from coal transport.

No one disputes the existence or severity of these environmental problems; the question of the future supply of oil, however, arouses considerable controversy. Some contend petroleum production will peak sometime around the year 2000 and that global reserves cannot support any substantial production much beyond 2040. Another group argues that improved technologies for exploration and exploitation will add another 10 to 20 years of potential reserves.

Whoever is correct about the precise timing, the real problem remains. Current subsidies encourage overconsumption, accelerating the inevitable exhaustion of petroleum reserves. By distorting the market processes, subsidies tilt the playing field in favour of more polluting energy sources, penalizing efficiency measures and renewable energy sources. They also delay the adjustment that normally takes place as a commodity becomes scarcer. It could all end with a dreadful shock.

The costs of subsidies

Judging by their public pronouncements, governments around the world realize they should be following policies that encourage a transition to greater energy efficiency and lower energy use. Yet many official policies instead encourage energy profligacy and waste. Worse still, they usually favour the dirtier energy sources. Germany, for instance, for years imposed an 8.5-per-cent surcharge on power bills to subsidize the price of costly Ruhr Valley coal, thus encouraging use of a fuel that makes the greatest contribution to the greenhouse effect.

Governments also tend to look after their own. Policies in OECD countries mainly support energy production while developing countries subsidize energy consumption. While this report hasn't listed every single last subsidy, the global total is still impressive: about \$350 billion yearly for subsidies to energy production and consumption in the early 1990s — roughly two per cent of world GDP. Since then subsidies may well have been reduced by as much as \$100 billion because of reforms that substantially raised domestic energy prices in Russia and China.

And many and varied are the means of subsidizing energy, for both producers and consumers. Here are some typical examples, following the categories of the Subsidy Guide on page 5:

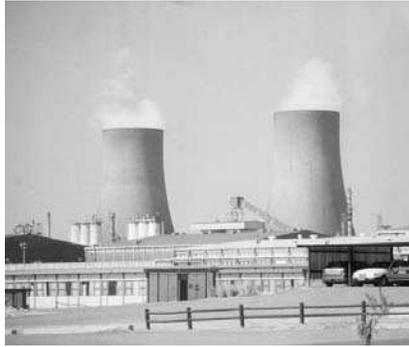


Oil exploration and production could falter sometime early next century, throwing the world into another oil shock.



Wind energy gets a tiny fraction of the support for the coal, oil and nuclear sectors.

- Direct grants to encourage production and to cover financial losses in the coal sector. Those were once extensive in the U.K. and are still common in countries such as the Germany, Japan and Russia.
- Tax subsidies such as depletion allowances in Canada and the U.S.A. Enacted in the United States to support petroleum production during the First World War, this tax subsidy still exists in both countries. In the U.K. and Italy, residential users of electricity pay a lower value-added tax, a hidden subsidy.
- Government provision of services below cost, in particular research and development.
- Loan guarantees or soft loans to energy producers at low interest rates; governments may also allow public energy companies to earn a lower than market rate of return.



Coal-to-oil conversion, as in this South African plant, receives large subsidies through research and development funding.

OECD COUNTRIES

Imagine devoting at least \$70 billion to \$80 billion a year to something and not bothering to keep precise tabs on your money. Yet that's the case with energy subsidies in the western industrialized world. Our Figure 2 had to be laboriously compiled from numerous sources, with substantial differences in the underlying concepts, coverage and quantification. Without doubt, these estimates seriously underestimate actual OECD energy subsidies but it's impossible to say precisely by how much. A safe bet would be tens of billions of dollars.

One feature stands out starkly from this statistical jumble: The more environmentally damaging a fuel, the bigger the subsidy. The subsidy ranking is a pollution rogues gallery — coal far in the forefront, followed by oil, then nuclear power and finally natural gas. Strikingly small is the proportion of total funding (around five per cent) devoted to sources of renewable energy, the most environmentally friendly sources. These estimates also reveal that budgetary subsidies and the public provision of goods and services are the preferred types of support for fossil fuels. In contrast, nuclear energy is largely subsidized through publicly funded R&D expenditures and laws capping the liability of the power utility for damages from nuclear accidents.

For most OECD countries, the statistics on energy subsidies are very fragmentary. Information is more comprehensive about energy subsidies in the U.S.A, where roughly two-thirds of producer subsidies are directed towards fossil fuels. The largest share for any single energy source goes to nuclear energy, with only tiny subsidies for renewable forms of energy. In Canada, a 1995 study by the Library of Parliament concluded that the oil and gas industry received highly favourable tax breaks with a gross value of almost \$6 billion.

FIGURE 2: Subsidies in OECD energy sectors

(in billions of U.S. \$)

type of subsidy ^f	coal PSE ^a	electricity ^b	U.S.A. ^c		Canada	other IEA ^d		"total" ^e
			producer	consumer		R&D	end-use	
budgetary subsidies	4.4	5.9	9.5	1.5	6.0 ^h			27
public provision		0.1	14.5			5.8	2.9	23
capital subsidies		1.3	6.5					8
price support	5.9	2.3		0.0				8
total	10.3	9.6	30.5	1.5	6.0	5.8	2.9	67
coal	10.3	5.5	7.1			0.3		23
oil		3.2	8.2		2.8 ^g	0.3		15
gas			3.0		3.1 ^g			6
nuclear		0.9	9.0		0.1	4.2		14
renewables		0.0	3.2			1.0		4
not attributed				1.5			2.9	4
additional subsidies	8.4		1.2					10
cross subsidies		6.5						7

a Canada, France, Germany, Japan, Spain, Turkey and the U.K.; 1993.

b Australia, Italy and the U.K.

c Upper range of estimates. Includes construction and interest costs of the strategic petroleum reserve and the unrecovered investment in uranium enrichment facilities.

d Public expenditures for research and development and end-use efficiency in the rest of the countries in the International Energy Agency. Total 1994 expenditures for R&D by all IEA governments were \$8.7 billion and for end-use, \$3.5 billion.

e Total is the sum of the different components, but since concepts and coverage differ, one must be cautious interpreting this figure and keep a large uncertainty margin in mind.

f See page 5 for our subsidy classification.

g Attributed according to their shares in energy production.

h Entirely in the form of tax expenditures.



Subsidizes mostly favour polluting energy sources, rather than clean ones like this Indian biogas plant.

DEVELOPING COUNTRIES

Consumer energy subsidies alone are huge in developing countries, although once again the best estimates are still rather rough and ready. The most comprehensive estimate, an update by Laren and Shah of earlier work, yielded a range of \$270 billion to \$330 billion for consumer subsidies alone in 1991 (see *Figure 3 on the following page*). This calculation was based on measuring the gap between domestic and world prices for various forms of energy.

FIGURE 3: Consumer subsidies in non-OECD countries, 1991

(in billions of U.S. \$)

	all fossil fuels	electricity	total
former Soviet Union	125-180	34-39	159-219
China and India	15	21	36
major fuel exporters	23	3	26
Eastern Europe	12	9	21
Latin America	8	5	13
others	7	8	15
total	190-245	80-85	270-330

Another approach uses a mathematical model known as GREEN, which stands for **GeneRal Equilibrium ENvironmental** model. This produced a 1991 estimate of \$254 billion for consumer energy subsidies in developing countries, not including subsidies for electricity. That agrees well with the earlier work by Laren and Shah, which came up with a subsidy figure of \$230 billion, also not including electricity.

So we can be fairly confident that our numbers are in the right ballpark. As with the OECD figures, they're also likely to be on the low side; for instance, avoidable power losses in the transmission, distribution and generation stages amount to \$30 billion in developing countries — a potential budgetary saving and an additional subsidy.

A glance at Figure 3 shows the dominance of the former Soviet Union (FSU), accounting for almost two-thirds of total subsidies. With domestic energy prices at 20 to 40 per cent of the world price, consumer subsidies in the FSU amounted to \$160 billion to \$230 billion in the early 1990s, about 10 per cent of GDP. Nearly half went to subsidize petroleum fuels. By contrast, energy policy in China and India is mainly aimed at subsidizing electricity, with tariffs in the 1980s averaging 40 to 60 per cent of incremental costs. Generally speaking, energy policies in fuel-exporting countries seem to be aimed at fuel subsidization (*see Figure 4*) while Eastern European countries tend to subsidize coal consumption, with domestic prices at 40 per cent of the world price.

But matters are changing rapidly, especially in Russia and China. Market reforms in Russia have increased real prices of all energy sources for the industrial sector between 30 and 90 per cent between 1990 and 1994. For households, however, energy prices are still a long way from real market levels. As the list opposite shows, real prices for heating and natural gas in Russian households would have to be increased by 50 to 75 times their 1994 levels to remove consumer subsidies — amounting to politically explosive 30-per-cent annual price hikes until 2010. Yet over all, fossil fuel subsidies in Russia have been roughly halved, bringing a \$100 billion drop in total subsidies.

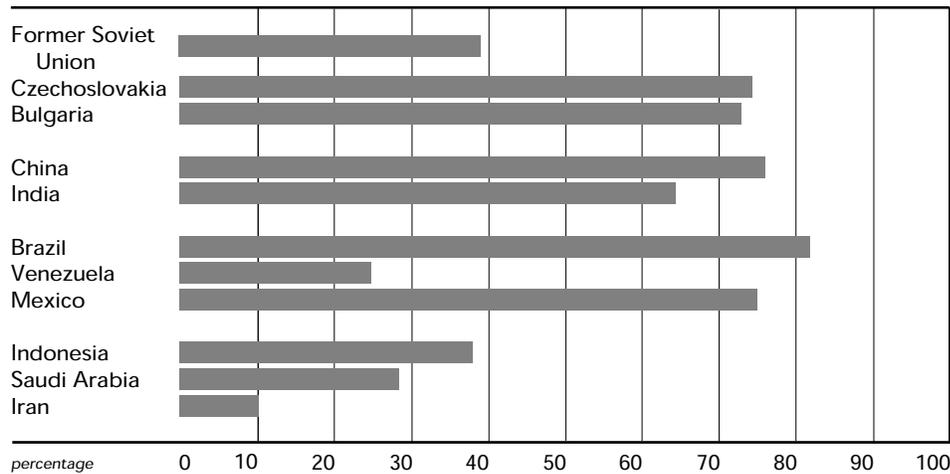
China is another example where energy policies have changed recently. To tackle the poor efficiency of the coal sector, the Chinese government is phasing out coal subsidies; domestic coal prices are already nearing world market

Getting Russian energy prices in line

Percentage price increase required yearly to remove subsidies by 2010 starting in 1994.

households:	%
gasoline	2
natural gas	28
coal	8
electricity	14
heat	31
industry:	
crude oil	4
oil products	0
natural gas	5
coal	3
electricity	2

FIGURE 4: Ratio of domestic to world price for oil in non-OECD countries, 1991
(in percentage)



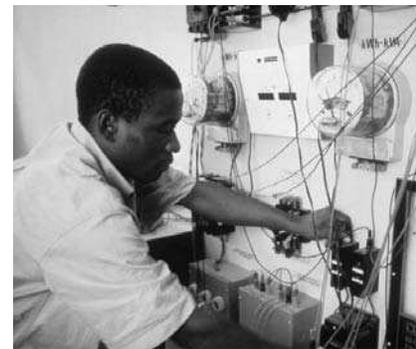
prices. These developments, plus others in countries like the Philippines, mean that annual energy subsidies in developing countries are now probably no more than \$200 billion and might be as low as \$150 billion.

Reforming subsidies

There's something unbelievable about the world spending hundreds of billions of dollars annually to subsidize its own destruction. It seems more the stuff of myths, like the North American Indian tales of the trickster coyote snatching fire from right under the noses of fierce guardians. To cite just one example: The heavily subsidized burning of fossil fuels spews more than six billion tonnes of carbon into the atmosphere each year; yet the globe's oceans and forests can naturally absorb about a third that amount. The resulting global warming from excess carbon dioxide is being blamed for recent weather catastrophes that have even the insurance companies worried. So right now seems a good time to consider the impact of phasing out or reforming most energy subsidies.

ECONOMIC IMPACT

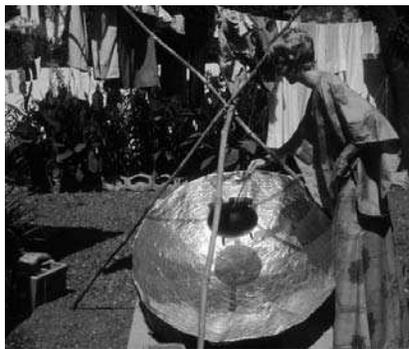
Studies by both the World Bank and the OECD indicate that getting rid of energy subsidies would raise real incomes globally by three-quarters of one per cent, although the gains would be unevenly distributed. Most developing countries would be better off; in particular, the former Soviet Union and Eastern European countries would benefit, with an expected increase in income of 20 per cent. The major exception would be China, where the deterioration in terms of trade might result in an average real income loss of just below one per cent per year. According to the Bank and the OECD, the other losers would be energy-exporting countries, with an estimated decrease in real income of five per cent annually. However, a specific study of three such oil exporters — Algeria, Iran and Nigeria — concludes that bringing



In developing countries, cheap energy is considered crucial to economic growth.

domestic oil prices up to world levels would generate \$69 billion in additional annual income. That's because removing energy subsidies would improve the efficiency of domestic oil use, resulting in savings of between 10 per cent and 18 per cent of current production, which could then be sold abroad.

Just as important, other research strongly suggests that energy price increases as a part of overall subsidy reform will complement economic development, rather than harming it, as is often alleged. One such project analyzed the economic and social effects of energy price reform in Colombia, Ghana, Indonesia, Malaysia, Turkey and Zimbabwe by looking at the impact on growth and industrial competitiveness. The researchers conclude that raising energy prices to remove subsidies did not harm growth or industrial competitiveness. GDP grew even faster than before the reform — except for Malaysia where growth continued but at a slower pace.



For countries like Mali, solar cooking is a step towards sustainable energy use.

ENVIRONMENTAL IMPACT

While reforming energy subsidies is merely beneficial to economic development, it's essential to global environmental health. Without scrapping many energy subsidies (and overhauling the rest) there is no way the world's 37 industrial countries have a hope of meeting the Earth Summit goal of holding emissions of greenhouse gases at or below the 1990 level in the year 2000. Even with drastic reforms, the target may well be missed.

A soon-to-be-published OECD study estimates that eliminating all energy producer subsidies in selected OECD countries may reduce carbon dioxide emissions by roughly 80 million to 180 million tonnes in 2010. The drop comes largely from cut backs in the use of coal, in response to a forecast 20 per cent rise in world coal prices once producer subsidies are removed. While that sounds like a lot, it isn't enough to stabilize OECD carbon emissions at their 1990 levels. Carbon emissions in Italy and the U.S.A., for example, would still be higher than 1990 levels in 2010, a decade after the turn-of-the-millennium deadline.

Removing subsidies to consumers would also reduce emissions by lowering energy demand. Compared to a baseline scenario in which carbon emissions in OECD countries are assumed constant, one report concludes that phasing out consumer subsidies in non-OECD countries would reduce CO₂ emissions by seven per cent below projected levels in 2010. Subsidy removal would allow most non-OECD countries, including so-called "transition" economies like Russia, to stabilize carbon emissions at 1990 levels, but not others like China where carbon emissions would still be more than double the 1990 level. Another group of researchers used the OECD's GREEN model to project the effects of eliminating all energy price distortions (including subsidies) over the period until 2050. Compared with a business-as-usual scenario, carbon emissions would be reduced by 3.4 billion tonnes, or 18 per cent of world emissions.

Removing energy subsidies would also significantly reduce other greenhouse gases and emissions of sulphur dioxide and nitrogen oxides. Phasing out coal subsidies in Europe would have specific environmental benefits because European coal has a higher-than-average sulphur content.

SOCIAL IMPACT

Forecasting the social impact of energy price reform is not for the faint of heart. On the macro scale, theory cautions there might be an economic rebound, with the energy price rise triggering inflation, thus reducing purchasing power. One study in Colombia, Ghana, Indonesia, Malaysia, Turkey and Zimbabwe, referred to earlier, found the opposite in practice, with overall inflation lower in the two years after the reform.

On the micro level, the effects depend on several unknown variables: the size of the price increase, the relative share of energy costs in the household budget and whether people will pay more for the same amount of energy or cut their consumption, and by how much. The same real-world study mentioned above concluded that energy price reforms in those six developing countries had not harmed the poor. The researchers found that the maximum loss in income was very small, ranging from a drop of one per cent to slightly more than three per cent. The losers were low-income urban households that were heavy users of commercial fuels; this group is not typical of the poorest population groups, commonly rural households using non-commercial fuels. Furthermore, recipients of gasoline subsidies were primarily car owners, hardly a “needy” group in developing countries.



Even oil exporters in the Gulf need not suffer from raising their subsidized domestic oil prices to world levels.

Lessons for sustainable development

It is evident that there is no easy route to sustainable energy development. If projections of global energy consumption increasing by six times over the next 50 years prove true, there may well be no route at all. One sure way to start curbing such forecast demand — and thus ease the transition to sustainability — is to eradicate the most perverse of energy subsidies, and radically transform the rest. This is also a sure winner with taxpayers and governments who want to reduce deficits. The two essential steps are:

1. Quickly remove or reform most subsidies, ensuring that energy sells for at least the cost of production.
2. Gradually raise energy prices to market values, reflecting full resource and environmental costs.

Do this internationally and simultaneously, with Western industrialized nations in the vanguard. To have much chance of success, energy policy reform has to be carried out on the largest possible scale. Internationally coordinated policy reform helps countries reap the maximum benefits while minimizing the negative effects. As well, a global approach can create the momentum for real change and allow for compensation when the environmental gains are unevenly distributed.

Such generalizations are easy to write. In reality, each nation’s policy reform must be tailor-made to fit individual circumstances. And just as any suit of clothes has two arms and two legs, every reform strategy should consist of four basic parts: economic, institutional, international and technological. To give some general idea of the complexities involved, consider just one segment —

the economic. Remembering the two essential steps mentioned above, here are some other general policy signposts on the road to sustainability:

- decouple all subsidies from production or consumption;
- remove cross subsidies by aiming energy prices at specific market segments;
- combine pricing strategies with efficient metering and control systems;
- consider deregulation and privatization to stimulate competition, making sure governments guarantee minimum standards for safety and security;
- cushion any negative effects of the adjustment through measures financed from budget savings or newly generated revenues;
- target the original policy objectives more cost-effectively, for example by switching to direct income support;
- pay attention to unintended side-effects of reform and to better linkages between energy sectors.

Yet it isn't really such technical complexities that have kept governments from seriously tackling subsidy reform until now. It's the fact that subsidies have turned out to be almost as addictive as narcotics: the more you have, the more you crave. Something like our love affair with the automobile.



The desire for rural electrification can give rise to generating stations that use high-polluting coal.

The road goes on forever

(and is the car servant or master?)

5

To celebrate the centenary of the mass-produced motor car in 1996, the captains of the British motor industry took over Coventry Cathedral. They filled the pews with car workers, car executives, car drivers, car investors, car collectors, car writers, even car artists. Then they drove two cars down the cathedral's main aisle. To reflect the industry's environmental concerns, one of the two cars was electric.

The sacred united with the profane. It's difficult to imagine a more apt symbol of modern society's strained relationship with the automobile than the Coventry celebration. Over the past 100 years, the car has liberated individuals just as surely as it has enslaved societies. Every day, vast reaches of prime agricultural land are paved and offered up as sacrifices. Every month, the population equivalents of entire towns perish from road accidents and automotive pollution. Every year, tens of millions of cars are produced — and almost all sold.

Yet the car's hold on us grows still. The world's fleet of passenger cars doubled in just 17 years, from 1970 to 1987 — a period that included two global oil shocks (see Figure 1 on the following page). By some yardsticks, other forms of transport may be growing faster (passenger air travel tripled from 1970 to 1990), but none has the same impact, both symbolic and real, as the private car. And none benefits as much from gargantuan subsidies. Most of the people who travel in cars don't think of these billions of dollars as subsidies for them, of course; they see free parking, police patrols and even roads and bridges as simply part of the natural order, an integral part.

Indeed, most economists would agree that transportation is an integral part of economic development. Efficient transportation leads to savings in time and costs, stimulating economic growth directly. Indirectly, transportation helps allocate capital (including human capital) efficiently across a region and between regions. The relationship, however, works in both directions; growing prosperity also increases the demand for transportation.

What factors decide transport growth in general, and car use in particular? Foremost in Western industrialized societies is a state of mind, captured three decades ago in the seminal work *Understanding Media* by Canadian Marshall McLuhan: "The car has become an article of dress, without which we feel uncertain, unclad and incomplete." In other words, we think we can't live without it. Underlying this state of mind is a straightforward economic relationship: The better off people are, the more likely that they own a car. Look at an ascending list of car ownership per 1,000 people (see list opposite) and you're also looking at a list of mounting GNP per capita.



Many people in North America look upon free parking as part of the natural order.

Number of cars per 1,000 people, 1990

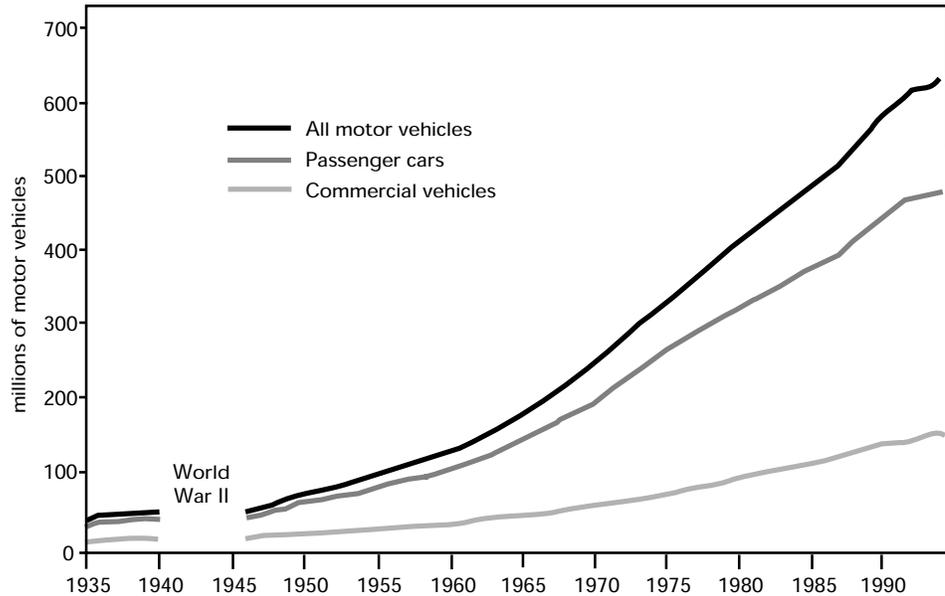
Developing countries

India	2
Pakistan	4
Philippines	7
Kenya	11
Thailand	14
Egypt	19
Colombia	33
Mexico	83
Argentina	133

OECD

Japan	282
United Kingdom	354
Netherlands	367
France	416
Canada	474
Italy	481
Germany, west	551
U.S.A.	572

FIGURE 1: Why the roads are crowded



The growth of private cars is exploding in many cities in developing countries.

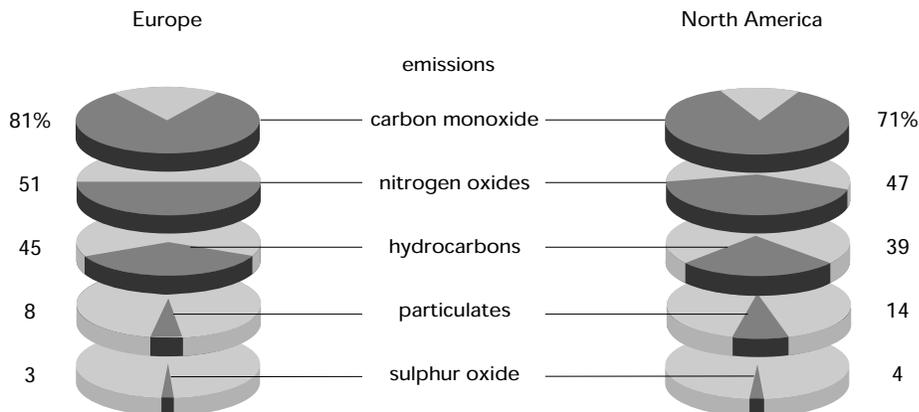
Not surprisingly, car ownership and vehicle density are high in the wealthy countries of the OECD. Vehicle density in the U.S.A is the highest in the world and car ownership may even be saturated with nearly one car per driver's licence. Tailgating the U.S. is Germany, the leading car country in Europe. Again, it's hardly unexpected that 99 per cent of all passenger surface traffic in the United States is by car; 84 per cent in Germany.

Despite tax increases, real fuel prices have held constant or even dropped over the long term, one reason for the explosion in car use. Away from gridlocked city cores, shorter travelling times have encouraged greater use of cars. In addition, several socio-demographic factors have also boosted travel — location and (sub)urban living conditions, more women in the labour force and extended shopping hours. Result: More people in industrialized countries tend to travel short distances and increasingly for social and recreational purposes.

But when fuel prices rise, even temporarily as in the oil shocks of the seventies, they do have an effect. North Americans initially downsized to smaller and more fuel-efficient cars. When the oil glut came along in the 1980s, however, they rushed to buy gas-hungry mini-vans and sport utility vehicles. As well, it was the optional shopping excursions that were temporarily sacrificed when gas prices rose, not the daily crawling commute to work: “lust” driving in contrast to “must” driving.

Developing countries face severe transportation difficulties in both urban and rural areas. In large cities, problems arising from the relatively low quality of the transport system — and often poor safety as well — are made far worse by the uncontrolled growth of private cars. For example, nearly 500 new vehicles enter Bangkok's notoriously congested streets every day, slowing traffic in peak periods to an average of two miles per hour. There is a booming business

FIGURE 1: What transportation contributes to total air pollution
(in percentage)



selling plastic urine bags to (male) drivers and passengers who spend an average of 44 days a year stuck in Bangkok's traffic jams. Outside the cities in developing countries, the low quality of highways is a potential roadblock to economic development; the World Bank estimates that at least half these paved roads are in poor condition.

EXTERNAL COSTS

The principal external costs caused by transportation are accidents, air pollution and noise. Each year an estimated 100 to 200 residents per million in Europe die in traffic incidents; in India, the rate is two to three times higher. More than 50 million people in OECD Europe and 36 million people in Japan are exposed to road traffic noise high enough to cause hearing loss over prolonged exposure.

Transportation is also a major contributor to air pollution. It causes up to 75 per cent of carbon monoxide emissions in OECD countries and half the nitrogen oxide emissions (see Figure 2 above). In the OECD, the transportation sector also contributes a fifth of carbon dioxide emissions, one of the causes of the greenhouse effect that is warming the Earth (see Chapter 4). Air pollution in cities can be severe enough to cause health problems and even deaths. In Los Angeles, the air is officially “unhealthful” three days a week; a recent study of hospital records in Sydney, Australia, estimates that 400 people die each year as a result of local air pollution.

These numbers are likely to worsen in the future if transportation growth continues or even accelerates; in developing countries in particular, uncontrolled traffic growth might trigger an outburst of environmental and health problems. While water and rail transport are relatively non-polluting, the two fastest-growing traffic segments — road freight and aviation — are not. Road freight is also responsible for relatively large external costs in terms of fatalities and noise per vehicle kilometre.



An estimated 400 people die yearly in Sydney because of air pollution, mostly from motor vehicles.

The cost of subsidies

One of the most successful bits of automotive propaganda is the myth that the car shrinks distances. You can see this idea propagated daily on TV tubes and on movie screens around the world, as part of the American “global culture.” Other than the occasional Sylvester Stallone disaster film, when does traffic congestion feature on the screen or tube? Yet the paradox is that the very people who maintain this myth — those in the entertainment industry of southern California — are among the car’s chief victims. Many face hours of commuting because the automobile has created distance, not overcome it. The car begat the superhighway, the superhighway begat suburbs and the suburbs begat exurbia.



Drivers in Bangkok spend the equivalent of 44 days a year stuck in traffic.

Such sprawl and waste of productive land is one of the many costs from roads and transport not covered by the people who actually do the travelling. In fact, motorists rarely are taxed enough to pay back even the investments required to build and maintain the roads they drive on. And don’t even think about car or gasoline taxes covering less tangible costs like the health toll from automotive air pollution, suburban sprawl or productivity frittered away in traffic congestion. All these uncovered costs are subsidies, pure and simple. A good way of measuring them is to compare road-related public expenses and costs with road-related revenues.

OECD COUNTRIES

For the United States, Japan and Germany, the question isn’t whether road transportation is subsidized, or whether the subsidies are huge, but how huge. Unfortunately for those who value precision in such matters, two immensely detailed U.S. studies come up with final annual subsidy estimates of \$174 billion and \$55 billion — a gap about the size of Norway’s economy.

A big part, \$66 billion in fact, of the gap between the high estimate of the World Resources Institute and the low figure from an OECD-commissioned study arises from the treatment of free employee parking. The Institute authors argue that parking should be considered part of the normal costs of operating and owning a car and that free parking provided by employers subsidizes the use of cars and trucks, at \$1,000 a year per parking space. The OECD study assumes that a large portion of this supposed parking subsidy is borne by drivers indirectly, either through lower wages or higher prices for goods. This disagreement between economists, however esoteric it seems, explains much of the reason for the wide range of 20 to 50 per cent for the U.S.A. in Figure 3 on page 44. So, American motorists either pay a fifth of the actual costs of their travel or they pay half. Or somewhere in between. Whatever the precise figure, the public subsidy is still huge.

It’s the same in Japan, where an OECD study estimated net subsidies of \$16 billion to road users. Again, however, the researchers omitted subsidies for parking and selected some very low costs for road-related services, such as police. Once you correct for these underestimates, the real figure could be anywhere from \$16 billion to \$50 billion higher.



Heavy taxes on road use in Turkey don’t seem to deter many drivers in Istanbul.

In Europe, higher prices at the gas pump — including higher state levies and taxes — mean that subsidies to road users are much lower and sometimes even turn into net taxation. This is the case in the Netherlands and in France, where road users pay at least 10 per cent above their proportional share. A Dutch case study calculates net taxation in 1993 at \$4.8 billion; another study puts the figure for France at \$5 billion. By contrast, road users in Germany were subsidized to the tune of \$13 billion in 1991.

Cross subsidies exist in both subsidization or taxation cases. Passenger transport commonly subsidizes freight transport. Similarly, urban users may be subsidized by rural users who pay more than their share. Finally, there are cross subsidies between different types of vehicles, notably from gasoline to diesel vehicle users.

DEVELOPING COUNTRIES

Road transportation subsidies are likely huge in developing countries as well, but we have only fragmentary statistics. The World Bank has estimated that developing countries spend \$15 billion annually on road rehabilitation because of deterioration that could have been avoided with more efficient maintenance. Should these lost potential savings be regarded as subsidies? Yes. They support inefficient use of the road infrastructure and will eventually have to be absorbed by the public budget.

In the case of Africa, one study estimated nearly a third of the \$150 billion invested in roads has been lost because of poor management and bad maintenance. Such poor roads may well hamper economic development, particularly in remote and economically backward regions. To prevent further deterioration and to restore merely those roads that are economically viable would require \$1.5 billion annually over the next 10 years. Another example is Russia where a \$29-billion-price tag has been put on the maintenance backlog and underinvestment in roads and bridges.

Yet, as Figure 3 shows, some developing countries make motorists pay, and pay heavily, for the roads they travel. In Turkey, the ratio of road-related charges to spending was above 200 per cent, meaning that drivers there paid twice the cost of the road services they used. In few developing countries, however, have motorists pay much above half of the real costs of their travels.

Reforming subsidies

Three decades ago, German architect Walter Gropius declared: “The car is the greatest problem for architecture.” Look around and agree that the integrity of our towns and cities is one good reason why car users should have to pay the full costs of their driving. Two other compelling arguments: the wasteful use of a non-renewable energy source, oil, and the protection of the environment. Perhaps equally forceful is evidence that reducing subsidies won’t seriously hamper economic development.

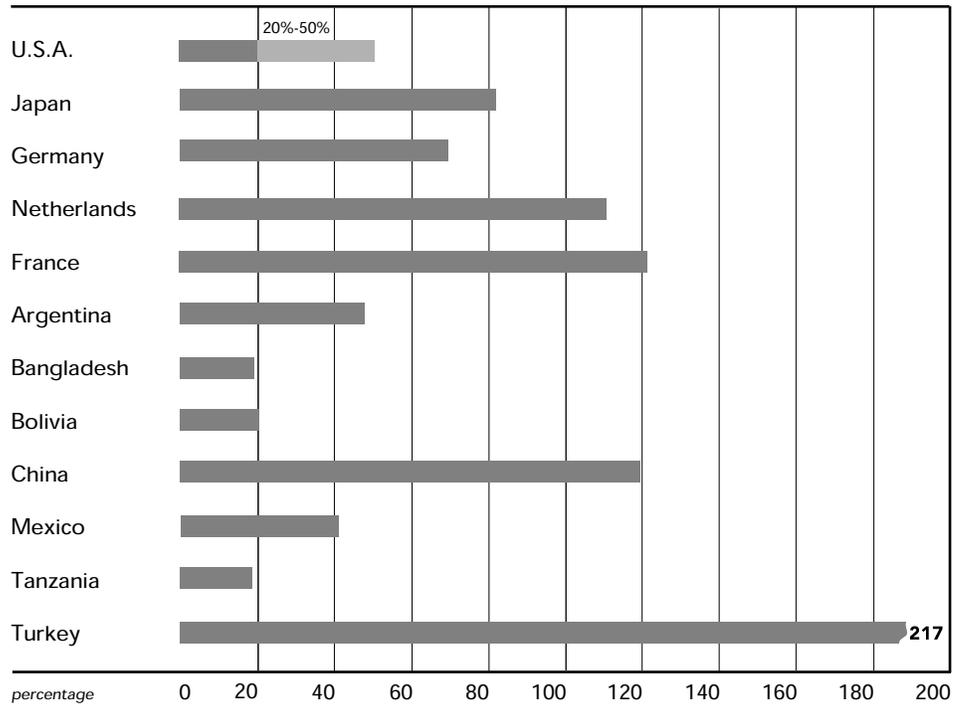


Regulations often discriminate against transportation that is less resource intensive.



Commuting takes different forms in various parts of the world.

FIGURE 3: How much road users pay of the costs of providing the roads and services they use^a
(in percentage) total road costs=100%



a OECD countries, early 1990s; others, mid-1980s



Improved public transit must accompany raising the cost of driving a car.

ECONOMIC AND ENVIRONMENTAL IMPACT

A soon-to-be-published OECD report considers reform of road transportation subsidies using case studies for the U.S.A., Japan and France. The American case study shows that removing subsidies there — either by targeted user fees or by gasoline taxes — would reduce carbon-dioxide emissions by 11 to 14 per cent over 20 years. Yet economic growth projections would be barely affected.

The Japanese case study examines a rise in fuel taxes which would cut carbon-dioxide emissions by 11 per cent compared to leaving taxes unchanged. Although car users in France pay enough in taxes and other levies to finance road expenditures and support services (*see Figure 3 above*), they don't cover what economists call external costs — the price of their vehicle pollution, congestion and accidents. To pay that total bill would require a general fuel-tax increase, on top of targeted user fees to eliminate cross subsidies. The policies in the French scenario would also reduce carbon-dioxide emissions by 11 per cent. All three studies emphasize that the forecast economic and environmental results depend on the actual measures taken, as well as the use made of the additional revenue.

Transportation subsidy reform can also be tackled at levels other than the national, and should be. A recent study by the Dutch Central Planning Bureau demonstrates the importance and effectiveness of coordinating policies internationally. The researchers looked at three measures — an increase in the gasoline excise tax by \$1.50 U.S. per litre, roughly doubling the price; “road pricing” in urbanized areas; and the removal of subsidies for commuting. They then calculated the impact of these measures if implemented individually by countries within the European Union against the impact if implemented in a coordinated manner throughout the E.U.

Implementing the policy measures on a national basis would reduce car use and emissions of both carbon dioxide and nitrogen oxides by 20 per cent. Charging for the use of roads during peak hours and in urbanized areas around major cities turns out to be the most effective of the three measures. The \$1.50-per-litre increase in gasoline excise tax works well in reducing carbon-dioxide emissions but not in reducing car use. However, when implemented throughout the European Union, the latter measure would be far more effective: Car use would decrease by 40 per cent and emissions by more than 60 per cent. The study concludes that this type of internationally coordinated and supported policy need not create major economic distortions, although it could lead to significant changes in consumption patterns.

Pricing instruments can also work effectively on the city level, in both developed and developing countries. Some isolated experiments suggest that fiscal measures may succeed in reducing traffic and, consequently, pollution and other external costs.

In Singapore, a policy of area licensing begun in 1975 has decreased traffic entering the central zone during peak periods by 75 per cent and kept it well below predicted levels. The Singapore scheme is currently being modernized to use overhead cameras that will automatically deduct the entry fees for vehicles from “smart cards” mounted on their dashboards. Studies and experiments in Milan, London and Bergen all show that other forms of road pricing also can reduce traffic volume. A 1992 study looked at demand management policies for Mexico City, one of the most polluted megacities of the developing world. It concluded that emissions could be reduced by roughly 70 per cent, but four-fifths of this reduction came from higher standards and inspections and only a fifth from higher gasoline taxes.

In 1995, a trial was carried out in Stuttgart, Germany, as part of the European Commission Eurotoll program to see how high user charges need to be pushed to change driver behaviour. The results showed that the tolls need not be very high to alter the flow of traffic. Different charges for peak and non-peak hours and for alternative routes did indeed affect drivers and led them to change their travelling times. After the trial, some participants even maintained their new travelling patterns, and the demand went up for park-and-ride facilities. However, the charges were less effective in persuading drivers to switch to public transport. Apparently, the financial incentive has to be much higher to achieve this.

Frustrated by the limitations of pricing schemes, some cities have also tried outright traffic bans, with mixed success. Licence plate restrictions on cars in Athens, Mexico City and Santiago have been somewhat effective in reducing



Some countries in Southeast Asia are a long way from the area licensing experiments of Singapore.



Two rail lines can carry as many passengers as a 16-lane highway — with a lot less pollution.

congestion and air pollution. But many households got around the bans by buying second cars — usually older, more polluting vehicles — or switching licence plates. In Athens, motorists banned from entering the urban centre instead drove around it to reach their destination, increasing both driving and pollution, the opposite of the intended effect.

SOCIAL IMPACT

Subsidizing the provision of infrastructure is sometimes defended on the grounds that it redistributes resources from high-income households to the poor. However, the World Bank concluded in a 1994 report that price subsidies for all types of infrastructure in developing countries almost always benefit the better-off more than the poor. Also in the specific case of road transport in developing countries, subsidies patently benefit the better-off — car owners. In Algeria for instance, they receive almost four times more subsidized transport services than the poor.

There are, however, legitimate equity concerns about some of the road-pricing measures under consideration as subsidy reforms. Raising the cost of travel in peak periods might simply help the wealthy to speed along on less-congested roads. And city-core-bans are usually even more inequitable, since the poor can't afford one car, let alone a second to circumvent licence-plate-restrictions. A more equitable approach is to provide good public transit as an alternative while raising the costs of driving a car for everyone.



Road subsidies in developing countries always benefit the wealthy more than the poor.

Lessons for sustainable development

Most experts agree that economic and financial instruments can help achieve sustainable forms of transportation, but they can't do the whole job. Transportation issues are so complex and so intertwined with other issues, such as land use and demographic and cultural trends, that only a coherent set of policy measures will work. Obviously, detailed policy recommendations must be made on a case-by-case basis, but some common approaches can be suggested, along the lines of the polluter-pays-principle.

Transportation policy strategies should consist of economic, institutional, technological, information and land-use measures. A balanced strategy should set standards, use incentives to achieve full-cost recovery, inform consumers, provide alternatives for them, collaborate with the transportation sector and integrate social and urban planning.

Some specific policy guidelines for the use of economic measures to reform transportation subsidies include:

- Internalizing the uncovered costs, a key step. Road users must be charged the full costs of roads, space and traffic services provided.
- Eliminating cross subsidies, with freight transport and urban road users carrying more of their costs.

- Covering at least the direct costs. Making road users pay for their travel not only provides incentives for efficient usage but may also generate funds for road maintenance and construction.
- Creating level playing fields by pricing the different modes of transportation according to their full costs. “Feebates” and other targeted user fees can be effective in reducing cross subsidies and pollution.
- Custom-tailoring measures for urban and rural problems. Urban policies may focus on managing, changing and reducing the flow of traffic, while rural policies may deal with infrastructure and economic development.
- Targeting the needs of the poor directly. Instead of universal road subsidies, improve income and physical access for the poor, provide transportation to places of employment, eliminate discrimination against bicycles, horse carts and other approaches that are less costly (and less resource-intensive).
- Coordinating common subsidy reforms internationally.

If these policies sound intimidating in today’s car culture, they are surely preferable to the Draconian measures looming if the world does not take this sort of action now. That Hollywood movie cliché is coming true in real life — the car is heading for the cliff, and we may not be able to jump clear this time.



Eliminating discrimination against animal-powered transportation can help the poor.

An end to subsidy addiction

(reform the best, remove the rest)

No amount of subsidy reform, no matter how sweeping, will alone bring about the dawning of the age of sustainable development. To stop our current borrowing from the Earth's future requires, as the Brundtland Commission made clear, a fundamental rethinking of every aspect of today's civilization.

But if we cannot find the will to act against the sort of blatantly harmful subsidies detailed by this report, the prospects are dim indeed for humanity taking the other essential steps towards sustainability. Five years after the Rio Earth Summit, accelerated subsidy reform is a direct test of the resolve behind the millions of words, written and spoken, during the past decade about *Our Common Future*.

Certainly subsidies can be beneficial, especially if they are sharply focused and limited in duration. Too often, however, today's harmful subsidies are defended for the wrong reasons — because they help the poor (not as much as the well-off); because their removal would hinder economic growth (not demonstrated in theory or practice); because certain domestic industries would suffer (guess where their lobbying money comes from). Or perhaps some defend subsidies because of misgivings over the true intentions of subsidy critics. Anyone who defends subsidies for this last reason should look closely at this summary:



Governments subsidize nuclear power heavily by financing research and development and limiting liability for damages from catastrophes.

FIGURE 1: Adding up the subsidies
(in billions of U.S. \$)

	non OECD	OECD	total
water	42 - 47 ^a	(see note b)	42+ - 47+
agriculture	10 ^c	335	345
energy	150-200	70-80	220-280
road transport	15	85-200 ^d	100-215
total	217-272	490-615	707-887

a Includes subsidies to drinking water and irrigation

b No aggregate estimates. Subsidies average 30-50 % of total costs.

c Includes food and input subsidies but not irrigation.

d For the U.S.A., Japan and Germany.

Examining just four economic sectors — water, agriculture, energy and road transportation — our study identified at least \$700 billion in annual subsidies, close to current arms spending around the world. How much of that is wasted depends on individual judgments about the economic, environmental and social impact detailed here. Is it \$250 billion a year? Or \$400 billion? Or \$550 billion? Whatever precise figure you place on the annual waste, lending institutions, governments and the public have good reasons to pay attention to subsidies.



Subsidies often lead to unsustainable behaviour such as this industrial waste from factories near Mexico City.

Central to the Brundtland Commission's approach was the integration of economic and environmental considerations in everyday decision-making. To accomplish this, government policies must avoid creating harmful distortions of the market and must also ensure that the full costs of products are reflected in consumer prices. Appropriate pricing may be the most important single policy to distribute resources efficiently and promote sustainable practices. Let prices do their job — there is no better alternative. The fundamental role for governments is to help markets work more efficiently.

For that reason, subsidies are often *not* the right policies: They give the wrong market signals and lead to unsustainable behaviour. Subsidies tend to waste resources, they do not produce the intended results and they wind up in the pockets of the wrong people. The first task should be to get rid of those subsidy policies which are perverse, actually moving us away from sustainability. After that could come shifting the remaining incentives to full-cost pricing.

We recommend a course of subsidy withdrawal. First, policy makers should be wary about introducing new subsidies that may well turn out to be economically inefficient, ecologically destructive and socially inequitable. Once subsidies are in place, it is very difficult to wean people from their addiction to them. Second, existing subsidies should be carefully examined and usually reduced, or at least reformed. The \$700 billion for subsidies in just four sectors examined here, for instance, roughly equals a year's growth in the world economy. These resources can be used in a much more effective way.

Honesty is the best policy: make subsidies visible, publicize their costs and effects, list the winners and losers. Inform policy-makers about better alternatives so they don't backslide into the easy solution of subsidizing. Promoting public awareness and debate about subsidies will encourage such political honesty and resoluteness.

In one sense, it all comes down to good governance. Get the prices right and let the markets distribute resources. Accelerate efforts to desubsidize and shift the liberated resources towards sustainable practices. The costs and incentives should be put back where they belong — on users instead of on taxpayers or other groups. Industrialized countries are in the strongest position to take the global lead in moving towards desubsidization. They could profitably begin by looking at the original rationale for their existing subsidy policies and whether it still applies.

The rationale for subsidies

Based on our analysis of the four economic sectors, some combination of the following objectives seem to have motivated most subsidy policies in the past:

- stimulate economic development or growth;
- protect employment and investments;
- safeguard domestic supply and reduce external dependency;
- reduce poverty or support the poor;
- provide the basics of life.

Sometimes there were two or more reasons for the introduction of support policies. Analyzing the character and size of recent subsidies in the water, agriculture, energy and road transport sectors suggests some of the main reasons. These often differ for industrialized and developing countries (*see Figure 2*).

Water subsidies have tended to benefit the haves instead of the have-nots

FIGURE 2: Why governments subsidize

	Industrialized countries	developing countries
water	(farm) production growth	support the poor provide access (farm) production growth
Agriculture	maintain farm income domestic supply	maintain farm income (farm) production growth
energy	protect employment and investments domestic supply	economic development support the poor
road transport	economic development	economic development provide access

As this table makes plain, subsidy policies have often been born of a desire to act on certain economic and social problems. But are subsidies today still hitting their intended targets?

Consider **WATER**. Water subsidies in developing countries seem to have been inspired predominantly by social objectives. Subsidies for drinking water were intended to ensure that the poor had access to water, because it was assumed that poor people cannot pay high prices. Yet the reality has been the opposite; water subsidies have tended to benefit the haves instead of the have-nots. In addition, the poor often paid (and still pay) high water prices in practice, because they must buy expensive water from private vendors. Water sub-

sidies turn out to be a barrier to improving the conditions of the poor because governments, having spent unwisely on ineffective subsidies, then lack the money to improve the public water system.

In both developed and developing countries, subsidized water remains so cheap today that it invites overuse, misuse and waste. Irrigation is extensively subsidized, causing farmers to pump water at will, with little thought for costs or cost-effectiveness. As chronicled in Chapter 2, poor management and inappropriate use of water can severely damage the environment. Furthermore, low water prices cause a huge fiscal drain.



Energy subsidies are costly protection for jobs and for powerful sectors like the oil and gas industry.

Do subsidies remain the best way of reaching their original objective? Look at the example of **AGRICULTURE**. In both developed and developing countries, agricultural subsidies were originally intended to support farm incomes. There may also have been hopes of encouraging agricultural production, particularly in food-importing countries. However, our study shows that agricultural subsidies are today very costly, and often ineffective, ways of tackling these objectives. For example, only 20 per cent of \$335 billion in annual OECD agricultural transfers actually ends up as additional farm income. And when it does, most of it goes to the larger and richer farmers. Switching to direct income support could yield a triple dividend, benefiting farmers, consumers and taxpayers.

Are the original objectives of some subsidies still valid? Treat **ENERGY** as a case study. After the oil crises in the 1970s, many countries introduced energy subsidies to stimulate exploration and production because they wanted to be more self-sufficient in oil, and less susceptible to external shocks. But now the world is afloat in oil and increasing economic globalization has diminished the dominance of any single producer or group of producers. Energy subsidies have instead become very expensive protection for sectoral interests and employment. In addition, energy-subsidy policies are very costly and usually harmful to the environment, contributing to air pollution, acid rain and climate change.

Do yesterday's subsidies continue to make economic sense today? Take **ROAD TRANSPORTATION** for example. The promotion of economic development seems to have been the driving force behind subsidies for private road transport in both developed and developing countries. Greater mobility may very well promote and enhance economic development (by enlarging the potential area for work). However, subsidizing road transport has not primarily achieved this objective; instead, the subsidies have all too often encouraged overuse, increasing pollution and congestion. The proof can be seen daily in grid-locked cities and bumper-to-bumper highways. In addition, road transport subsidies put a heavy burden on the public budget and, in developing countries, mostly benefit the better-off, i.e. car owners.

To be fair, governments may sometimes feel that no better policy is available than a subsidy. This cramped outlook can sometimes be traced, in part, to the powerful forces which defend subsidies and oppose their reform.

The barriers to reform

Identifying harmful subsidies and suggesting alternatives is often the easy part. Reforming them is the real Herculean challenge. Many obstacles exist, and the absence of sound policy analysis is perhaps the least of them. They include:

- opposition from vested interests and stakeholders;
- the distributional consequences;
- addiction to entitlements;
- uncertainty about the result;
- concern over international competitiveness;
- lack of foreign resources for transition and support;
- administrative, institutional and skill barriers.

Opposition from vested interests and stakeholders is usually the single most important barrier to reform. A good rule of thumb is: The bigger the subsidy, the bigger the battle to keep it. And one tactic of the subsidy defenders in such battles is to argue that items dear to the hearts of voters would suffer if the subsidy disappears — like the rural smallholding or family farm.

Many taxpayers are won over by such tactics for the simple reason that few fully grasp any specific subsidy issues. All too often the existence of individual subsidies is hidden at the same time as their costs are spread across a broad public. That's what some governments prefer. Those getting the subsidies may also prefer implicit forms of support or support geared to production, out of fear that subsidies that are too high-profile will be cut first in times of fiscal stress.

Closely related are fears about how subsidy reform will play out: who is going to be harmed and by how much. Without measures to cushion negative effects or help in the transition, these distributional implications may be unacceptable for the potential losers from subsidy reform.

When subsidies create and reinforce an expectation of a continuing benefit — an entitlement — they may confer legitimacy on claims by recipients. For instance, the peanut growers in the state of Georgia have been receiving a U.S. government subsidy since 1977 on all unsold production within their quotas (amounting to \$360 a tonne in 1991). Removing that subsidy, as some federal legislators want, might cause the resale value of those peanut-growing lands to plummet.

Uncertainty about the outcome of subsidy reform may create a political bias for the status quo. When the result of reform is unclear, even those who could benefit may prefer the certainty of the present to the uncertainty of the future. Uncertainty about the benefits may also cause some countries to await international action before implementing reform at home. It's equally possible,



The larger the subsidies, the more violent the protests to retain them.

however, for international considerations themselves to be an impediment. Countries may be reluctant to act unilaterally and risk losing relative competitiveness internationally. A country may also fear that gains through domestic reform will leak away through an increase in imports.

For developing countries and economies in transition like those of Eastern Europe and Russia, the lack of foreign assistance can be a big problem. These countries may need short-term foreign funds to bridge the first stages of the process. Furthermore, countries may also require technical assistance in setting up legislative, administrative and control systems.

Finally, institutional factors may impede subsidy reform. Management and organizations that administer the subsidies may feel understandably threatened and be skeptical about the need for reform. Generally it takes strong political action to slice through the inertia and push administrative changes. In addition, many countries may lack the level and range of analytical and technical skills to assess and develop reform policies, or to implement them effectively.



Reducing energy subsidies could encourage more environmentally friendly techniques, like wind pumps for water.

Overcoming the reform barriers

Numerous and varied are the barriers, but numerous and varied also are the potential strategies for overcoming them and instituting subsidy reform. Here are some:

- ✓ Create more transparency about subsidies, especially their costs, impacts and rationale.

Creating more transparency around the motivations, costs and impacts of subsidy policies will naturally raise questions about their effectiveness and persistence. Once they see the magnitude of the costs, more people are likely to become interested in the implicit choices underlying subsidies, and raise questions about their rationale. More transparency also increases the political costs of irresponsible policies and rewards responsible action by policy-makers.

- ✓ Develop alternative policies that target the same objectives better and also compensate losers.

Although initially created to achieve certain policy objectives, subsidies often do not serve these ends and may even be counterproductive. The original objectives may remain valid, but they need to be addressed more cost-effectively through targeted policies such as direct income support.

- ✓ Buy out existing stakeholders.

Removing subsidies may affect recipients dramatically if they have become economically dependent on subsidies. Buying out such stakeholders can be a pragmatic solution, costly in the short run but not necessarily costlier than perpetuating current subsidies. Furthermore, buy-outs create the opportunity to start with a clean slate and allow more efficient allocation of land, labour and capital in a less environmentally damaging way.

- ✓ Initiate comprehensive economic reform.

A longer-term reform strategy is to remove the foundations on which many subsidies rest through a structural economic reform, a course particularly relevant for former centrally planned economies. A policy reform that involves liberalizing markets, restructuring sectors and creating ample room for fair competition eliminates many of the root motives for subsidy policies. Another key element is to impose financial discipline, which is not only vital to restructuring the economy, but may also help control inflation. Beyond that, the free entry of new businesses, both domestic and foreign, is crucial to the proper functioning of a market economy and essential for economic development. This business expansion, however, may well hinge on the creation of private property rights.

- ✓ Introduce a burden of proof on governments that subsidize.

One concrete way to create more transparency is to place the onus on government to prove publicly and regularly that subsidies are necessary and effective. The recipients of subsidies (and the benefits they get) are often more visible than losers (and the costs they bear). For subsidy removal, the opposite applies. Introducing a burden of proof through a formal commitment to report on the need for subsidies, their effectiveness, costs and distributive impacts should lead to more and better information. Citizen advocacy groups can also play a role, as the box below shows.

Grassroots voices for reform

Subsidy reform has made unlikely bedfellows of deficit hawks, environmentalists and neo-conservatives in the United States. They're united in agreement that Americans should not borrow from the future, either fiscally or environmentally. Beginning in 1993, this unlikely coalition has published a "Green Scissors" report every year spotlighting wasteful and ecologically destructive subsidies that should be cancelled. Another report, called "Dirty Little Secrets", concentrates on inequitable tax breaks, mostly to major polluters.

Both campaigns have captured U.S. media attention and are also showing concrete results. The "Green Scissors" coalition has identified nine projects and programs cancelled after being spotlighted, with projected savings of roughly \$22 billion.

- ✓ Set up retraining and education programs.

Retraining and education programs may be necessary to help government officials overcome administrative and skill shortcomings. Providing officials with the necessary tools and skills allows policy makers to develop and implement alternatives. Often, commitment at the top political level will be vital to overcome administrative inertia and initiate the necessary changes.

- ✓ Use crises to question and expose subsidy policies.

One way to outflank opposition is to initiate a public debate on subsidies during fiscal or environmental crises. Interest groups that normally defend their subsidies may have been thrown off balance, and this may provide an opportunity for attack. Or for negotiation, with the interest groups concerned that the crisis atmosphere increases the chance of losing everything if they won't compromise. An environmental crisis has another advantage: The public is then primed to give a sympathetic hearing to arguments favouring subsidy evaluation and reform.



The debate over subsidies should take place not only globally among policy-makers, but also locally among those most affected.

- ✓ Stimulate an international dialogue on subsidy reform.

There's a role for everyone in the debate over subsidies which must be started and sustained. International bodies such as OECD and the United Nations could play a pivotal role by nurturing the dialogue with facts and analysis. The World Trade Organization could adopt the model of international trade discussions and hold a series of "Green Rounds" to agree upon subsidy reform and provide mutual assistance. This subsidy debate would not only have to take place globally, but perhaps even more importantly, on regional and local levels.

Non-governmental organizations may well be crucial, exposing and publicizing subsidies as well as building support for reform among their constituencies. The Earth Council, in particular, with its wide network across regions, sectors and interests, could actively catalyze this debate and convene political representatives to debate and adopt a reform plan. Major subsidizing nations could set an example by initiating reform, smoothing the way for coordinated action on a global scale.

- ✓ Support development projects that speed subsidy reform.

International donors should encourage development initiatives that can fundamentally reform the subsidy system, for instance by providing a bridge to the market economy. (See the Guinea-Conakry example in the box opposite.) Donors should also seek out start-up businesses based on environmentally friendly technologies.

Water for the poorest

Drinking water subsidies mainly benefit the middle class and rich of the developing world. As a result, the poorest 20 per cent spend up to a fifth of their budget on water bills, three times more than the richest 20 per cent. It doesn't have to work this way, as two successful reforms demonstrated:

In Bangladesh, social cohesion is the collateral for loans from the Grameen Bank, given mostly to women. If one member in a borrowers group defaults, the entire group is no longer eligible for loans. Since 1992, the bank has used this method to finance the sinking of 70,000 wells, mostly for poor villagers, with loans repayable over two years at interest rates of 20 per cent.

In the West African state of Guinea-Conakry, the public water utilities were not providing reliable and efficient services, yet water prices were too low to attract private operators and dramatic price increases were politically unfeasible. This vicious cycle was broken with the help of the World Bank. First, a service contract was given to a private operator paid through a combination of user fees and a state subsidy supported by the Bank. Second, once service improved, user fees were gradually increased and subsidies removed.

The pace of reform

Does the speed of reform help or hurt the chances of success? Here are two contrasting, stylized options: rapid reform versus gradual change.

SHOCK THERAPY

Governments could launch a vigorous, drastic reform in the shortest possible time. Shock therapy may be particularly relevant where political commitments and stability are uncertain in the long run. Rapid reform may also be preferable for transition economies when many related problems are already being addressed. Another advantage of shock therapy is that it may quickly produce results, helping governments sustain subsidy reform politically.

PHASING IN

However, rapid reform is far from a panacea for all countries in all cases. First there has to be a constituency that supports change. So another strategy is to gradually phase in the necessary changes in order to cushion the blows and minimize the social costs of adjustment. This approach can also build support among subsidy recipients, because it gives them time to adapt, helped by government programs where necessary. However, gradually phasing in reform requires a long-term political commitment to continue the adjustment process, even after the initial enthusiasm dwindles.

Fast or slow reform?

Both Russia and China have successfully slashed energy subsidies that once cost hundreds of billions of dollars annually. But the two countries followed quite different reform strategies.

As part of a major economic transition from a planned economy to a market one, in 1992 Russia launched a rapid and continual process of energy reform, removing administrative controls, domestic sales allocations, export quotas and oil export duties. By 1996, this strategy had already moved domestic energy prices to three-quarters of world levels. Energy subsidies were reduced by \$50 billion to \$60 billion, with related drops in both energy use and carbon-dioxide emissions.

Price reforms in China began in 1978 in agriculture and gradually spread through the economy. Key to the Chinese strategy was developing a free market — first in parallel with the existing controlled market, then replacing it. Similarly, a gradual reform of the coal sector started in the mid-1980s but began to show results in the early 1990s. Coal prices are now close to parity with world prices, and subsidies have been cut by about \$20 billion a year. Energy use has also fallen by about a third since the mid-1980s.

Conclusion: Where the necessary preconditions exist (among them, popular support, administrative skills and sufficient industrialization), the World Bank concluded that rapid subsidy reform has proven more successful than phasing-in.

One final thought

As we began, so should we finish, with a recognition that subsidy reform by itself will not launch the essential transformation to more sustainable forms of development. Much more fundamental steps also need to be taken. This should come as no surprise. A quarter-century ago, just before the first UN Environment Conference in Stockholm, Barbara Ward and René Dubois observed that modelling human activities on our ecological systems leads to a deeper appreciation of an important truth:

“We do not achieve balance by one line or solution but by a careful interweaving of a great variety of partial answers which added together do not produce definitive answers — nature is too dynamic for that — but give us the possibility of proceeding without disaster, correcting, reconsidering, backtracking, advancing, observing, and inventing as we go.”

It was good advice in 1972. It still is. Let us proceed without disaster, correcting and inventing as we go. Let us start by quickening the pace of subsidy reform.

Endnotes

ALL THE DETAILS

A full bibliography is included in *Perverse Incentives*, the technical report of this study. It contains footnote references for material incorporated into this edition, as well as the complete source citations for tables, charts and figures. Those interested may obtain copies of the technical report from the Earth Council at the address on the back cover.

These endnotes deal with references found only in this popular version.

Chapter 1: Stalking the elusive subsidy

- Page 1 - Yet far too few people:** For “disguisedly subsidized consumption” see Barbara Ward and René Dubois, *Only One Earth: The Care and Maintenance of a Small Planet*, numerous publishers, 1972, p. 143.
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- Page 9 - From the very beginning:** The salinization of Sumerian croplands was first reported by Jacobsen and Adams in the November, 1958, *Science* magazine article “Salt and Silt in Ancient Mesopotamian Agriculture.”
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- Page 11 - Figure 2** from Michael Renner, *Fighting for Survival: Environmental decline, social conflict and the new age of insecurity*, Worldwatch Institute, 1996. p. 42.
- Page 13 - Less visible but no less serious:** Percentage figures on salt-damaged land from D.L. Umale, World Bank Technical Paper 215, *Irrigation-induced salinity: a growing problem for development and the environment*, Washington, D.C., 1993.
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- Page 15 - The questionable finances:** Tunisian farmer costs from Postel, 1996, p. 54.
- Page 17 - Irrigation water subsidies:** Bhadresar example from Roodman, p. 40.
- Page 18 - Pindar verse** from Olympian Ode 1, dedicated to Hieron, tyrant of Syracuse.

Chapter 3: Agriculture: the bountiful earth

- Page 19 - If water is the elixir:** Birth of agriculture from Hugh Thomas, *A History of the World*, Harper & Row, 1987, p. 20.
- Page 20 - Lately, however, population:** Grain harvest data from *Vital Signs 1996*, Worldwatch Institute.
- Page 22 - The costs of subsidies:** Statistics exclude forestry, hunting and fishing. Annual fishing subsidies world-wide of more than \$54 billion have also exacted a dreadful toll on sustainable development — 13 of the 15 major oceanic fisheries are in decline because of overfishing and there are now enough subsidized boats, nets and gear to catch twice the available fish. Fishing information from Roodman, p. 30. and from “The World’s Imperiled Fish” by Carl Safina, *Scientific American*, November, 1995, p. 34.
- Page 27 - Reducing subsidies for input:** Details of brown rice planthopper incident from a forthcoming World Bank publication, *Monitoring Environmental Progress: Expanding the Measure of Wealth*, Washington D.C. (1997).
- Page 28 - A touch of humility:** Sugar cane catastrophe from Herman J. Viola and Carolyn Margolis eds., *Seeds of Change*, Smithsonian Institution, 1991, pp. 12-13.

Chapter 4: An all-consuming energy

- Page 29 - From the Shinto myths:** Generally from *Mythologies of the Ancient World*, ed. Samuel Noah Kramer, Doubleday Anchor, New York 1961; *Myths of the World*, by Michael Jordon, Kyle Cathie Ltd., London 1993; *Fire Race: A Karuk Coyote Tale*, by Jonathan London, Chronicle Books, San Francisco, 1993; *World Religions: From Ancient History to the Present*, ed. Geoffrey Parrinder, Facts On File, New York 1985.
- Page 35 - There’s something unbelievable:** Coyote legend from London’s *Fire Race*. Carbon loading of atmosphere from the Worldwatch Institute’s *State of the World 1996*, W.W. Norton, New York, p. 29.

Chapter 5: The road goes on forever

- Page 39 - To celebrate the centenary:** Coventry Cathedral celebrations from *The Independent*, January 15, 1996, and *Daily Mail*, January 16, both London.
- Page 40 - Developing countries face:** Bangkok’s traffic jam from *Vital Signs 1996*, Worldwatch Institute, Washington, D.C. p. 84. and *World Resources 1996-97*, World Resources Institute and Oxford University Press, 1996 p. 86.
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Chapter 6: An end to subsidy addiction

- Page 53 - When subsidies create:** Details of Georgia peanut subsidy from *Green Scissors 1996*, Friends of the Earth, Washington, D.C. 1996, p. 41.
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Further reading

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And stay tuned . . .

Internet coverage devoted to the Rio + 5 meeting and the UN General Assembly's special session on sustainable development, June 23-27, 1997, is available through:

www.sustainabledevelopment.org

www.sustainabledevelopment.net

The two meetings will also be part of the regular environmental reporting on:

www.earthtimes.org

www.iisd.ca/linkages/sd

The dedicated Internet coverage is being provided in a cooperative venture through WETV, a new global access television network based in Canada, and Global Exchange Incorporated, a U.S. developer of Web software.

Glossary

Brundtland Commission:

The World Commission on Environment and Development, chaired by Gro Harlem Brundtland, former prime minister of Norway. The commission's 1987 report, *Our Common Future*, called for a global transition to more sustainable forms of development and proposed the Earth Summit — the United Nations Conference on Environment and Development which was held in Rio de Janeiro in June, 1992.

Desertification:

The spread of deserts, a world-wide problem especially severe in the Sahel region of north and central Africa.

Developing countries, developing world:

Countries that are underdeveloped by comparison to industrialized nations or the emerging economies of Southeast Asia. Also known as the Third World or the South. (See also *transition economies*.)

FAO:

The Food and Agriculture Organization, a UN agency, with headquarters in Rome.

GDP:

Gross Domestic Product, the value of all the goods and services produced and used within a country's borders. A broad measure of economic activity.

Greenhouse effect:

The warming of the Earth because some of the sun's energy is blocked from radiating back to space by greenhouse gases, in the same way as glass causes the temperature to rise in a greenhouse. Also called *global warming*.

Greenhouse gases:

The gases which produce the greenhouse effect, primarily carbon dioxide (CO₂) but also including nitrous oxides, methane, chlorofluorocarbons (CFCs) and their substitutes.

IEA:

International Energy Agency, headquartered in Paris.

IMF:

International Monetary Fund, headquartered in Washington.

Non-Governmental Organization (NGO):

A group that furthers a cause, or causes, from outside government although often lobbying governments. NGOs operate both nationally and internationally.

OECD:

Organization for Economic Co-operation and Development, headquartered in Paris.

OPEC:

Organization of Petroleum Exporting Countries, headquartered in Vienna.

Transition economies:

A term applied to the former centrally planned economies of the Soviet Bloc now making the shift to market economies.

World Bank:

The chief international lending agency and a major influence on aid strategies for developing countries. Its annual *World Development Report* often sets the agenda for debate. Headquartered in Washington and affiliated with the United Nations.

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Maurice F. Strong, Chairman of the Earth Council, Executive Co-ordinator for UN Reform, and Senior Advisor to the President of the World Bank, was Secretary General of the 1992 UN Conference on Environment and Development, known as the Earth Summit, and of the 1972 Stockholm Conference on the Human Environment. He is Chairman of the World Resources Institute, former Chairman and CEO of Ontario Hydro, Director of the World Economic Forum and a member of the Commission on Global Governance. He has received the Order of Canada and several other honours and is a member of the Queen's Privy Council of Canada.



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