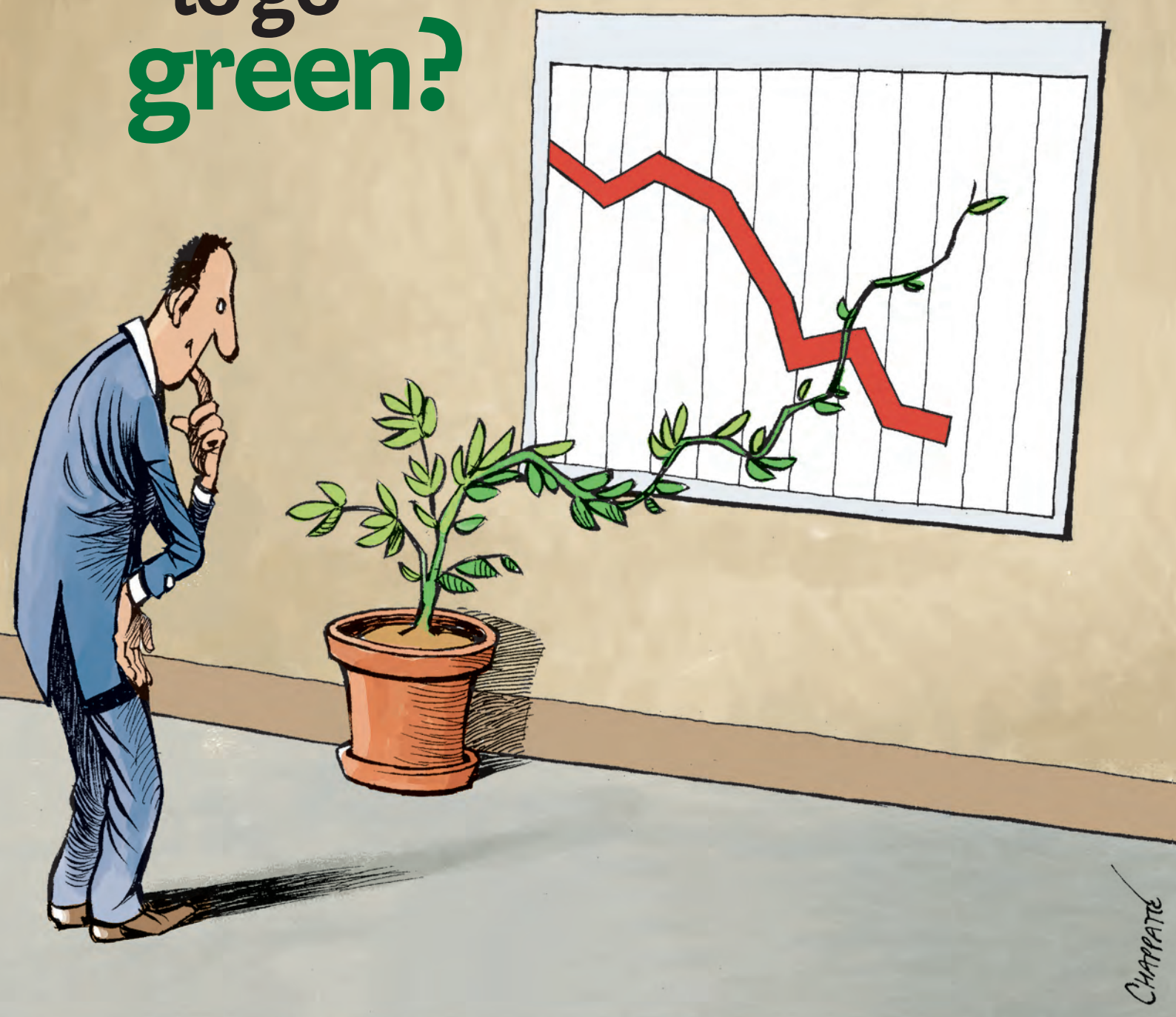
Number 1

MakingIt

Industry for Development

- Prosperity without growth?
- Microsoft on e-waste
- President Kagame interview
- Green cars

Time to go green?



A new quarterly magazine. Stimulating, critical and constructive. A forum for discussion and exchange about the intersection of industry and development.

Welcome

It has happened to many of us in recent months. We flick through a newspaper filled with downbeat assessments of the prospects for the global economy, predictions of a future ravaged by the effects of climate change, and shocking reports of humanitarian catastrophe in the world's poorest countries, and we ask ourselves – where did we go wrong?

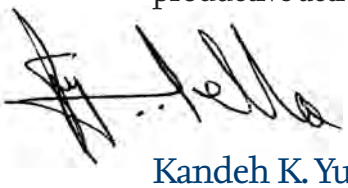
What became of the expectation that, through concerted action, poverty would be defeated in our time? Why, almost two decades after the Kyoto Declaration, have we still not properly tackled the issues of environmental degradation and climate change? And, with the scars of the worst recession since the 1930s still visible on enterprises the world over, how can it be that we did not learn from the mistakes of the past?

Yet, amid all this gloom and doom, there are positive developments that need to be acknowledged, learnt from, and built upon. We see them in Asia, in Latin America and, let's not forget, we see them in Africa too. Our country feature on Rwanda illustrates just one of several encouraging improvements taking place on that continent.

The goal of *Making It* is to throw some light on these and other matters, to stimulate reflection and debate on both the challenges and the solutions, to be critical but also constructive. It is not a publication that claims to have all the answers, but it is a forum for enquiry into a range of topics across the intersection of industry and development. Published each quarter, *Making It* will always have a specific thematic focus – the subject of this first issue is the promise of "green growth".

The magazine's contributors come from a wide range of disciplines and backgrounds – they may not agree with each other, nor with the official stance of UNIDO, the Organization that I have the privilege to lead as Director-General. But I believe that we all share the wish to see the day when finally, in the words of the Nobel laureate Seamus Heaney, "hope and history rhyme".

I trust you will find *Making It* a stimulating and thought-provoking read, and I encourage you to join the debate about how productive activities can help the world to develop and progress.



Kandeh K. Yumkella,
Director-General, UNIDO

MakingIt
Industry for Development

Contents

GLOBAL FORUM

FEATURES

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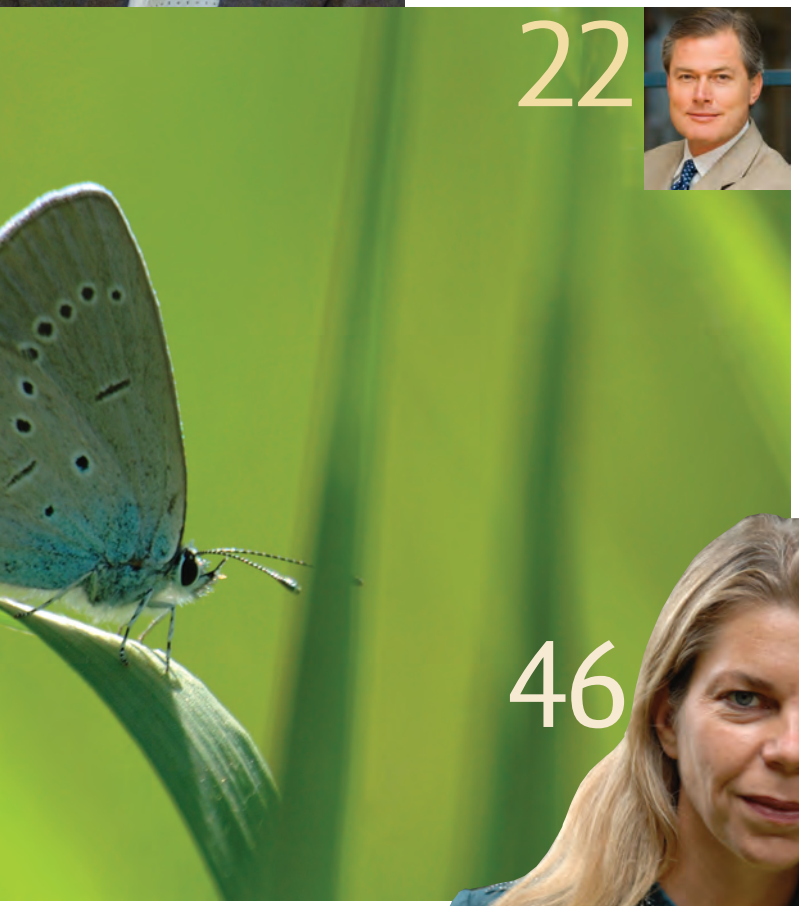


FACT FILE

global trends

■ The International Energy Agency (IEA) estimates that manufacturing industry can improve its energy efficiency by an impressive **18 to 26%**, while reducing the sector's CO_2 emissions by **19 to 32%** based on proven technology.

■ If governments continue to make good on pledges to accelerate the transition to a low-carbon economy, and businesses maintain investments in climate change-related products and services, the sector can expect to be worth more than **US$2 trillion** a year by 2020. (HSBC)

■ UNEP reports that investment in the sustainable energy market defied the global recession in growing by around 5% – from **US$148 billion** in 2007 to around **US$155 billion** in 2008.

■ Residential energy use by information and communication technologies (mobile phones, PCs etc.) and electronic devices (televisions, DVDs, MP3 players, etc.) is expected to **double** by 2022 and increase **threefold** by 2030 – equivalent to the current combined total residential electricity consumption of the US and Japan. (IEA)

RICOH

Japanese office equipment supplier, Ricoh, is setting up an eco-powered sign in Times Square in New York City. The billboard will be powered entirely by the sun and the wind, needing no electricity supplies from other sources.

did you know?

■ ...that in **CHILE** the per capita personal disposable income (at 2005 prices) increased from US$1,863 in 1990 to US$4,118 in 2008, and the percentage of the population living in poverty fell from 39% in 1990 to 14% in 2006.

■ ...that **BOTSWANA** has maintained one of the world's highest economic growth rates since independence in 1966. Economic progress over the past 40 years has significantly raised living standards for about two-thirds of the population. Botswana has transformed itself from one of the poorest countries in the world to a middle-income country. Per capita GDP (PPP) increased from US$1,839 in 1980 to US$13,903 in 2008.

■ ...that in **VIETNAM** the net flow of foreign direct investment increased from US$1 billion in 2003 to US$10 billion in 2008, providing a boost to the economy and employment. The total value of exports rose from US$2 billion in 1990 to US$61 billion in 2008.

events

■ The 3rd annual **World Future Energy Summit**, January 18-21, 2010, Abu Dhabi, UAE. "The world's largest meeting of influential figures from the renewable energy industry." www.worldfutureenergysummit.com

■ The National Council for Science and the Environment's 10th **National Conference on Science, Policy, and the Environment**. January 20-22, 2010, Washington, DC, USA. The New Green Economy. http://ncseonline.org/conference/GreenEconomy/

■ First ever Green Economics conference in Africa, January 22-23, 2010, Cape Town, South Africa. **Green Economics: a Beacon of Hope for Africa**. www.greeneconomics.org.uk/

■ The 4th **International Renewable Energy Conference**, February 17-19, 2010, New Delhi and Uttar Pradesh, India. Ministerial meeting, business-to-business and business-to-government meetings, side events, and a trade show/exhibition. http://mnes.nic.in/

■ Extraordinary meetings of the conference of the parties to the **Basel, Rotterdam, and Stockholm Conventions**, February 24-26, 2010, Bali, Indonesia. www.pops.int www.basel.int

■ **Business for the Environment Global Summit**, April 22-23, 2010, Palais des Congrès, Paris, France. The Green Imperative: Leadership, Innovation and Technology. www.b4esummit.com/

GLOBAL FORUM

The Global Forum section of *Making It* is a space for interaction and discussion, and we welcome reactions and responses from readers about any of the issues raised in the magazine. Letters for publication in *Making It* should be marked 'For publication', and sent either by email to: editor@makingitmagazine.net or by post to: The Secretary, *Making It*, Room D2226, UNIDO, PO Box 300, 1400 Vienna, Austria. (Letters/emails may be edited for reasons of space).

To provide a platform for further discussion of the issues raised in *Making It*, a magazine web site has been created at www.makingitmagazine.net and readers are encouraged to surf on over to the site to join in the online discussion and debate about industry for development.

Making it happen... An entrepreneur's perspective: Viet Nam

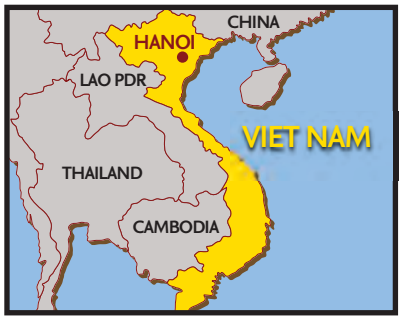
Truong Anh Tuan is the CEO of iWay JSC (Information Way Joint Stock Company), an IT company based in the Dong Da district of the city of Hanoi in the north of Viet Nam. The 35-year-old Tuan founded the company in April 2004.

Was it easy or difficult to start your business?

Starting a business in Viet Nam is generally very easy. Our legal system has been upgraded in recent years, and this is a positive factor favouring the establishment of a business. From a business point of view, it's not difficult to choose a sector in which to invest, but it's difficult to run a business once it's created, because there are always unexpected factors occurring that prevent the business from operating effectively. Our enterprise had a smooth start-up.

What are the key factors contributing to the growth or development of your business to date?

One of the most important factors up to now has been our strategy. Having properly identified our strengths, market demand, and our competitive capacity, we have moved our strategy from software and IT solutions in general, to more specialization in providing such services and solutions as consultancy, deployment, training, support, maintenance and custom development, based on free/libre and open source software – FLOSS.



The second most important factor has been human resources. iWay currently has a staff of 20 people who hold bachelors and masters degrees in IT and economics, and who have a specialized knowledge of IT products, services, and solutions.

What aspects of your business give you the most satisfaction?

Our enterprise is well aware that FLOSS applications can bring huge benefits to the business sector, as well as to the whole community and society. We have been making a great effort to meet the market demand for FLOSS-based services and solutions.

What is currently the biggest problem for your business, and how are you dealing with it?

The biggest problems that we are facing – but ones that are gradually being fixed – are the government's policies on, and the public's awareness of, FLOSS. Although FLOSS is established in other parts of the world, it is a very new sector in Viet Nam. The government's policies in this regard are quite advanced and constantly updated, but they are not always issued in a timely fashion. This limits people's awareness and slows down the demand for FLOSS applications in terms of both quantity and specification level.

What do you expect to happen to your business in the next 5-10 years?

Our aim is to become the largest supplier of FLOSS application-based assistance services in Viet Nam and the region.

● Interview by **FRANCESCO RUSSO**, UNIDO

Note: The term open source refers to software in which the source code is freely available for others to view, amend, and adapt. The basic idea behind open source is very simple: when programmers can read, redistribute and modify the source code for a programme, the software evolves. It can be improved and adapted. Free/libre and open source software (FLOSS) has become the preferred choice of many governments and companies in the Asia-Pacific region.

Managing the transition to resource efficient and low carbon industries in Asia

An international conference on green industry in Asia took place in Manila, the Philippines, from 9-11 September 2009. Co-organized by the Government of the Philippines, with the United Nations Industrial Development Organization, the United Nations Environment Programme, and the UN Economic and Social Commission for Asia and the Pacific, the conference provided an arena for high-level policy-makers and other key stakeholders to discuss policies and strategies for low-carbon and resource efficient industrialization. *Making It* spoke to three of the more than 1,200 conference participants.

PAUL HOHNEN – Sustainability Strategies advisory services.

Is there a business case for sustainability?
Well, instead let's ask the question – 'Is there a business case for ruining the planet?' – and the answer is clearly, 'No'. The business case for business is actually to have vibrant sustainable societies, investors, consumers, and markets that survive. Because only in that context can business survive, and thrive.

What have been the major messages coming out of the conference?
I thought that the conference outcomes were very well captured by two comments. The first was that Asia can be, and must be, a leader of the world in green industry. The second – and this was a more chilling conclusion – is that in relation to issues like climate change, unless Asia *does* take the lead, there will be no future for the world. So, there is a win-win here.

The conference has been extremely good in focusing people's minds on this dilemma of our existing patterns of behaviour and production, and the way that we need the transition to a more fuel efficient, low carbon economy. And indeed that there are economic, technological, and ecological reasons for us to do that. There is a sweep of policies out there that are being implemented in different countries. The challenge for us now is to fast-track them.

What are the specific lessons for Asia?
At this moment, Asia is at a turning point. China is an Asian country that has gone from having no wind energy ten years ago to become a world leader. There is an example of leadership in technology, in green industry. On the other hand, we have countries here in Asia, and indeed elsewhere in the world, that are lagging behind, that are waiting for the first movements, and that are hesitant to change from the existing business model. There is a real danger for Asia, unless it leads on new technologies, on green industry, that it will be left behind, and indeed the industrial gap, the economic gap, may grow rather than close. ■
Interview by George Assaf, UNIDO

"Asia can be, and must be, a leader of the world in green industry.... in relation to issues like climate change, unless Asia does take the lead, there will be no future for the world"

AJAY SHANKAR – Head of the Department of Industrial Policy and Promotion in the Ministry of Commerce and Industry, Government of India.

What is the position of your country on green industry?
Since the 1980s, under the visionary leadership of Indira Gandhi, India has felt the need to reconcile industrialization and development with preserving the environment. We are committed to greening industry....We have drawn up our own national action plans. We are already quite successful in the field of wind energy, and we are launching a national solar mission. Solar energy offers great promise because we get a lot sun in India. We have launched a very strong programme of improving energy efficiency, and we want to build on our successes. In our energy-intensive industries like cement, steel, and fertilizer,

UNIDO

Opening ceremony of September's international conference on green industry in Manila.

we lowered energy consumption by about 28% per unit output. And similarly, if you look at the last few years, the economy in its peak period was growing at about 9% per annum, but energy consumption was growing at only 3.7 %. So, we have good achievements. We have to build on that, and do a lot more.

Can you give some examples of the significant national initiatives that should be adopted, not just by India, but also by other similar countries?

For developing countries, the first of two major areas would be urbanization, because the way we urbanize, the way we get green buildings mainstreamed, and the way we get energy efficient public transport into our urban settlements, will have a huge impact on how energy demand grows in the developing countries. The second big area is to move towards low carbon, or zero carbon, sources of energy. Solar energy offers huge promise because some experts believe that by 2015 or 2020 it could be commercially viable. And our Prime Minister has been wise by seeking international civil nuclear cooperation, because we believe that nuclear energy is a zero carbon source of energy and is an option which needs to be considered seriously at a global level. ■

Interview by Linx Productions

EDGAR CHUA – Chairman, Shell Companies in the Philippines, Guam, Palau, and Saipan.

Green industry – what is in it for business, and particularly for big business, which you represent?

First of all, I think business is not separate from society as a whole. There is no wall which could separate us. If there is a problem in society, like climate change, then business is a part of that. Secondly, I think this presents new business opportunities as well. So, it is not just going to be a cost, meaning you need to mitigate your emissions, your carbon footprint. I see this as providing business opportunities.

For oil companies, such as Shell, is there a contradiction in that this is a move away from your kind of business?

In the past we have been considered an oil and gas company, but now we see ourselves as an energy company…It is important for us to move into new areas for business, like renewables. Already Shell is the biggest marketer of biofuels for example. And we are working on different technologies, which we call second generation biofuels, which we believe will present new business opportunities for the company in the future.

Sometimes people in developing countries say, "Look, you are now telling us don't do this because it's ruining the environment, and don't do that because there are finite resources. But you guys became rich doing exactly that."

I think this is a valid point, and that's why the developed countries should give the developing countries space, so that they can also develop. But the developing countries cannot use that as an excuse for not protecting the environment… We have available technology which will enable us to leapfrog. And I think that it's not going to get us anywhere if we start having that sort of discussion, because that's pointing fingers. I think if we come to the table with goodwill and trust, then we can come up with something which is workable for both developed and developing countries. Because – again – in the end you cannot put a curtain between developing countries and developed countries when it comes to emissions and climate change… We are all in this together. ■

Interview by Linx Productions

HOT TOPIC

In what will be a regular feature, Making It invites distinguished contributors to consider one of the controversial issues of the day. Making It asked Tim Jackson and the UN's Tariq Banuri and David Le Blanc whether it is possible to achieve prosperity without growth.

Prosperity without growth…?

by Tim Jackson

Economic growth is supposed to deliver prosperity. Higher incomes should mean better choices, richer lives, and an improved quality of life for us all. That, at least, is the conventional wisdom. But things haven't always turned out that way.

Growth has delivered its benefits, at best, unequally. A fifth of the world's population earns just 2% of global income. Inequality is higher in the OECD nations than it was 20 years ago. And while the rich got richer, middle-class incomes in Western countries were stagnant in real terms long before the current recession. Far from raising the living standard for those who most needed it, growth let much of the world's population down. Wealth trickled up to the lucky few.

Fairness (or the lack of it) is just one of several reasons to question the conventional formula for achieving prosperity. As the economy expands, so do the resource implications associated with it. These impacts are already unsustainable. In the last half century, the global economy has expanded five times. But an estimated 60% of the world's ecosystems have been degraded. Global carbon emissions have risen by 40% since 1990. Significant scarcity in key resources – such as oil – may be less than a decade away.

A world in which things simply go on as usual is already inconceivable. But what about a world in 2050 where nine billion people all aspire to the level of affluence achieved in the OECD nations? Such an economy would need to be 15 times the size of this one by 2050 and 40 times bigger by the end of the century. What does such an economy look like? What does it run on? Does it really offer a credible vision for a shared and lasting prosperity?

These are some of the questions that prompted a recent report from the UK Sustainable Development Commission to engage in a critical examination of the relationship between prosperity and growth. The report acknowledges at the outset that poorer nations stand in urgent need of economic development. But it questions whether ever-rising incomes for the already-rich are an appropriate goal for policy in a world constrained by ecological limits. In short, it challenges the assumption of continued economic expansion in rich countries and asks: is it possible to achieve prosperity without growth?

> "It seems fanciful to suppose that 'deep' resource and emission cuts can be achieved without confronting the nature and structure of market economies."

Clearly, the recession throws this question into sharp relief. The banking crisis of 2008 led the world to the brink of financial disaster and shook the dominant economic model to its foundations. It redefined the boundaries between market and state, and forced us to confront our inability to manage the financial sustainability – let alone the ecological sustainability – of the global economy.

Unique opportunity

If this seems like an inopportune moment to question growth, it's not. On the contrary, the current crisis represents a unique opportunity to address financial and ecological sustainability together. And as the report argues, the two things are intimately related. The growth imperative has shaped the architecture of the modern economy. It motivated the freedoms granted to the financial sector. It stood at least partly responsible for the loosening of regulations and the proliferation of unstable financial derivatives. Continued expansion of credit was deliberately courted as an essential mechanism to stimulate consumption growth.

This model was always unstable ecologically. It has now proven itself unstable economically. The 'age of irresponsibility' – as British Prime Minister Gordon Brown called it – was not

about casual oversight or individual greed. If there was irresponsibility, it was systematic, sanctioned widely, and with one clear aim in mind: the continuation and protection of economic growth.

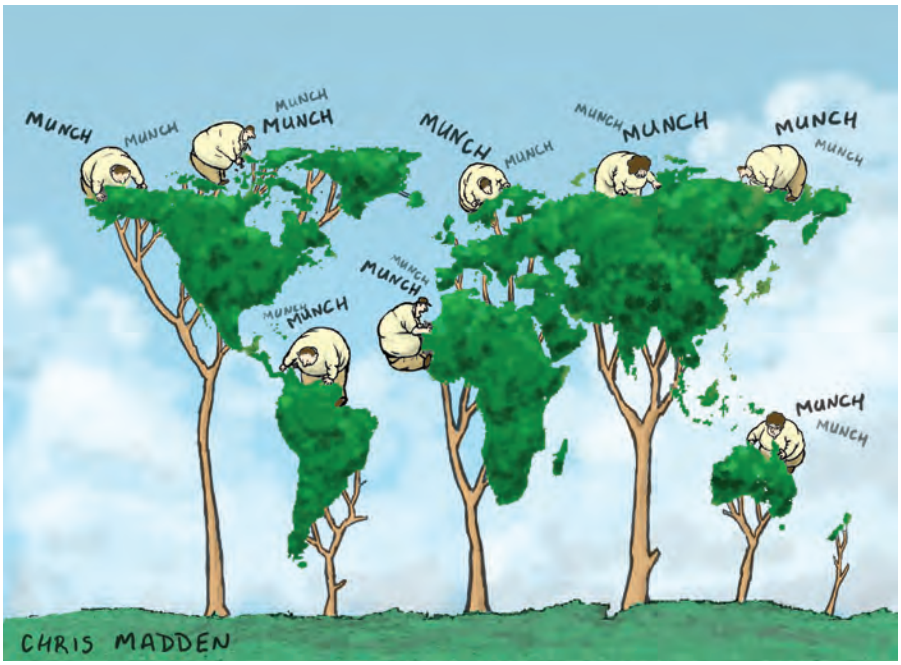
The trouble is that doing without growth is also deeply unpalatable for all sorts of reasons. The most pressing is the structural reliance of capitalism on growth. The reasons for this are complex. But the most important dynamic is the high emphasis placed on labour productivity. Continuous improvements in technology mean that more output can be produced for any given input of labour. But crucially this also means that fewer people are needed to produce the same goods from one year to the next.

As long as the economy expands fast enough to offset labour productivity there isn't a problem. But if the economy doesn't grow, there is a downward pressure on employment. People lose their jobs. With less money in the economy, output falls, public spending is curtailed and the ability to service public debt is diminished. A spiral of recession looms. Growth is necessary within this system just to prevent collapse.

This evidence leads to an uncomfortable and deep-seated dilemma: growth may be unsustainable, but 'de-growth' (planned reductions in economic output) appears to be unstable. At first this looks like an impossibility theorem for a lasting prosperity. But ignoring the implications won't make them go away. The failure to take the dilemma of growth seriously may be the single biggest threat to sustainability that we face.

Decoupling

The conventional response to the dilemma of growth is to call for 'decoupling': continued economic growth with continually declining material throughput. Since efficiency is one of the things that



modern capitalist economies are supposed to be good at, decoupling has a familiar logic and a clear appeal as a solution to the dilemma of growth.

Evidence for declining resource intensities (relative decoupling) is relatively easy to identify. The energy required to produce a unit of economic output declined by a third in the last thirty years, for instance. Global carbon dioxide intensity fell from around one kilo per dollar of economic activity to just under 770 grams per dollar between 1980 and 2008.

But evidence for overall reductions in resource throughput (absolute decoupling) is virtually absent. The improvements in energy (and carbon) intensity noted above were offset by increases in the scale of economic activity over the same period.

There are rising trends in the global throughput of a number of other resources – a range of different metals and several non-metallic minerals for example. Worryingly, in some cases, even relative decoupling isn't happening. Resource efficiency in the use of some structural materials (iron ore, bauxite, and cement) has been declining globally since 2000, as the emerging economies build up physical infrastructures, leading to *accelerating* resource throughput.

The scale of improvement required in the future is daunting. In a world of nine billion people, all aspiring to a level of income commensurate with 2% growth on the average EU income today, carbon intensities would have to fall on average by over 11% per year to stabilize the climate – 16 times faster than it has done since 1990. By 2050, the global carbon intensity would need to be only 6 grams per dollar of output, almost 130 times lower than it is today.

Capitalism's delusion

The reality is that there is as yet no credible, socially just, ecologically sustainable scenario of continually ➤

HOT TOPIC

growing incomes for a world of nine billion people. And in these circumstances, simplistic assumptions that capitalism's propensity for efficiency will allow us to stabilize the climate and protect against resource scarcity are nothing short of delusional.

In fact, it seems fanciful to suppose that 'deep' resource and emission cuts can be achieved without confronting the nature and structure of market economies. In particular, we're drawn inevitably towards the role of two inter-related features of modern economic life that together drive the growth dynamic.

On the one hand, the profit motive stimulates a continual search by producers for newer, better or cheaper products and services. This process of 'creative destruction', according to the economist Joseph Schumpeter, is what drives economic growth forwards. For the individual firm, the ability to adapt and to innovate – to design, produce and market not just cheaper products but newer and more exciting ones – is vital. Firms who fail in this process put their own survival at risk.

But the continual production of novelty would be of little value to firms if there were no market for the consumption of novelty in households. Recognizing the existence, and understanding the nature, of this demand is essential. It is intimately linked to the symbolic role that material goods play in our lives. The 'language of goods' allows us to communicate with each other – most obviously about social status, but also about identity, social affiliation, and even – through giving and receiving gifts for example – about our feelings for each other.

Novelty plays an absolutely central role here for a variety of reasons. In particular, novelty has always carried important information about status. But it also allows us to explore our aspirations for our selves and our family, and our dreams of the good life.

Perhaps the most telling point of all is the almost perfect fit between the continual production of novelty by firms, and the continuous consumption of novelty in households. The restless desire of the consumer is the perfect complement for the restless innovation of the entrepreneur. Taken together these two self-reinforcing processes are exactly what is needed to drive growth forwards.

Despite this fit, or perhaps because of it, the relentless pursuit of novelty creates an anxiety that can undermine social well-being. Individuals are at the mercy of social comparison. Firms must innovate or die. Institutions are skewed towards the pursuit of a materialistic consumerism. The economy itself is dependent on consumption growth for its very survival. The 'iron cage of consumerism' is a system in which no one is free.

Government's role

Government is in conflict with itself here. On the one hand, it has a role in 'securing the future' – protecting long-term social and ecological goods. On the other, government holds a key responsibility for macro-economic stability. For as long as macro-economic stability depends on economic growth, government will have an incentive to support social structures that undermine collective behaviour and reinforce materialistic, novelty-seeking individualism – particularly where that's needed to boost high street sales.

Conversely though, freeing the macro-economy from a structural requirement for growth will simultaneously free government to play its proper role in delivering social and ecological solutions and protecting long-term interests.

The narrow pursuit of growth represents a horrible distortion of the common good and of underlying human values. It also undermines the legitimate role of government itself. At the end of the day, the state is society's commitment device, *par excellence*, and the principal agent in protecting our shared prosperity. A new vision of governance that embraces this role is urgently needed.

In fact, there is now a unique opportunity for governments in advanced nations both to demonstrate economic leadership, and at the same time to champion international action on sustainability. This process must start by developing financial and ecological prudence at home. It must also begin to redress the perverse incentives and damaging social logic that lock us into unproductive status competition.

Above all, there is an urgent need to develop a resilient and sustainable macro-economy that is no longer predicated on relentless consumption growth. The clearest message from the financial crisis of 2008 is that our current model of economic success is fundamentally flawed. For the advanced economies of the Western world, prosperity without growth is no longer a utopian dream. It is a financial and ecological necessity. ■

"The 'iron cage of consumerism' is a system in which no one is free."

TIM JACKSON is Professor of Sustainable Development at the University of Surrey in the United Kingdom. He is the author of a new, groundbreaking book, *Prosperity without Growth: Economics for a Finite Planet* (Earthspan).

HOT TOPIC

Is 'green growth' really possible?

by Tariq Banuri and David Le Blanc

At a logical level, the answer to the question is a resounding yes.

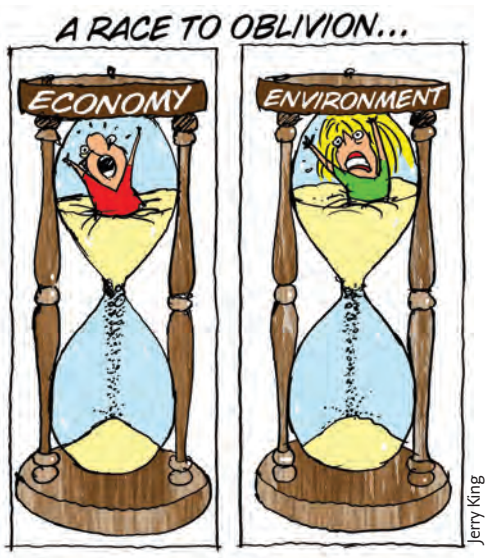
Currently, the world as a whole produces far more than is required to meet the needs of human beings. Beyond a threshold level of income or consumption – perhaps around US$10,000 per capita per year – additional income or consumption seems not to bring any improvement whatever in human well-being, as expressed either by individuals themselves, or by aggregate indicators of well-being, happiness, or human development. In fact, except for the one area of health – where arguably improvements in longevity and successes in fighting basic diseases can be taken as a significant improvement in human welfare – it is a challenge to pinpoint any area where consumption in excess of what advanced economies already enjoy, actually brings real improvements in human welfare.

This would suggest that in practice, human well-being is already decoupled from consumption beyond such a threshold, and therefore that the maximization of human welfare does not require ever increasing levels of consumption.

The promise of growth

The problem, however, is that economic growth is written inextricably into the very fabric of modern society. The rapid growth of the past two centuries held out the promise of a permanent solution to what might be termed the "survival" problem. Yet, although, at least in principle, the world today produces enough to meet the needs of all people everywhere, billions are still hungry and lack access to shelter, health care, water, sanitation, and other basic necessities. The only available solution for addressing this inequality is more growth in developing countries.

But growth has become essential in other ways as well. In industrialized countries, a slowdown in growth results in unemployment, economic and political instability, and various forms of social dysfunction. More generally, it is the promise of growth that plays a stabilizing role in our societies. It offers on the one hand a hope to the poor that they will not remain frozen in an unequal situation forever, and on the other an assurance to the rich that achievement of income equality or poverty eradication would not come at the expense of their lifestyles or privileges.



The key question therefore is not whether "green growth", namely growth in human prosperity without growth in material throughput, is logically possible, but whether it can address the three goals of development, employment, and solidarity, namely whether green growth can (a) reduce global inequality and solve the "survival" problem in developing countries, (b) enable full employment, political stability, and maintenance of social welfare in industrialized countries, and (c) continue to offer the promise of a "positive sum game", in which the improvement in the conditions of one group will not be seen by other groups as a threat to their privileges.

For developing economies, the coincidence of development imperatives and the need to limit global material flows has created the perception of a race between development and catastrophe. Is it possible to bring developing countries to decent living standards before the crisis hits? ➤

HOT TOPIC

➤ Analogous to Tim Jackson's recommendations for developed countries, one can identify some pressing priorities for developing countries. Perhaps the most urgent of these is a rapid expansion in modern energy services. Energy is not only the key driver of the industrial revolution; it is also the best indicator of human development. More importantly, energy has been used as a substitute for other scarce resources. Given that because of climate change, modern energy services have themselves become problematic, it is critical that the transition to renewable energy be undertaken through a cooperative global programme of investment and technological diffusion.

Second, while circumstances differ among countries, limiting population growth is certainly high on the agenda. This is not only because a lower level of peak global population is consistent with a lower demand for aggregate material throughput, but also because the desired speed of adjustment of consumption flows is now driven by ecological trends, which are moving much faster than the demographic transition.

Beyond this, accelerating universal access to education and basic services, drinking water and sanitation, and modern health services, is probably far more urgent and beneficial than the current international status quo acknowledges.

Global cooperation

To achieve all the above, growth in developing countries will be necessary. However, this growth can be largely concentrated in targeted areas, namely renewable energy services, better management of water resources, and expansion of education, health, and sanitation services. But this will require global cooperation at an unprecedented scale, involving both a targeted investment programme in developing countries, and a dramatic reduction in material throughput in developed countries. The latter would not only make room for developing countries, but also create models combining high welfare and low material use.

Jackson offers several recommendations on the reform of institutions in developed countries so that full employment is consistent with zero growth.

Beyond such reform, however, is the sticky question of values, and in particular the deep anxiety of humans towards their situation relative to others. Part of the consensus on growth in developed countries may be related to a fear that some decades from now, the rich will be few and the poor will be many, and that in order to remain at the rich countries' table in the future, you have to keep up with your neighbours in the race for growth. If this story is true, low-growth societies in advanced countries cannot be achieved without coordination among them.

And this leads to perhaps the most difficult question: can humans thrive in a zero-sum game? If the size of the pie is fixed, will it create anxiety about your neighbour's success, or an incentive to protect one's privileges at all costs? Notwithstanding all its flaws, the industrial revolution, through the promise of an endless accumulation of wealth, slowly made possible the idea that cooperation could be better than rivalry, that one need not kill one's neighbour to survive, and that political liberties and the rights of others were not necessarily in conflict with one's own. If we have to revert to the idea of a scarcity society, how would all the advances in political development be protected? Would democracy and human rights come under threat from fascistic political movements aimed at retrieving the largest share of the pie for their groups?

Brave new world?

This has not yet been clearly worked out. George Orwell in *1984* and Aldous Huxley in *Brave New World* describe dysfunctional versions of steady-state economies, both showing the complete de-humanization of the individual. The power that these two books still convey today can be attributed to the fact that both explicitly expose the dangers that would have to be avoided as we confront a world without the possibility of permanent growth. It is perhaps in recognition of both the danger and the challenge that the economist, Herman Daly, once described sustainable development as the kind of development that places the least demands upon natural resources, and the most demands upon moral resources.

Viewed thus, it soon becomes clear that while green growth is possible, it will require a high level of political maturity and global social solidarity – between rich and poor countries, as well as among them.

Whether such maturity and solidarity will emerge in time remains, for now, an open question... ■

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Phaedra Ellis-Lamkins at a press conference at the San Francisco Mayor's Office announcing opportunities for directing green tech jobs to low-income communities, and discussing the relationship between environmental justice and green-collar jobs. Photo: Stephen Loewinsohn

How I became an environmentalist: A small-town story with global implications

PHAEDRA ELLIS-LAMKINS is the Chief Executive Officer of **Green For All**, a national organization dedicated to improving the lives of all people in the United States of America through a clean energy economy. Green For All works in collaboration with the business, government, labour, and grassroots communities to create and implement programmes that increase quality jobs and opportunities in green industry – while holding the most vulnerable people at the centre of its agenda. ➤

More than 12,000 youth leaders converged on Washington, D.C. in early 2009 to advocate for investment in a clean energy future.

➤ It's not surprising that new, popular movements and organizations are emerging in response to the ecological crisis. Climate change is the most important challenge facing humanity – and the rest of the planet – today. It threatens the balance of the global systems and relationships most fundamental to life – like the polar icecaps (the world's fresh water storage system and a natural reflector of excess heat and light from the sun) and global ocean and air currents (the world's circulatory system). These threats are serious, and demand immediate attention. But they are not why I became an environmentalist. My story is much smaller, about one family in one town on the west coast of the United States.

Growing up in Suisun, California

I grew up in a little California town called Suisun, about 50 miles from San Francisco. In retrospect, it is easy for me to see how my childhood was my impetus into activism – and into environmentalism. But I didn't know it at the time.

What I did know was that, compared to the rest of the United States, my family was poor. Even in the richest country in the world, I had to sign up for my school's free lunch programme. That meant I had to stand in a separate line, apart from my friends and most of the other students, clearly visible as too poor to pay for lunch myself.

Then one day, my mother got a union job. She started to make a little more money. It wasn't enough to buy a fancy lunch, or even to pay full price at the school cafeteria. But it was enough that I could upgrade from free lunch to reduced-fare lunch. We could afford 40¢ for lunch every day – enough to get me out of the free lunch line and standing with my classmates, feeling like one of the group.

To this day, I remember how it felt: the dignity of self-sufficiency; the pride of accomplishment; and the quiet comfort of being an equal and accepted member of one's community (in this case, a community of grade-schoolers). It was an incredible feeling – one that I've spent my adult life trying to bring into the hearts and lives of working families in the United States.

Life in Suisun was hard – so hard that, in 1989, the *San Francisco Chronicle* named it the worst place to live in the San Francisco Bay Area. We were far from the only poor family in town, and poverty was far from the only challenge facing the people who lived there. It was an unhealthy place. Most of the people in Suisun worked in heavy industrial plants, which poured a fair share of poison and pollution into our community. I was just one of many children who grew up with asthma as a result. Workers, parents, children – everyone had a hard time in Suisun.

When the people of Suisun had finally had enough, many (including my mother) began to demand that the big polluting companies shut down their toxic factories. They traced many of Suisun's problems – economic and environmental – back to these facilities.

It was a powerful statement. A lot of people in Suisun didn't have steady work, and many of those who did, worked at those facilities. It was a big risk to ask them to leave. For many of us, it meant going back to the free lunch line and many hungry nights. But it was a sacrifice that our parents were willing to make.

Back then, I didn't see how we could have safe, clean, and healthy communities where people had meaningful and dignified jobs. I would learn that only much later.

Re-learning my own story

Early in my career, I worked for many years in the US labour movement. I became a union organizer because it was a union job that allowed my mother to move me from free lunch to reduced lunch. I wanted more parents to be able to do things like that for their children.

For a long time, I did not think of myself as an environmentalist. In my mind, I cared about poor and working people, and environmentalists cared about plants and animals. That was fine, but it was not for me. But soon I began to realize that many of the people I respected and worked closely with – people who clearly cared about poor and working people as much as I did – also considered themselves environmentalists. The more I talked to them, the more I realized that they had the same vision that my mother had given to me so many years ago: clean, safe commu-

"I needed to do something that both helped little girls like me move from free lunch to reduced-fare lunch, and helped parents keep their children and communities healthy, safe and economically viable"
PHAEDRA ELLIS-LAMKINS

nities that are healthy physically *and* economically for people and for the planet.

When I thought back to my childhood, I realized that I had always been an environmentalist. I just didn't know it.

It was a profound moment for me. I was able to connect global problems – like the melting of the polar ice caps – with local problems – like childhood asthma in a small, poor town in California. I was able to connect environmental problems with economic problems, seeing that they both come from an economy that rewards companies that put profit before everything else, including the health of the planet and the well-being of their workers. I was able to connect what I had been doing – helping working people create a better life for themselves – with the work that I would soon be doing – helping to create a more safe, secure and clean country for all people in the USA.

The more I learned, the clearer it became that my life's work was about to change. I needed to do something that both helped little girls like me move from free lunch to reduced-fare lunch, and helped parents keep their children and communities healthy, safe and economically viable.

That's when I joined Green For All.

Poverty and pollution

Green For All is built on a simple idea: that we can fight poverty and pollution at the same time. Solving the ecological crisis is going to take a lot of work – like rebuilding our roads and bridges, renovating our homes and buildings, constructing wind turbines and solar panels, building electric vehicles, and expanding mass transit. At the same time, a lot of people need good, steady, family-supporting work. They are struggling to keep their homes, feed their families, and provide health care for their children. If we link the people who most need work in the United States with the work that most needs to be done, we can fight pollution and poverty at the same time.

Putting that idea into practice is not as simple. It means a complete overhaul of the way the United States does everyday business. We must invest in clean, green solutions – like energy efficiency and renewable energy sources. We must write our laws to include equity and opportunity for all. And we must make sure that the new jobs we create are high-quality jobs, and are available to workers in disadvantaged communities who often get left behind during economic boom times.

Obviously, no single organization can make these changes alone. We need every part of the United States to contribute: government, civil society and the private sector. Much as we need solutions that connect everyday people to global climate issues, we also need a broad, powerful movement that empowers everyday people to participate in those solutions. That movement is emerging, both here in the United States, and throughout the world.

Here, our movement still has a long way to go – but it shows incredible promise, and is growing stronger every day. Green For All is just one in a constellation of groups and individuals working in the US for a clean-energy future. But look just at what our one group is doing and you will get a sense of the hope this movement holds.

Green For All trains leaders from across the United States to be standard-bearers for this movement. We organize national "communities of practice," where the grassroots practitioners building the infrastructure of the clean-energy economy can connect to each other, innovate together, and share their learning with the entire field. We work with emerging green businesses to make them stable and successful, and to take their operations to scale. And we bring all these people together to advocate for cutting-edge policies at the local, state and federal levels that invest in green industry and will lead to green-collar jobs.

A worldwide movement for change

This is a glimpse of how our movement looks in the United States. It will look different in different places, shaped in the hearts and minds of the people who live there. But no matter where you go in the world, I think you will find people trying to put into practice the lessons I learned in a small California town. Everyday people need jobs that can support their families. Those jobs need to be healthy for the workers, their communities and the environment. The benefits of polluting industries do not outweigh the costs to our health, whether those costs be asthma, rising sea levels or climate shifts that put us all in danger.

In the United States, we are working to build clean-energy pathways out of poverty for everyday people. We want to create 21st century, green-collar jobs that buoy communities struggling to keep their heads above water. We want to launch green enterprises that create new wealth and new opportunities for the entire country. And what we are trying to do for workers, families and communities in the US, we can also do for people, even entire countries, who are struggling throughout the world. It is not only individual firms that can take advantage of the economic opportunity in clean and renewable energy and other green industries. Entire countries that have been struggling to find paths to development, now find in clean energy a vast economic landscape where everyone is new and no one has a decisive advantage.

Right now, we have a global economy that is hurting people and hurting the planet. The harm is global in scope, but people feel it at a local, personal level. Ecosystems collapse while small children in small towns suffer from asthma and poverty. We can fix this. By giving everyday people ways to participate in the decisions that are going to shape the next century, we can build a path from this moment to the future we choose. I want to help do that.

I guess that makes me a proud environmentalist. ■

Microsoft's **SEAN NICHOLSON** reviews the commercial possibilities presented by e-waste

Old computers

It is estimated that around 20% of the world's one billion-plus personal computers in current use will be disposed of by the end of this year, rendering e-waste the fastest growing global waste stream. Exacerbating the state of affairs are unscrupulous agencies that transport e-waste from developed countries and dump it in emerging economies which lack the capacity to properly handle hazardous waste. In countries like India and Ghana, tens of thousands of people are involved in informal recycling of dumped e-waste, and every day there are news stories about the dangerous consequences for people's health and environment.

At the same time, millions of usable computers are being thrown away while most people in the world don't have access to any computing technology.

There are several views regarding proper solutions to e-waste. Some lobbyists want all computers to be recycled in the same country they were used in, while others insist computing equipment should be reused, rather than recycled. Since PC-reuse could potentially harm sales of new computers, fingers are often pointed at big IT companies on account of the slow progress they are making in this direction. Some people have proposed giving surplus computers to schools, but others are against such donations, as often the PCs are broken, or the schools do not have the facilities to maintain the PCs. Yet another perspective is provided by some large multinational corporations

– new business

Sean Nicholson is Global Manager of Emerging Solutions for the Microsoft Corporation in Seattle, USA.

which express concern about the risk of data leakage from improper hard disk disposal, leading them to support policies of immediate destruction/recycling of disposed PCs.

As an initial step, effective legislation regulating e-waste could play a role in stimulating positive change. This is illustrated by the fact that PC reuse is higher in those countries that are members of the European Union, than it is in neighbouring countries outside the EU. In countries with adequate e-waste regulations, people have stronger incentives to collect PCs and reuse them, thereby extending their life cycle.

On the other hand, stricter legislation on e-waste trade is not necessarily the answer. Calls for policy-makers in developing countries to block all imports of second-hand computers are problematic because in those very same countries such imports may constitute the only path to PC ownership for many people. For example, new PCs in South Africa are often beyond the reach of people at the lower end of the economic pyramid, while quality refurbished PCs, available for US$80, offer affordable computers to a much wider audience.

It is against this background that coalitions of multinational companies, governments, and non-profit organizations, have begun coming together to find sustainable solutions for tackling e-waste. One example of this is 'SteP' (Solving The E-Waste Problem), a UN-led initiative. Although the primary objective of StePis to address environmental issues stemming from e-waste, the initiative also recognizes the opportunity to develop sustainable green business capacity in developing economies.

So what are the commercial opportunities presented by second-hand computers?

The first is asset disposal services. This opportunity involves reliable data-wiping of computers when they leave their owners. Regardless of the final destination of disposed-of PCs, corporations and governments can rest-assured that no data will get into the wrong hands.

The second is refurbishment for reuse and resale. Most PCs disposed of by corporations are usually in working order. It costs a commercial refurbisher around US$40 to process a PC for resale. While the resale price of refurbished PCs depends on PC specifications, the average three-year-old laptop can be resold for more than a couple of hundred dollars, thereby presenting a large profit margin.

The third is recycling. This includes disassembly of the PC into component parts. There is a large international market in PC components, e.g. for memory chips. A high-tech commercial recycler can extract far more precious components from the same materials compared to a low-tech recycler. For example, an informal recycler might harvest 20% of the gold, but a commercial recycler could potentially achieve an 80%+ yield.

In countries like the USA and the UK, a number of companies now offer all these services. They provide PC owners a safe and ethical disposal solution for their computers, they support legislation development, and their business capacities often extend into handling other forms of e-waste such as mobile phones. A customer bringing in his computer for disposal could expect around 90% recycling, with 10% incineration and zero landfill. Also, the customer may make money as well from the resale of the PCs.

However, in most other countries around the world, the capacity to provide such services is absent. But this is starting to change as corporations, such as Microsoft, see opportunities to support the reuse and recycling of PCs. A move in this direction makes commercial sense because it provides access to new customer segments, supports the agendas of traditional customers such as governments, helps customers who are updating their computer systems, and provides opportunities for staff to support social programmes, which further increases job satisfaction.

The opportunity now exists to expand the capacity for PC disposal, reuse, and recycling in developing countries. This could be a way to create jobs, develop new green industrial capacities, support environmental legislation, and ensure affordable access to quality PC technology for people unable to afford new PCs. ■

The challenge of CLIMATE CHA

The UN Climate Change Conference in Copenhagen in December is expected to forge a new international treaty committing all signatory countries to broad reductions in domestic emissions. Industries will be expected to show their commitment towards protecting the environment through sustainable business growth. **ACHIM STEINER** reviews the challenges facing the sector and the opportunities offered by a green economy.

STILL PICTURES/UNEP

Rethinking the economy

Beyond its immediate consequences, the economic crisis is indicative of flaws in patterns of growth and development that have relied excessively on investment in financial capital without paying equal attention to investment in human and natural capital. The world economy has grown over the past 50 years: global Gross Domestic Product (GDP) doubled between 1981 and 2005. At the same time, 60% of the world's ecosystems have been degraded or unsustainably exploited, according to the Millennium Assessment Synthesis report released in 2005. The continual neglect of investment in conserving and regenerating natural capital is increasingly undermining the basis of livelihoods and wealth creation. This particularly affects the poor and most vulnerable segments of society. The imbalance in patterns of investment in economic, human, and natural capital represents a challenge for long-term sustainable development, and must be given due attention in the global effort to rebuild economies.

These challenges and contradictions will not disappear if economic growth resumes in a 'business as usual' manner. Once global growth resumes, the price of oil is expected to rise to US$180 a barrel. The impact will be felt throughout the global economy, and especially by the poor. In 2008, rising fuel prices cost consumers in developing economies US$400 billion in higher energy expenditure, and US$240 billion in more expensive food. The rise in food prices in 2007 is estimated to have already increased global poverty by between 130 million and 155 million people.

Tackling climate change

A world economic recovery that revives fossil fuel consumption will accelerate global climate change. Greenhouse gas (GHG) emissions are expected to increase by 45% to 41 gigatonnes in 2030, with three-quarters of the rise generated by China, India, and the Middle East. The International Energy Agency warns that the atmospheric concentration of GHG could double by the end of this century, and lead to an eventual global average temperature increase of up to 6°C. Such a scenario is likely to cause a sea level rise between 0.26 and 0.59 meters, and severely disrupt ecosystem services. According to the *Stern Review of the Economics of Climate Change*, with 5-6°C warming, the world economy could suffer losses equivalent to 5-10% of global GDP. Poor countries will suffer costs in excess of 10%

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of GDP. Reports by the Intergovernmental Panel on Climate Change indicate that by 2020, rain-fed agricultural production in several sub-Saharan African countries could decline by over 50%. Changes in agricultural productivity will not only hit GDP growth expectations, but also exacerbate many of the agricultural and food security challenges already facing the world's poorest countries. Across cities worldwide, about 40 million people are exposed to a one in 100 year extreme coastal flooding event. According to the OECD, the top ten cities in terms of exposed populations are Mumbai, Guangzhou, Shanghai, Miami, Ho Chi Minh City, Kolkata, Greater New York, Osaka-Kobe, Alexandria, and New Orleans. By the 2070s, the size of the exposed population could rise to 150 million.

NGE

In response to these challenges, and taking the current economic crisis as an opportunity, in October 2008 the United Nations Environment Programme (UNEP) launched the Green Economy Initiative which makes the economic case that the right policy actions can stimulate recovery and improve the sustainability of the world economy. These policies – "The Global Green New Deal" – could create millions of jobs, improve the livelihoods of the world's poor, and channel investments into dynamic economic sectors.

The Green New Deal was released in the wake of unprecedented economic stimulus packages (over US$3000bn announced in 2008 and 2009) in December 2008. A subsequent Policy Brief to G20 heads of states urged them to turn the crisis into an opportunity: a global green economy driven by massive job creation based on a more efficient use of resources; energy-efficient building and construction; widespread use of modern clean public transport; the scaling up of renewable energy; sustainable waste management; and sustainable agriculture reflecting the latest thinking in ecosystem management, biodiversity and water conservation.

Investing in green industries

The production of energy-intensive industrial goods has grown dramatically – for example, between 1970 and 2007, the global annual output of cement increased by 271%, aluminium by 223%, and ammonia by 200%. Production is expected to continue growing as population and per capita income increase.

Responding to these challenges requires transformative change in the way the economy's resources are allocated. There is a growing indication that investment in the so-called green industries could offer solutions to today's myriad of environmental, economic and social challenges. During 2008, UNEP, the International Labour Organization, the International Organisation of Employers, and the International Trade Union Confederation, jointly commissioned *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*. This is the first comprehensive report on the emergence of a "green economy" and its impact on the world of work in the 21st Century.

The report showed that employment could be affected in at least four ways:

- Additional jobs will be created – as in the manufacturing of pollution-control devices added to existing production equipment.
- Some employment will be substituted – as in shifting from fossil fuels to renewables, or from truck manufacturing to rail car manufacturing, or from land filling and waste incineration to recycling.
- Certain jobs may be eliminated without direct replacement – as when packaging materials are discouraged or banned and their production is discontinued.
- Many existing jobs (especially such as plumbers, electricians, metalworkers, and construction workers) will simply be transformed, and redefined as day-to-day skill sets, work methods, and profiles are greened.

Enabling a green economy

Aware of the challenges facing the industrial sector in transitioning to a greener economy, especially in developing countries, UNEP promotes resource use efficiency throughout the life-cycle of goods and services through its longstanding partnership with the United Nations Industrial Development Organization (UNIDO). The new Joint Resource Efficient and Cleaner Production Programme builds on the existing capacities to advance sustainable industrial development, and sustainable consumption and production in over 40 developing and transition countries. Through this synergistic, joint programme, UNIDO and UNEP are developing and strengthening national capacity services to businesses, governments, and other organizations. The programme enables them to implement the concepts, methods, techniques, and policies necessary to reduce pollution and waste intensities, and to improve efficiency of their natural resource use. Key focal areas address construction and buildings, transport, waste, and industrial water use.

UNEP's *Green Economy Report*, due for publication in late 2010, will make a macro-economic case for increasing public and private investments in 12 "green sectors" including energy-intensive industry sectors like cement, steel, chemicals and refineries. It will also show how improvements can be realized through product design and development, material substitution, process modification and control, energy substitution and efficiency, new clean technologies and processes, and technology transfer measures.

UNEP is committed to work with governments, civil society, and the private sector to identify the most promising work streams for enabling a green economy. Through these initiatives, UNEP is seeking to motivate and enable policy-makers, business executives, and stakeholders at large to invest in sustainable industry measures that are supported by necessary policy and institutional reforms. ■

we must let na

GUNTER PAULI is a born entrepreneur whose scope of initiatives spans business, culture, science, and education. In 1994 - with the support of the Japanese government and the United Nations University - he launched an initiative to design an economic framework and business model that converts all waste, including emissions, into a value added cascade, modelled on ecosystems. In 2004, he launched a research project identifying the innovations that will shift business towards higher levels of competitiveness and sustainability, while generating millions of jobs through the creation of a platform for entrepreneurship. In early 2010, he will personally direct a two-year initiative that each week for one hundred weeks will present another business model to inspire entrepreneurs to translate these opportunities into worldwide business initiatives. Pauli is the author of seventeen books published in twenty-one languages, and of thirty-six fables that bring science and entrepreneurship to children at an early age.

ture inspire us

Based on his new book, *The Blue Economy: 100 innovations to generate 100 million jobs in 10 years*, **GUNTER PAULI** presents an alternative business model that is environmentally-friendly and sustainable. ➤

➤ Just months after the 2008 financial meltdown, the International Labour Organization (ILO) reported the destruction of fifty million Third World jobs. This was the beginning of a social shock that unsettled the world. Downsizing and outsourcing had been the driving force for every major industrial group for decades. Developing economies were deeply affected by the massive layoffs in the formal sector, and the loss of income in the informal sector. For the past few decades, the world economy has been based on money that simply did not exist. "Wealth" was generated by making "assets" appear, as though by magic, through the leveraging of non-existent credit and the creation of obscure and meaningless financial instruments. Money was multiplied over and over in special accounts without risk, or initiative, or the production of real assets. Innovation was limited to investments that could produce multiple returns in a few years. This form of capitalism was entirely disconnected from peoples' real needs – food, water, health and energy. Entrepreneurs became a vanishing breed.

Fortunately, times have changed. As the second decade of the 21st century sets the stage for a new economy, the core question becomes: "What is the business model that we really need?" Some two billion people barely survive on less than two dollars per day, lacking basic needs such as water, food and health care; and 25% of the world's youth are unemployed. Yet, one billion of us are over-nourished, and swim in 400 million tons of electronic waste that often contains higher concentrations of metal than the ores extracted from the Earth's crust. In the past, the model driving our economies depended on perpetual growth, requiring ever more resources and investments. This model has inherent flaws: it leads to societies that are highly unjust, economies that are highly skewed and exploitative, and ecosystems that are destroyed. The new economy must be more effective and competitive. It must become sustainable, using less investment by introducing innovations that generate more revenue, while building social capital. It should not just generate shareholder value and excessive executive pay.

The prevailing economic model pre-supposed that scarcity was the major limitation. Therefore, this model searched for ever higher agricultural yields and industrial outputs, demanding that the Earth and labour produce more. It is time to do more with what the Earth produces, rather than requiring the Earth to produce more. It is time to end the insatiable quest for ever lower marginal costs that drives business towards economies of scale through mega-mergers and acquisitions. It is time to adopt broad-based innovation strategies that generate multiple revenues and higher cash flows, while creating more jobs. This business model relies on a new generation of entrepreneurs who, rather than pursuing a business strategy based on core competence, use what is available to meet the basic needs of a multi-faceted and diverse society.

The shift from core business and economies of scale, to multiple businesses with economies of scope, certainly sounds unrealistic to an ear trained by any leading business school. However, based on four years of research, covering over 2,000 innovations, and a study of creative business models implemented around the world, it is clear that the new approach is not only viable, but has already been emerging over a quarter of a century. The current crisis is highlighting the need for an economic development model based on bold innovations that generates desperately needed jobs, while sustainably addressing the immediate needs of citizens.

Detailed research, analysis, and dialogue with scientists, business strategists, equity providers and policy-makers,

Pine tree resin processing in Las Gaviotas, Colombia – Resin harvested from Honduran pine trees grown on land considered unproductive for centuries is converted into *colofonia*, a raw material for the paint and paper industry.

"The inspirational Las Gaviotas project in Colombia – under the leadership of Paolo Lugari – converted a desolate savannah, created by 400 years of thoughtless cattle-farming, into a lush rainforest that is not only self-sufficient in water, food and fuel, but also builds valuable social capital"

reveals a portfolio of 100 innovations that have the potential to generate as many as 100 million jobs worldwide over the next decade. Some of these innovations, all proven and benchmarked at a remarkable scale, simply cascade nutrients and energy in the same way that ecosystems do. The inspirational Las Gaviotas project in Colombia – under the leadership of Paolo Lugari – converted a desolate savannah, created by 400 years of thoughtless cattle-farming, into a lush rainforest that is not only self-sufficient in water, food and fuel, but also builds valuable social capital. In New Mexico, USA, a small area of woodland – a well-known fire hazard – has been converted into a job-creating and food-generating programme that builds on the traditions and culture of Native Americans. It stands in stark contrast to the dramatic images of wildfires that periodically devastate California. The production of silk that substitutes for the high-performance titanium used in health care and certain consumer products, while regenerating top-soil and reducing the burden of mining on the Earth, is just another example in a portfolio of technologies that spans the globe.

Other innovations show how to substitute "something with nothing". Our modern society has become so dependent on particular solutions that it is difficult to imagine life without certain products. Unfortunately, over time, many of these solutions rebound, rendering life totally unsustainable, squandering limited resources. Real, lasting solutions require a fundamental shift in our consciousness, and therefore require breakthrough innovations. Just two such innovations highlighted in my forthcoming book, *The Blue Economy* concern batteries and antibiotics:

Consumers do not realize that the cost of electricity stored by a hearing aid or a pacemaker battery may easily surpass €100 per kilowatt hour or that the production of this battery requires energy-intensive mining and smelting. The race for an effective 'green battery' is underway, but the time has come to simply eliminate the battery, and embrace out-of-the-box solutions: The Fraunhofer Institute in Germany has already developed a cell phone powered by the differential between ambient and body temperature, and the pressure generated by our voice.

Antibiotics have certainly made a great contribution to health care, yet alarming bacterial and viral resistance is forcing science to think beyond antibiotics, venturing towards solutions provided by red algae or the vortex. Certain algae jam the communications among bacteria so they cannot form a biofilm, whereas the vortex – the naturally-occurring swirling movement that happens when water is subjected to gravity – increases pressure at the core, eliminating oxygen from water, thereby stopping bacterial proliferation. Since these solutions do not kill, there is neither speedy mutation nor undesired side-effects.

The 100 innovations identified in *The Blue Economy* have been benchmarked and realized in different parts of the ➤

➤ world. After years of research, these initiatives have emerged as viable businesses, bringing profound innovations to the market, responding to basic needs, creating jobs, and also improving the competitiveness of agriculture and industry. The following snapshots of businesses based on these principles show how this is possible:

The slaughterhouse healthcare project

Dirty slaughterhouse offal, along with blood, is currently thrown away. Under hygienic conditions, which improve overall working conditions, this offal can be used to produce maggots. This is happening at the Songhai Centre in Benin, under the leadership of Father Nzamujo, where maggots serve as a crucial source of protein feed for the Centre's poultry and fish production activities. In addition, maggots are the source of a valuable enzyme that promotes wound-healing in diabetic patients. Pioneered during the Napoleonic era, this technique is still in practice in over 800 hospitals worldwide. There is strong demand for the enzymes, and existing production costs are very high. This has created a new opportunity for the Songhai Centre based on the technologies developed by Advanced Gel in the United Kingdom.

The non-destructive extraction of enzymes by simply washing the harvested maggots in salt water means that, in addition to generating revenue from fish and poultry, there is a third source of income from the sale of enzymes for local health care or for export. This makes offal-processing competitive, reducing feed costs while permitting additional job creation and cash-flow generation. Each slaughterhouse in the Third World could generate 50-100 jobs. If 3,000 slaughterhouses in Africa were involved, there would be an additional 150,000 to 300,000 jobs created, using locally-available resources, and securing a high value-added that justifies sustainable financing for the additional employment. Each of the components produces a cash-flow that services the capital invested. This demonstrates that multiple revenues can be generated from something like offal, which previously had no value – and indeed cost considerable money to dispose of. Precedents such as the European Union's decision to destroy offal in the wake of "mad cow" disease show that it should also be possible to mandate the re-use of offal.

The coal-based electricity to food security project

The carbon dioxide-rich flue gas from coal-fired power stations can be concentrated in warm water that is kept in the retention basins of cooling towers, and can be used to produce spirulina algae. This blue-green algae has a potential role in fighting malnutrition since it contains all the micronutrients necessary for infants and children. This has been already been carried out in Rio Grande do Sul (Brazil), thanks to the work of Professor Jorge Alberto Vieira Costa. The original idea emerged under the auspices of *Fome Zero* (zero hunger), a programme initiated by the Brazilian Government when President Luiz Ignácio Lula da Silva started his mandate. While Brazil has only five coal-fired plants, the success of the pilot project in the south of the country has motivated the government, business, and academia to pursue this approach.

Given the high volume of coal consumed in countries like China, the USA, and South Africa, the production of spirulina as a cheap source of quality nutrition will greatly and quickly exceed demand, thus stamping out malnutrition. The algae's lipids are also an ideal source of biofuels. The cost of infrastructure having already been funded by the power generator, only a comparatively small additional investment is needed to increase output to an industrial scale. As many as 100 jobs can be generated at each power plant, which means that more than 100,000 jobs could be created in the countries mentioned above. Fuel from algae becomes competitive with oil at approximately US$100 per barrel, so other multipliers kick-in over the longer term. Further income can be derived from carbon credits generated in the process of converting carbon dioxide into value-added products. Brazil has shown that by purchasing algae for food security programmes, government agencies can help launch such innovative projects.

Agro-waste to rural development project

The single-minded quest for higher crop yields per acre often ignores the value of the biomass that is discarded after a harvest. The search for new technologies concentrates on ways to increase the value of the crop alone, such as genetic manipulation. This is a faulty approach. Coffee and tea plantations, fruit orchards, vineyards, and maize and wheat fields generate huge amounts of "waste," which – in fact – should never be wasted. The amount of waste often overwhelms the system, making it impossible to plough the biomass back into the soil. Burning is frequently the only solution, contributing to both pollution and climate change. The alternative is a "pulp to protein" programme that converts biomass into value-added products, following the ecosystem logic of cascading nutrients and energy where nothing is wasted. Everything remaining from one part of the cycle turns into food for another.

"If there was a return to the late 19th and early 20th century level of production of around one million tons a year of silk, an amazing 12.5 million jobs could be created"

In Colombia, the application of the simple science identifying plant lignocellulose as an ideal substrate for mushrooms has already created over 10,000 jobs. Coffee bean husks are converted into a substrate for farming mushrooms, and the spent substrate that is left after harvesting the mushrooms is used as animal feed. In the Colombian department of El Huila, over the past twelve months, more than 100 companies producing food on what previously was considered waste have been established. Most of them are run by women.

This nutrient cascade was studied in detail by Cenicafé, the Colombian Coffee Farmers' Federation research centre, under the leadership of Carmenza Jaramillo. She demonstrated how each component of the waste could be best

exploited to grow different types of mushrooms. In terms of protein content, these mushrooms rival meat on a dry weight basis. Professor Jaramillo monitored the implementation of the programme on the coffee farms, as well as in the peri-urban region where coffee is industrially processed and where waste had contaminated local rivers.

The successful "pulp to protein" programme has been repeated in Zimbabwe's coffee sector. The focus there is on providing food security for women at risk, especially orphan girls in the rural areas of Mutare, Karoi, and Chipinge whose parents have died from AIDS. When these young women, who at an early age become heads of their families, have a source of income and food security, their increased confidence enables them to make better life choices, often resulting in less exposure to HIV/AIDS and other diseases. The Zimbabwe programme is complemented by an intensive international marketing campaign highlighting the way that waste from coffee helps provide food security for formerly marginalized people. As coffee consumers have ➤

➤ become aware how the coffee waste is being put to use, a solid new platform for secure sales of a premium priced coffee in the USA, Europe, and Japan has developed.

As the programme in Colombia has demonstrated that on average two jobs are generated per farm, and knowing that there are an estimated 25 million coffee farms around the world, the potential employment for this cycling of nutrients and energy could add up to some 50 million rural jobs globally, while adding another 25 million tons of food to the world's table.

Regeneration of topsoil to health care

Over past Millennia, China developed the technique of regenerating topsoil by planting mulberry trees. The original goal of the Chinese leadership was to secure fertile farmland, and the opportunity to produce silk was only discovered centuries later. Today we have all but forgotten the capacity of mulberry trees to thrive on poor soil. Since one ton of silk generates ten tons of fertilizer, planting mulberry trees on dry and unproductive land not only regenerates farm-land, but just planting the trees would also generate two jobs per hectare. Silk is no longer competitive as a raw material for textiles, but on the other hand, it offers solutions for sophisticated applications like nerve repair, bone grafts, and orthopaedic surgery. Silk competes in price and performance with titanium, which is mined and requires high temperatures for smelting and conditioning. A reduction in the demand for titanium in medical, industrial, and consumer products will reduce stress on the environment, while the increased planting of mulberry trees will act as a massive carbon sink, not least because silk itself is over one third carbon.

The development of a broad portfolio of silk applications from health care to razors (currently made from titanium and stainless steel) would dramatically increase the demand for silk after decades of losses. The logic is not limited to performance. One ton of processed silk is only half the price of one ton of processed titanium. The additional farming of 100,000 tons of silk could generate 1.25 million rural jobs, and silk manufacturing could support an extra 25,000 industrial jobs. If there was a return to the late 19th/early 20th century level of production of around one million tons a year, an amazing 12.5 million jobs could be created. The project requires long-term funding for the mulberry planting, but is commercially viable, based on technologies benchmarked by Oxford University in the UK through a programme directed by Professor Fritz Vollrath.

Low cost social housing based on African technologies

From Latin America to Asia, innovative housing schemes have converted the need for shelter into job generation programmes that provide income, build on local biodiversity,

Termite-inspired air-conditioning – The Eastgate shopping centre and office block in Harare, Zimbabwe, also known as 'The Anthill', is modelled on the self-cooling mounds built by termites. The termites' structures are able to maintain the temperature inside the nest to within one degree of 31°C, day and night. This is accomplished even when the external temperature varies between 3°C and 42°C. The Eastgate building uses only 10% of the energy of a conventional building of the same size.

reduce construction cost, and successfully introduce innovations that lead to healthier living conditions. Sustainable housing is more than saving energy and using recyclable materials. Sustainable housing creates a healthy environment in homes, offices, and factories. An estimated 50 technologies, several inspired by know-how available in Africa, have found their way to the market. These remain largely unnoticed. Each of these technologies deserves attention. In the light of the unmet demand for shelter, the integration of a portfolio of low-cost housing innovations demands our attention.

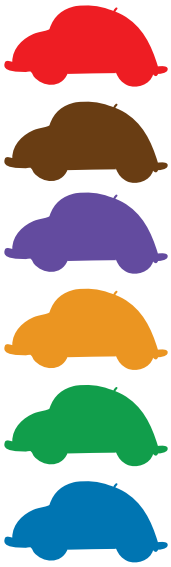
Nature-inspired technologies are already being applied in buildings around the world. The Eastgate shopping and office centre in Harare, Zimbabwe; the Gaviotas hospital in Colombia; and the Lagerberg school located outside Sundsvall, Sweden; all apply termite-inspired air conditioning systems. The results of Professor Andrew Parker's innovative studies of the Namibian beetle's water-from-air collection methodology are already used in the City of London, producing water out of the air released by air-conditioning equipment. A Living Filter system, using tropical plants to clean the air, is in use inside the Ford Motor Company garage in Umeå in northern Sweden, much in the same way that the Amazon forest extracts dust from the air. Benchmarked by the Swedish architect, Anders Nyquist, quality construction material is produced from un-recyclable glass in Belgium, the Czech Republic, and the USA. These are but a few of the technologies that could revolutionize construction. Each of them could generate tens of thousands of jobs, with an overall potential exceeding 500,000 jobs within the building industry's supply chain.

A new business model has emerged:
(1) It operates with what is locally available,
(2) It generates multiple revenues, and
(3) It responds to basic needs while generating jobs through the adoption of innovations that render industry more competitive.

The *Blue Economy* merges the desire to evolve towards sustainability, with a broad platform for creative entrepreneurship, by bringing breakthrough innovations to the market. In doing so, it resembles the evolutionary path of nature. Indeed, just as ecosystems evolved to ever more efficient nutrient and energy cycles, bringing ever more diversity, leading to resilience, flexibility and performance, the economy will increasingly rely on less energy and provide more diversity. Materials will be recycled without landfills and incinerators, and more players will be permitted to respond to societies' needs. Innovation, sustainability, and entrepreneurship will be linked, forming a pathway out of the crisis.

With over one billion young people entering the labour market in the next decade, this is exactly the framework we need. ■

Number of cars on the road in 2005



600 million

Why we need to green the global automotive industry

Car makers across the world are reeling from a steep fall in sales, but once the current crisis subsides, the priority of the industry is once again expected to shift to the production and design of more environmentally-friendly vehicles. GARETH LEATHER suggests that emerging markets, rather than the developed world, will be the first to adopt such technologies.

The global automotive industry is facing the most difficult year in its history. After strong growth in 2004-2007, the final few months of 2008 saw car sales go into meltdown across the world. Many markets experienced unprecedented collapses in passenger car sales – a trend that continued in the first half of 2009. The bad economic news from the US, Japan and Western Europe, but also from most developing countries in Asia, Latin America and eastern Europe, means that global passenger car sales will fall sharply in 2009. The 20% or so fall in car sales that is likely for 2009 will lead to massive overcapacity, plant closures, and lay-offs. Moreover, given that only a modest economic recovery is forecast for 2010 and beyond, the suffering is likely to last for some time yet.

Companies focusing on survival

The steep fall in car sales has led to serious problems for automakers across the globe. The crisis has been most dramatic in the USA, where two of Detroit's 'Big Three' car companies – General Motors (GM) and Chrysler –

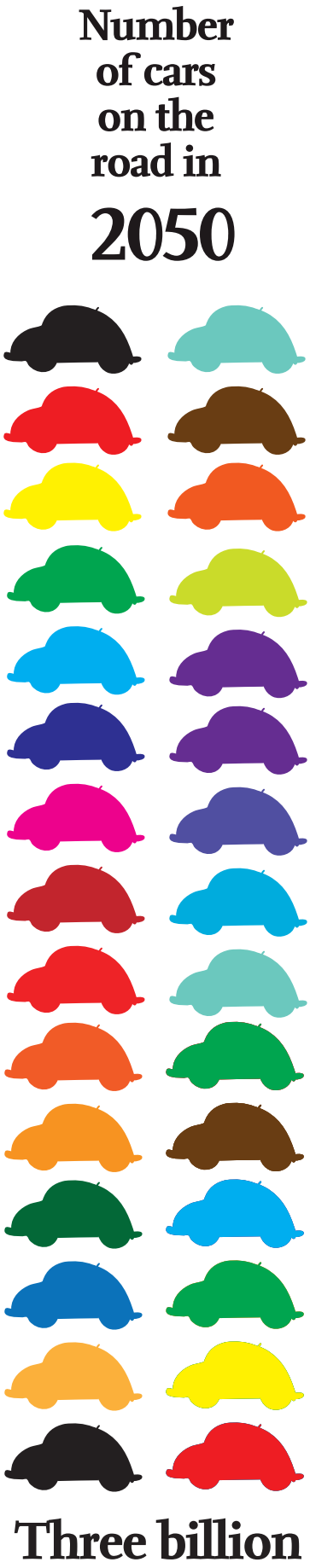
GARETH LEATHER is the Economist Intelligence Unit's chief automotive analyst

were forced into Chapter 11 bankruptcy. In Japan, car companies (which are in much better financial shape than those in the USA) have been hit hard, not just by the collapse in demand, but also by the sharp appreciation of the Japanese yen. Toyota, Nissan, and Honda, all reported huge financial losses. In Europe, where demand has also fallen sharply, despite the introduction of some successful car scrappage schemes, national governments' have helped by propping up teetering car companies in a desperate bid to prevent factory closures and keep jobs at home.

Problems in the sector had been expected to lead to a long overdue consolidation of the sector. However, so far the only country where any consolidation has occurred is in the US, following the merger of Chrysler (which emerged from Chapter 11 bankruptcy) with Fiat of Italy. Fiat had also hoped to take over the European arm of GM, which had also been forced into bankruptcy. But Opel has instead been bought by the Canadian components manufacturer, Magna, thus thwarting Fiat's plans to create a new European automotive giant. One other likely merger is that between Volkswagen, and its much smaller German rival, Porsche.

Emerging giants to the rescue?

With sales in the US, Japan and much of Western Europe still very weak, car makers' last hope is that sales in the emerging markets will help make up some of the slack. Many car makers feared the worst at the end of 2008 and in early 2009 when car sales in even the strongest and most robust emerging economies such as China and India started falling. However, over the past few months, car sales in China have recovered strongly, with sales in August increasing by an eye-popping 90% compared with the same month last year. Passenger car sales in India have also recovered in recent months, although not as strongly as in China. With sales in the developed markets of the European Union (EU), USA, and Japan likely to struggle for years to come, growth will increasingly come from elsewhere. The role and influence of China, India, and other big emerging markets will continue to expand.



Environmental concerns

The overwhelming priority of every major car company at the moment is survival. However, once the current crisis subsides, and car markets begin to stabilise, the priority of the industry is once again expected to shift to the production and design of more environmentally-friendly vehicles. Indeed, green issues have the potential to bring about massive change in the global automotive industry. Two main factors are driving this change. First, there is growing concern about climate change, and of the role the auto industry has in reducing emissions. Second, countries and governments around the world are becoming increasingly worried about their growing dependence on oil imported from potentially unstable countries.

All of the major automotive manufacturers are busy investing in new environmentally-friendly technologies. However, Japanese companies are so far leading the way in terms of bringing new technology to market, with the standard for hybrid-electric vehicles being set by Toyota and Honda. Despite this, a number of other companies have stepped up their development of new fuel-efficient cars. GM, for example, is planning on releasing the Volt, an electric car with a petrol-driven engine which will help generate additional electricity, by 2010. Nissan also has plans to introduce a low-priced electric car, the Leaf, in Japan and the USA by 2010.

A number of car makers from developing countries are also rapidly increasing their investment in new environmentally-friendly cars. In China, one of the world's biggest battery manufacturers, BYD (which is 10% owned by the US investor, Warren Buffet), has developed a battery technology which it believes has some important advantages over both lithium-ion and nickel-metal hydride batteries. BYD claims that its ferrous batteries are not only cheaper, but can be charged to 50% of capacity in ten minutes. Meanwhile, India's Tata Motors (part of the local Tata Group) has a controlling stake in a small Norwegian electric vehicle company, Miljo Grenland/Innovasjon. The Norwegian company will produce electric vehicles based on Tata's products. ➤

➤ Which kind of technology will prevail?

Hybrid technology, however, is regarded by many only as a stop-gap, which will over time face increased competition from other technologies. In the short-term, hybrids in the USA will face increasing competition from diesel-powered vehicles, which are 20-30% more efficient than petrol vehicles, particularly with the advent of cleaner (reduced NOx) diesel and higher-performance diesel engines. In the USA (where the market is dominated by petrol engines), the Environmental Protection Agency has described ultra-low sulphur diesel (ULSD) as the biggest advance in clean fuels since the removal of lead from petrol in the 1980s.

The most attractive option in environmental terms remains hydrogen-powered fuel-cell vehicles, which only emit water and steam from the exhaust pipe. Another exciting new technology, with much greater mass-market potential, is the electric car powered by a lithium-ion battery. At present, the batteries need to become more reliable and more powerful, but this is an area where a great deal of new investment is currently being ploughed. The second biggest factor holding back the development of electric cars (and indeed hydrogen fuel-cells) is the investment needed in order to build an infrastructure to cope with such vehicles. However, investment is likely to be encouraged by regulators anxious to reduce emissions.

It is unclear which of the competing technologies will win out. This means that car makers have to hedge their bets by spreading research and development investment over many of the available options. Given the constraints on cash caused by the current market downturn, this will prove particularly difficult.

Legislation in developed countries

Demand for change is currently being driven in the developed world, in particular by new legislation which is being introduced by the EU and the USA. In the EU, at the end of 2008, a new set of obligatory emissions standards was finally decided upon after the perceived failure of a voluntary agreement. This will see car makers in Europe being required to reduce their fleet average emissions to 130 g/km in a three-year phase-in period between 2012 and 2015. Although developments in the USA have continued to lag behind those in Europe, on May 19th 2009 US president, Barack Obama, announced plans for a set of strict new fuel economy standard rules. Mr Obama's new rules bring together the efforts of various authorities to regulate vehicle emissions and fuel efficiency. The new regulations will require cars to average 35.5 miles per gallon (mpg) and light trucks 30mpg across a manufacturer's range of vehicles, to be phased in by 2016. This compares with current corporate average fuel economy (CAFE) standards that were introduced in 1985 and require a fleet average of 27.5mpg from new cars. Meanwhile, in Japan, the government has set itself a target to reduce the country's carbon emissions by 18% by 2020 compared with 2005 levels.

Increased car ownership is unsustainable

According to research from the International Monetary Fund (IMF), car ownership really starts to accelerate when per capita income reaches over US$5,000 a year. Based on these estimates, the IMF has calculated that the number of cars on the road stands to increase from just 600m in 2005 to nearly 3bn by 2050. By 2030, according to these estimates, China will have the biggest car fleet in the world (having overtaken the USA), and by 2050 China will have as many cars on its roads as the whole world has at the moment. However, cars are already one of the main sources of greenhouse gas emissions. According to the *Stern Review on the Economics of Climate Change* which was published in 2006, in the year 2000 cars were responsible for 6.3% of total carbon dioxide emissions. If emissions rise as fast as total car ownership, the effects on the climate could be catastrophic.

Emerging markets to the fore

Clearly therefore, current trends are unsustainable, and there is an urgent need to develop vehicles which are either very low or zero emissions as soon as possible. At the moment, most of the political pressure for such cars is coming from environmental lobby groups and politicians who see pro-green policies as potential vote-winners. However, a number of factors may mean it is emerging markets, rather than the developed world, that will be the first to adopt such technologies.

Rising concern about air pollution in the developing world is one factor driving change. In China, for example, which is home to 16 of the 20 most polluted cities in the world, efforts to reduce factory emissions are now being eclipsed by the surge in car ownership – which are now the primary source of air pollution in Chinese cities. Since 2000, China has been implementing a progressively more stringent series of standards modelled on those applied in the EU. The Euro 3 standard is now applied to all new cars sold nationwide. The much stricter Euro 4 is already in effect in the capital, Beijing, and there are plans to extend the standard nationwide by 2010.

Car makers recognise that their traditional markets in the US, Japan, and Western Europe are set for a period of slow or even stagnant sales growth. Therefore they will increasingly try to cater for the demands of consumers and governments in the big emerging markets, like China, India and Brazil. Indeed, long gone are the days when automotive industry giants would only sell their discontinued brands to these markets.

A second factor is that emerging markets are capable of jumping straight to new technologies. For example, many developing countries never built a traditional fixed-line telephone network because of the high cost, and instead adopted the latest mobile network. One of the main obstacles for the adoption of battery-powered cars in the developed world is the costs involved in replacing hundreds of thousands of petrol stations with new battery-charging facilities. However, countries like China and India are instead well-placed to introduce a new electric car infrastructure because they don't have to consider the costs involved in tearing down and replacing all their petrol stations. ■

IMAGE SOURCE/GETTY IMAGES

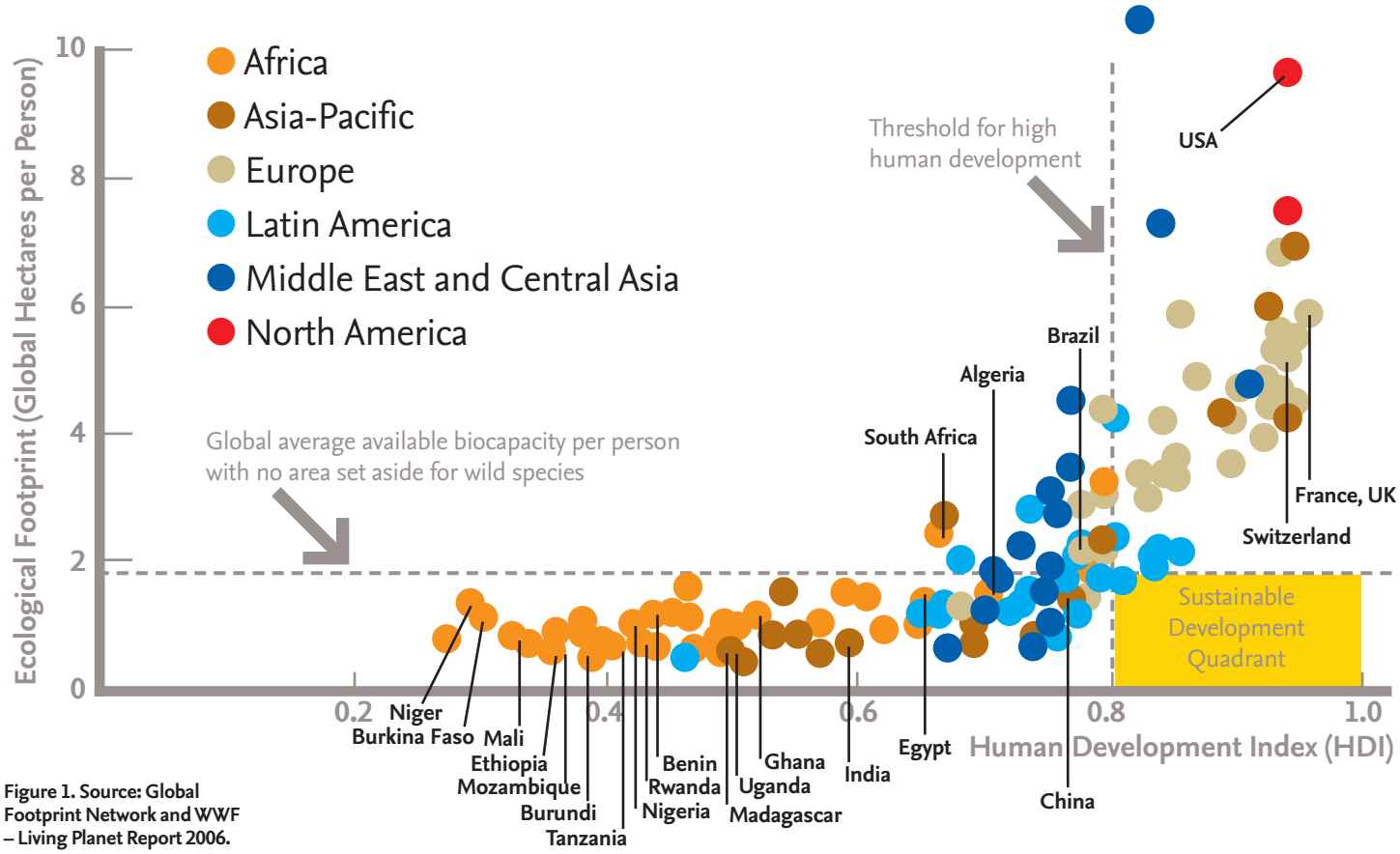


Figure 1. Source: Global Footprint Network and WWF – Living Planet Report 2006.

Factor Five

Can sustainable development be achieved by increasing resource productivity? **ERNST VON WEIZSÄCKER** argues that is not only desirable but eminently doable.

Ocean fish stocks are declining due to overfishing. Global warming has become a reality and could soon become a nightmare. Human-induced biodiversity losses make this century resemble the catastrophic events 65 million years ago which saw the end of the age of the dinosaurs. For the sake of human prosperity, we can no longer ignore the threats to the global environment. But what can we do to curb the destruction? How big is the challenge? Some recent publications can answer this question.

The *Stern Review: The Economics of Climate Change* showed that instead of 'business-as-usual' scenarios, we should reduce carbon dioxide emissions by some 80% by the middle of the century. Even this ambitious reduction has been challenged as too modest because it will not prevent some additional global warming – in the range from 1 to 3.8°C on average – meaning some considerably higher temperature increases locally. Nonetheless it serves as a useful benchmark. An 80% reduction means a factor of five in reducing the carbon intensity of production and consumption.

The same order of magnitude applies to the reduction of 'ecological footprints'. Figure 1 shows the size of per capita footprints for different countries, plotted against the Human Development Index (HDI). The carrying capacity of the earth can be assumed to be sufficient to accommodate seven billion people, each with a footprint of a bit less than two hectares. A decent living standard means an HDI rating above 0.8. The "sustainable development quadrant" would then be defined as "a footprint below two hectares and an HDI rating above 0.8" (as seen in the lower right corner of Figure 1). Looking at the geometry of the graph, the message is clear: we should be aiming at a five-fold shrinking of the footprints (with no shrinking of the HDI rating) of the *rich* countries, and a five-fold increase in the HDI rating (without increasing the footprints) of the developing countries. That, roughly speaking, would render both types of countries "sustainable".

So much for the challenge, but is it at all possible to increase carbon efficiency or the efficiency of land use by anything like a factor of five?

➤ Good news: it can be done

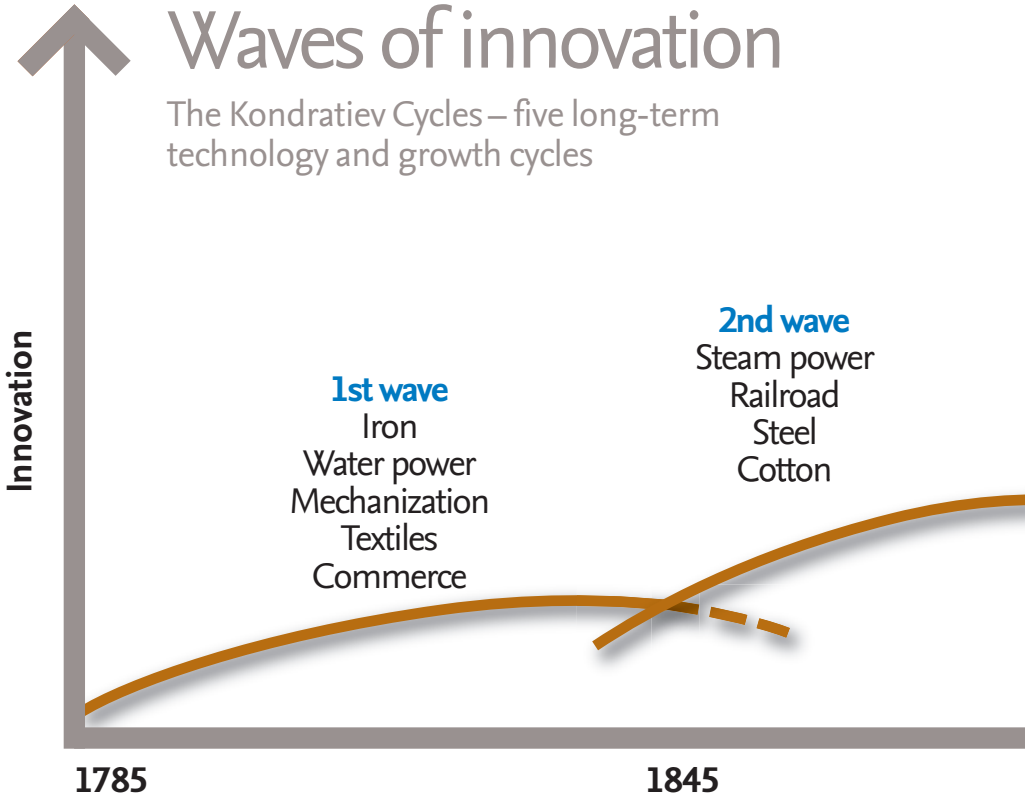
Here comes the big surprise. It can be done. In a book, titled *Factor Five*, I have collaborated with the Australian team, The Natural Edge Project, under Karlson "Charlie" Hargroves, to present examples showing the availability of a factor of five in efficiency improvements for entire sectors of the economy. Even such unwieldy sectors as cement and steel seem to be susceptible to dramatic improvements in resource productivity. The story gets even more persuasive if inter-sectoral synergies are considered. For example, a building constructed with recycled steel and geopolymer cement, and designed to use one fifth of the energy ordinarily required for daily operation, can be 20 times more efficient than a conventional building.

Factor Five is the sequel to *Factor Four*, a book that presented 50 examples of technologies and logistics saving 75% or more energy, water, or minerals, without losing the quality of service or well-being. *Factor Five* has a stronger focus on whole sectors of the economy, notably, buildings, heavy industry, transport, and agriculture. Most, if not all, of the improvements are available to rich and poor countries alike.

To be sure, nothing is really new in *Factor Five*. Low energy farming has been around for 5,000 years, by necessity, and will have to be combined with modern techniques helping to feed a planet of seven billion people. Replacing Portland cement with geopolymer cement – thereby making an 80% energy saving – repeats the experience of the ancient Romans, who 2,000 years ago built their aqueducts using cement-like binders very similar to modern geopolymers. Recycling metals, and thus saving a lot of energy, has been going on since the Bronze Age, and is enjoying a revival with "city mining" – the extraction of valuable metals from landfills or from the tailings of old mines. On the other hand, there are of course also some exciting high-tech advances already in progress; for example, with lightweight yet robust automobiles, in the field of micro-electronics, and with selected applications of bio- and nanotechnology that help optimize processes, systems, and specific technologies.

A global green technology cycle

We discuss these questions at a time of a major global job crisis following the financial disasters of the second half of 2008. During a time of recession, people often speak about, and hope for, the 'next upswing'. Usually they are thinking about the short kind of business cycles. But there are also *long-term cycles*, every 30–50 years, which can be attributed to major *technological* innovations. Although the idea of long-term cycles is not fully accepted in mainstream economic literature, the historical observations are quite striking. Figure 2 shows in a simplified manner how technologies unfolded over several decades spurring economic growth, and then faded, giving way, after a while, to a new set of technologies and a new growth cycle. The best-known early scholar to describe such long-term cycles was the great Russian economist Nikolai D. Kondratiev (1892–1938) who published his findings in 1925.



After Kondratiev was killed in 1938 during one of Stalin's purges, the famous Austrian, and later American, economist Joseph Schumpeter suggested honouring Kondratiev by naming the long cycles after him. It was also Schumpeter who associated the long-term growth cycles with major technological innovations.

All five growth cycles so far were accompanied by a massive rise in energy and resource consumption. If we take the above-mentioned ecological and climatic crisis seriously, we cannot conceive of another such growth cycle. The *Factor Five* message could signal a new Kondratiev Cycle, initiated by a new wave of exciting technologies, but this time with technologies reducing, instead of enhancing, resource consumption and environmental degradation. The co-authors of *Factor Four*, Amory and Hunter Lovins, together with Paul Hawken, had a similar idea as early as 1998, in their pivotal book, *Natural Capitalism*.

When, in late 2008 and early 2009, many countries went ahead with stimulus packages worth hundreds of billions of dollars, some put the main emphasis on greening their economies. South Korea, China, and the USA were the three champions in this regard. Still, the total amount of the packages and of its "green" component was very small in proportion to the world economy. It cannot be expected that the "green" stimulus money alone will trigger such a big thing as a new, world-wide growth cycle. That will have to come from the private sector – in close cooperation with the guiding forces of the state and international organizations.

But what can make private investors move in the direction of a green growth cycle? I suggest three components should come together:

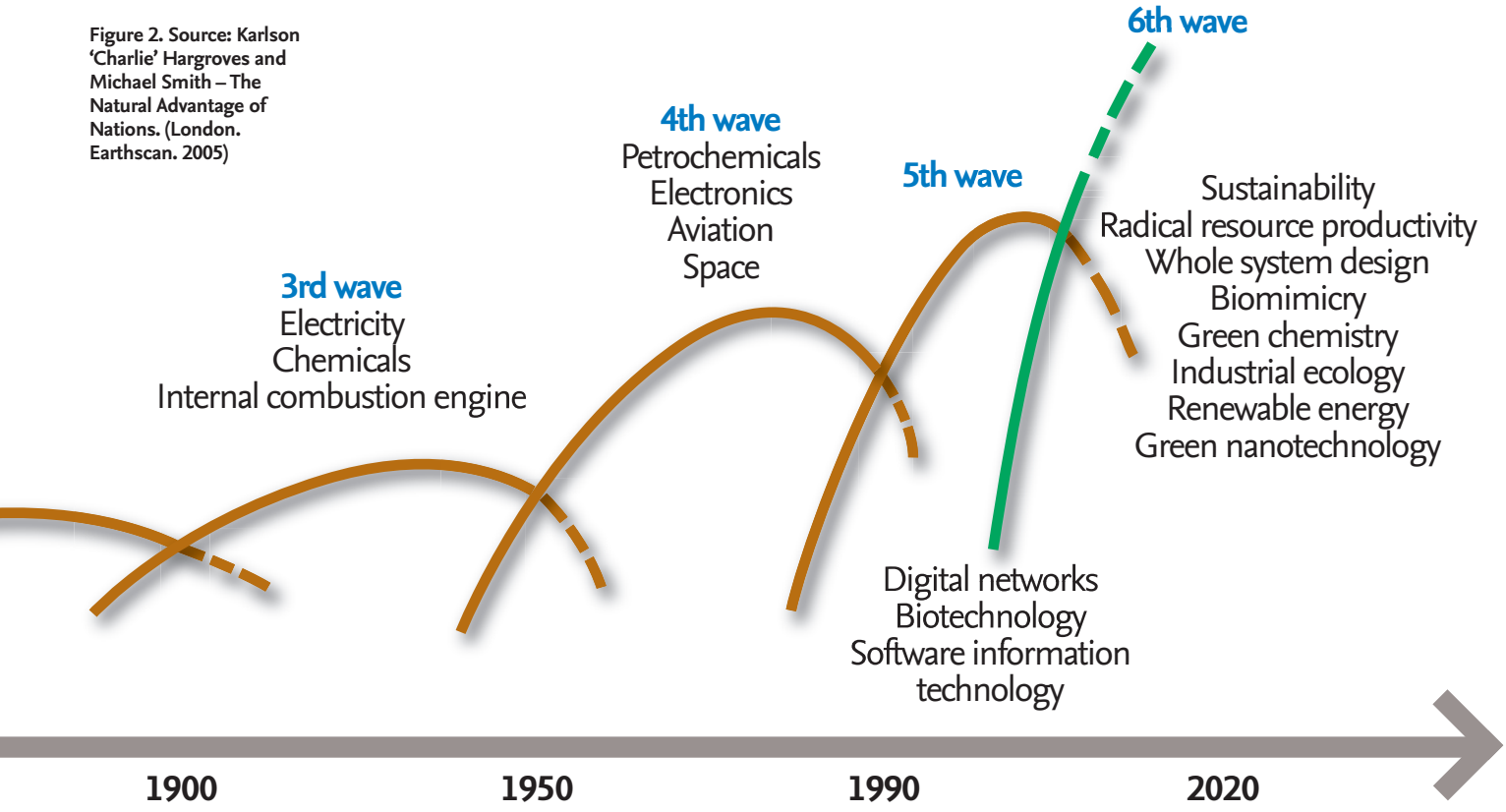


Figure 2. Source: Karlson 'Charlie' Hargroves and Michael Smith – The Natural Advantage of Nations. (London. Earthscan. 2005)

- The existence and availability of attractive technologies, well-known ones and novel ones, that promise to produce the kind of wealth a world of seven billion people is longing for, while drastically reducing specific energy and resource consumption;
- The realization that the conventional kind of expansion both of infrastructure and of consumption will only store up ever greater troubles and eventually strong opposition from the losers of climate and other environmental deterioration;
- The willingness of states to work on the frame conditions so that investing into the new and green technologies will be more profitable than conventional expansion.

In other words, there has to be a broad consensus that the greening of industry, of agriculture, of transport and tourism, and of the service sectors, is both doable and desirable. It is often a clear sense of direction that makes the investor community move.

Some greening of technologies and the economy is actually already underway. Increased oil and other commodity prices since the turn of the century have alerted many countries and firms to the need for the development of low resource production and consumption. Thomas Friedman, always one of the early birds in new developments, wrote another bestseller in 2008, *Hot, Flat and Crowded*. In the US edition, the subtitle runs, 'Why we need a Green Revolution – and how it can renew America'. This is an appeal to his homeland to overcome its complacency, epitomized by an "American way of life" that just does not care about energy, land, water, and other resource, consumption. What holds for the United States, should be even more relevant for countries like China and India, less richly-endowed with natural resources, but with much higher economic growth rates and much larger populations.

Changing the economic framework

Complacency in the USA has a lot to do with a history of cheap availability of land and of most other natural resources. There was no need – or so it seemed – for increasing energy or resource productivity. However, the price hikes on the world markets, after 2000, came as a wake-up call for many US Americans. Millions had built new homes far away from their jobs, and with borrowed money. When oil prices skyrocketed in 2007-08, many had to relocate into mobile homes, close to their jobs, because they could no longer afford the daily commute. Their houses lost value, the mortgage banks began to falter, and the entire financial system imploded. Taxpayers had to bail out some of the biggest financial institutions. By contrast, countries used to paying high rates of petrol tax were much less vulnerable because they were also accustomed to energy efficiency.

This experience should teach us something about suitable economic frameworks that are conducive to the launch of the new technological revolution. What I find attractive is a trajectory of gradually increasing energy and raw materials prices, preferably in parallel with measured increases in resource efficiency, so that no social hardship should be expected. The price increase can come from a revenue neutral ecological tax reform reducing indirect labour costs (or reducing deadly public deficits). If investors know that resource prices will move upwards from now on, for a very long time, they will throw a lot of money into efficiency solutions, thus accelerating the process leading to the Sixth Kondratiev Cycle.

If such thoughts gain momentum, I foresee a new international race for a place among the pack pioneering the new growth cycle. ■

A country proving doubters wrong, winning plaudits, and planning big – **Joseph Bugabo** introduces one of Africa's success stories.

RWANDA MEANS BUSINESS

COUNTRY FEATURE

Rwanda

JOSEPH BUGABO is the weekend editor of the Rwandan daily newspaper, *The New Times*.

During a recent visit, the World Bank's Penelope Brook observed, "What is remarkable to everyone who comes here, is that in a relatively short time Rwanda has taken itself from one of the most painful places a country can be, to become a country that is a leader and a model for other countries at different levels of development, and for those struggling to come out of conflict."

Fifteen years since the genocide, when more than 800,000 people were killed in just 100 days, Rwanda is moving on, and moving up. Peace and political stability have been established, reconciliation efforts are continuing, and democratic institutions and processes are being strengthened.

While over half the population still lives below the poverty-line, and although health indicators remain poor, the situation is improving. The tiny central African nation, with a population of 9.7 million people, is on track to meet three of the Millennium Development Goals – those relating to universal primary education, gender equality, and HIV/AIDS and malaria.

At the same time, an economy shattered by the events of the early 1990s has successfully been rebuilt. Growth rates have averaged 5-6% over the last decade, hitting a high of 11.2% in 2008. The global economic downturn will temper growth in 2009, as foreign investment, remittances from abroad, and demand for exports, all slow. Even so, the finance ministry forecasts a respectable 5.5% growth rate.

Subsistence agriculture has traditionally been the mainstay of Rwanda's economy, and the main exports are coffee and tea. Today, agriculture still accounts for around 40% of GDP and employs some 80% of the labour force. To a large extent, the country's economic revival has been based on improved agricultural output, but the other main driver of growth has been a mushrooming services sector. Since 1994, this sector has grown faster than the overall economy, and now contributes over 40% of GDP. The major activity is telecommunications, although transport and tourism also play important roles. The manufacturing sector – dominated by food processing – contributes about 20% of GDP.

With stability and economic growth restored, the authorities are now embarked on an ambitious development plan that aims to transform the country. The Vision 2020 project envisages that by the year 2020 Rwanda will become a lower middle income country (per capita income over US$976) operating as a knowledge-based service hub. Industry minister Monique Nsanzabaganwa, points to possibilities in the fields of ICT, banking, pharmaceuticals, and tourism. "I see a bit of Switzerland, a bit of Singapore, and probably Mauritius," she said when asked which industrial policy model the government is following. "All those are models, but we try to copy whatever is best from whoever can provide it."

This transformation will be partly achieved by taking advantage of Rwanda's geographical location. The authorities are promoting the use of French and English, as well as the indigenous language Kinyarwanda, so that Rwandans can serve both the English-speaking East, and the French-speaking Central Africa. "We are the gateway to Central Africa", says finance minister James Musoni. Officials are fond of the catchphrase about Rwanda being 'land-linked', rather than 'land-locked'.

With investments growing from US$28m in 2000 to over US$2.8bn in 2008, and with the country's ranking in the World Bank's *Doing Business Report* improving from 143rd in 2008 to 67th in 2009, Rwandans are confident that things can only get better.

I believe my country is bound for greater heights. There is still much to be done – but that means there are plenty of opportunities! Rwanda is not counting on luck. We are dealing with the past, and creating the future. ■

Paul Kagame was born in 1957. His family fled pre-independence ethnic persecution in 1960, crossing into Uganda, where Kagame spent thirty years. His military career started in 1979, when he joined Yoweri Museveni's National Resistance Army. In 1986, Kagame was instrumental in forming the Rwandan Patriotic Front (RPF). In 1990, he returned to Rwanda to lead the RPF's army, whose victory over the incumbent government in July 1994 effectively ended the Rwandan genocide. In 2000, he was elected President by the Transitional National Assembly. On 12 September 2003, following the country's first democratically-contested, multi-party elections, he was sworn in as President for a seven-year term.

People-centred leadership

Interview with His Excellency **Paul Kagame**, President of the Republic of Rwanda

Looking back, how has Rwanda succeeded in moving out of its crisis so quickly?

Rwanda's problems have been unique, with deep social divisions exacerbated by colonialism and particularly poor post-independence leadership. As a result, the solutions to these problems also had to be unique. Rwanda's post-genocide leadership guaranteed the right of every Rwandan to live in their country in peace. We designed the *Gacaca* courts system, based on our traditional judicial practices, in order to meet the overwhelming need for justice, as well as reconciliation. Through this system of participation, Rwandans have ownership of the healing process, whether victims or perpetrators.

Rwanda has recovered relatively quickly mainly due to focused, people-centred leadership, and the use of sound policies and strategies for economic and social development. Our goals are well-defined by processes – such as Vision 2020 and the Economic Development and Poverty Reduction Strategy – which unite institutions in providing objectives and targets. This has taken place against a backdrop of security and stability that has provided the conditions for unity and democratization, which, in turn, allow people to participate in development programmes and activities aimed at improving their lives.

Decentralization has been another factor in Rwanda's recovery – empowering citizens ➤

Rwanda

Right: Worker at the Bralirwa soft drink production and bottling plant in the capital, Kigali. Brasseries et Limonaderies Du Rwanda (BRALIRWA) is Rwanda's biggest manufacturing concern. In May 2009, the company inaugurated a new wastewater treatment plant that will enable the re-use of water used to clean bottles and permit sludge created during the production process to be used as agricultural fertilizer. Photo: Rwanda Information and Communication Solutions

➤ to make decisions and plans for their own socio-economic development. Central government respects the knowledge and capacities of citizens at the grassroots, because they understand their challenges and priorities best, and are therefore best-placed to devise the required solutions.

What are the biggest challenges that need to be overcome?

We realize that achieving our vision of becoming a middle income country by 2020 is not simply a matter of numbers and accounting. It will mean that Rwandan people are healthy, skilled and in employment, and adequately housed. This requires significant investment in social facilities and job-creation. Rwanda will need to move to higher capacity and value addition in our productive sectors, and revamp existing industries to meet the quality and quantity of production that national, regional, and international markets demand.

The key is significant investment in infrastructure, productive capacity, and people. We look to empowering the private sector with the skills, infrastructure, and management capacity to enable it to flourish. We are encouraging the private sector to invest in innovative and profitable fields such as ICT, pharmaceuticals, and other manufacturing sectors for growth. As the government, we also need to provide research and development capabilities through public-private partnership, and collaboration with educational and research institutions in Rwanda and beyond.

Achieving these goals will require solutions originating from Rwandans themselves. Our objective is to equip citizens with the requisite skills and the required business environment, so they can provide the innovation required to move us forward and make Rwanda competitive.

What do you see as key strategies and policy thrust for making your country develop a competitive economy and participate effectively in global trade?

Rwanda is an open economy, both regionally in terms of trade blocs such as COMESA and the East African Community (EAC), and in its dealings internationally, through the AGOA and the EPA with the United States and the European Union, respectively. As a result, tariff barriers have been significantly reduced over the past few years, making our markets more open to trade than ever before. The motivation of this openness is ultimately to drive investment and growth.

Investment is the key to developing our industrial and service sectors. Rwanda's policies are focused towards value addition – both of our existing exports, and of our domestic industries and services.

Rwanda currently has a small industrial base. This is a disadvantage in that it will take time to develop competitive firms. However, it is also an advantage, since we can bypass obsolete technologies and move to the frontier of industries with a technological and competitive edge. Rwanda's private sector must take the lead to move into new sectors, adopt new technologies, and reach quality standards that will allow it to compete regionally and internationally.

The international private sector is a key partner in enhancing the capacity of our domestic firms. International firms can provide not only investment in capital, but also the expertise acquired over years. The Government of Rwanda is committed to improving the policy environment so as to attract these firms to Rwanda, either as individual entities or in joint ventures.

We also need to harness the capacities of international organizations such as UNIDO, UNDP, the World Bank, the European Union, and others, to support technological upgrading and the capacity to access international and regional markets. These organizations should be aware of our limitations, but also of our capacities and priorities. We are aiming for true partnerships with those organizations, focusing on our national priorities and objectives.

Rwanda is a member of the EAC, which has a common external tariff, and is now moving towards a common market. The EAC has a population of over 120 million people. Membership of the EAC is therefore an unprecedented opportunity for our private sector firms – in agriculture, services, and industry – to meet the demands of a larger market.

At the same time, the EAC brings new challenges to our private sector. They must compete with established regional players, many of whom are already advanced in their production methods and capacities. We are determined to learn quickly, and orient ourselves strategically, in order to become competitive and to benefit from the larger regional market.

What is your government's strategy to reach or maintain environmental sustainability without hampering the necessary economic growth for achieving your vision of mid-term prosperity?

The protection of our environment is a priority for the Government of Rwanda. We are well aware of the detrimental impact of erosion and deforestation, and work from the premise that environmental sustainability is a precondition for sustainable economic growth – whether in terms of agricultural yields or protecting our valuable flora and fauna.

Rwanda's national parks and other natural attractions are the cornerstone of our tourism

industry – ensuring the protection of these areas is crucial to the long-term sustainability of the sector. Our policies and strategies therefore emphasise community involvement in tourism, ensuring that local people benefit from tourist revenue.

Where there are conflicts between the environment and growth, for instance, in the case of polluting industries, we will provide mitigation and technological solutions to avoid unnecessary contamination. In order to ensure that industrial growth does not encroach on the environment, we are promoting cleaner production methods to industrial firms. The Rwanda Environment Management Agency provides oversight of industrial development to ensure that where there are developments, there are also impact assessments and mitigation strategies.

Furthermore, industrial zones, to be created over the medium-term, will group industries in geographical locations where the necessary infrastructure to treat industrial waste will be provided, so that contamination and pollution do not take place.

Could you give a short description of Rwanda's current state and short-term prospects?

Rwanda has come a long, long way since the genocide of 1994. Political stability, democracy, security, unity, and reconciliation have provided the foundation for growth, and a reopening to the rest of the world. However, Rwanda is now at the beginning of its next journey– the journey to sustainable economic development.

The Government of Rwanda is working to transform the lives of our people. Health indicators have improved significantly over the past few years due to health insurance schemes and better provision of basic services, as well as advocacy for malaria- and HIV-prevention, among other areas. Education outcomes have also improved; through the *Education For All* programme enrolment has increased at primary, secondary, and tertiary levels.

For the growth of the private sector, a number of policy preconditions are now in place. Rwanda is significantly improving its business climate, as recognized by the World Bank *Doing Business* rankings. Tariff barriers are being reduced, as well as the bureaucracy faced by traders and international investors.

Rwanda seeks to become a knowledge-based economy, providing our people with the necessary ICT skills and infrastructure required to compete in the regional and global economies. We are also working to move up the value chain in agricultural, industrial, and services sectors. In agriculture, sustainable land use, combined with improved seeds and fertilizer application, is contributing to food security and the growth of our export crops. In industry, manufacturing needs to be promoted in agro-processing for our agricultural produce, as well as in modern, hi-tech sectors. In services, Rwanda aims to be an innovator in areas such as ICT, telecommunications, and banking.

The ultimate goal of all of this is to improve the lives of Rwandan people, fight poverty, and create prosperity for all – with the understanding that Rwandans have it within themselves to achieve these goals. ■

Interview by Kazuki Kitaoka, UNIDO

From waste to profit

With natural resources declining in both quantity and quality, the time has come to practice resource recovery. Materials, water, and energy that are regarded as unproductive by one company can be turned into a business opportunity by another operating nearby. Twenty years since the concept of industrial ecosystems was first proposed, **RENE VAN BERKEL** considers strategies for achieving further eco-industrial development.

In 1989 *Scientific American* published a seminal article, "Strategies for Manufacturing", in which the authors argued for a change in business practice that would lead to the creation of 'industrial ecosystems'. They defined an industrial ecosystem as "the transformation of the traditional model of industrial activity – in which manufacturing takes in raw materials and generates products to be sold, plus wastes to be disposed of – into a more integrated system – in which the consumption of energy and materials is optimized, and the effluents of one process serve as the raw materials for another process".

At around the same time, in Kalundborg in Denmark, the local media reported on an industrial complex where the oil refinery, power station, pharmaceutical company, and other businesses, were cooperating to save water and energy. These collaborations were extended until, by 2003, a total of 11 companies were involved in seven collective projects for the exchange of materials, and in six collective water and energy systems. The latter included the use of waste heat for residential heating and for improving productivity in local fish farms. Kalundborg soon became the best-known example of an industrial ecosystem in practice.

The Kalundborg ecosystem grew out of a desire to cut costs and develop new industries, and grew not as part of a planned process but as a result of business decisions – arrived at both individually and collectively – by a dozen companies. This process was significantly helped by the existence of a relatively tight-knit business community with established practices of cooperation and mutual trust. The Kalundborg success-story has variously been described as 'industrial symbiosis', as an 'eco-industrial park', and as an example of 'regional resource synergies'. All are terms referring to the physical transfers of surplus or unwanted natural resources between different businesses, in order to achieve productive use of the materials, energy, or water contained in the resources exchanged. Proponents have championed the possible benefits if Kalundborg would just be replicated on a larger scale elsewhere. Critics point to the absence of other working examples, and suggest that an industrial ecosystem cannot just be repeated at will.

In the past five years, however, a range of examples of other industrial ecosystems *have* been documented, including some in transitional and developing countries. A number of these emerged with the help of government incentives, but others developed without specific government intervention – self-organized

Vicky Rabinowicz/Images.com/Corbis

RENE VAN BERKEL is Chief of the Cleaner and Sustainable Production Unit at the United Nations Industrial Development Organization

by industries seeking to reduce operational costs and secure long-term access to scarce natural resources.

- Kwinana near Perth in western Australia is an isolated heavy industrial area where, over the course of two decades, 47 synergistic projects, involving 22 companies, have been developed and implemented. These include combined heat and power generation projects, innovative water recycling and reuse schemes, productive use of lime kiln dusts, and the recovery and reuse of carbon dioxide and hydrogen from industrial processes.
- In Ulsan – known as the industrial capital of South Korea – 12 companies operate a total of nine synergistic projects, including common plants for production of process water and treatment of effluent, the production and use of biogas, copper and zinc recovery from smelting residues, and the reuse of slag in construction applications.
- Guigang City in south China hosts the country's largest sugar producer. Since its establishment in 1954, the local company has gradually expanded its operations to achieve a comprehensive use of sugar cane. Molasses is used to produce alcohol, and the yeast from alcohol production is supplied to farmers for soil improvement. Bagasse – the fibrous residue remaining after sugar cane stalks are crushed to extract their juice – is used to manufacture paper. Sludges from pulp and sugar-making are used as supplementary fuel for power generation, while ash from the power station is used as an auxiliary material in cement making.

In different parts of the world, governments have endeavoured to catalyze eco-industrial development. Most of past and present initiatives comprise either one or a combination of the following three strategies.

Eco-industrial park planning

Governments have assumed that knowledge of the availability of a low-cost waste resource would encourage other businesses that could potentially use such a low-cost input to co-locate its facility in close proximity to that resource. On this basis, programmes were started in North America and Europe to identify niche industry opportunities based on available or expected waste resources. These programmes often included investment support for common facilities such as effluent treatment plants or public transport connections. In 1996, the US Presidential Council for Sustainable Development identified 15 eco-industrial parks for development. However, ten years later, only seven were operational, and none had achieved substantive resource exchanges between the co-located industries. While there has been more success in Europe, it is clear that physical planning and command-and-control environmental policies and legislation are not sufficient to achieve resource exchanges between companies.

Recycling legislation

Another strategy to provide an incentive for industries to implement symbiosis projects is to enact recycling legislation. Faced with rapid declines in available landfill capacity, since the mid-1990s, Japan has actively developed a regulatory framework for the creation of a recycling-oriented economy. Mandatory recycling rates increased the cost of waste management and recycling, thereby creating a market niche for recycling industries. In parallel, the government supported the development of advanced recycling technologies, in many cases utilizing knowledge and facilities from its ageing metallurgical and related industrial complexes. Of particular significance was the Eco-Town Programme under which the Japanese government provided support for local waste management planning, and investment subsidies for priority advanced recycling industries. Between 1997 and 2006, 26 eco-towns were established, and approximately US$1.65 billion was provided in co-funding for 61 innovative recycling projects. Their aggregated capacity is currently two million tons of waste per year, making a 7% contribution to the national waste avoidance target for 2010. The programme has triggered private sector investment in another 107 recycling facilities. One of the most successful examples is provided by Kawasaki, a city where 14 synergies connecting steel, cement, chemical and paper firms, and their offspring recycling businesses, have been documented.

Efforts to apply Japan's Eco-Town Programme methods and policies throughout Asia are now underway. For example, there are ongoing pilot projects in Dalian and Shenyang (China) and in Penang (Malaysia). In moving towards a Circular Economy, the Chinese government has also emphasized the need for integrated recycling systems in industrial estates and cities, and has already identified some 30 model eco-industrial parks.

Industrial matchmaking

Other initiatives have focused on brokering supply and demand for recyclables. Waste exchange databases have been established in many countries, so that waste generators can list their available recyclable wastes and recyclers can source suitable input materials. The results have been mixed at best, for a numerous reasons, including the reluctance of waste generators to put sufficient details on volume and composition of their waste streams into publicly accessible databases, and the use of different chemical names for the same materials. More recently there has been a more active approach to developing matches between the supply of potentially recyclable materials and recycling industries. Between 1997 and 2001, around a dozen by-product synergy studies were carried out in the USA, Canada and Mexico. The Mexican study focused on Tampico, one of the country's busiest ports, which also has chemical and petrochemical industries. Three synergies were eventually implemented, namely: the use of discarded polyethylene/polypropylene for the production of cargo pallets; the use of PVC residuals for the manufacture of shoe soles; and the capture and use of waste carbon dioxide from several facilities for beverage production.

A comparable initiative was launched in Map Ta Put, the largest seaport and petrochemical complex in Thailand. Seventeen exchanges were realized, including multiple combined heat and power generation plants fired by low-grade petrochemical by-products, ash use in cement and brick making, the recovery of organic solvents, and the recovery of process carbon dioxide for dry-ice production.

These and other by-product synergy studies encouraged the British government to launch a National Industrial Symbiosis Programme (NISP) in 2005. The NISP provides comprehensive support services to link waste generators with reuse, recycling, and recovery businesses, including databases, free expert assistance, and innovation workshops. The programme has been particularly successful in helping companies to improve waste management. NISP methodology is currently being piloted in a number of transitional economies, including China and Mexico.

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International efforts to increase the resource productivity and environmental performance of industries in developing and transition economies have, so far, focused on company-level initiatives, particularly through cleaner production and the transfer of environmentally-sound technologies. However, as we can see from the above examples and approaches, there is ample justification for increasing the level and scope of international support to include collective opportunities. The resource efficiency and environmental challenges of our time call for a concerted and sustained effort to accelerate and scale-up both plant-level efficiency and collective synergies. ■

Corporate Social Responsibility: doing well… and doing good

by **NATASCHA WEISERT** – Industrial Development Officer, UNIDO, and **MANUELA BOESENHOFER** – CSR Consultant, UNIDO

The emergence of Corporate Social Responsibility (CSR) over the past decade quickly gave rise to the expectation that private business would tackle some of the world's most pressing economic, social and environmental problems. By employing CSR as a tool for risk and reputation management along the supply chain, and by seeking to engage producers and consumers alike, enterprises worldwide embarked on a myriad of initiatives that tried – and often succeeded – in combining profitable business ventures with a contribution to sustainable development.

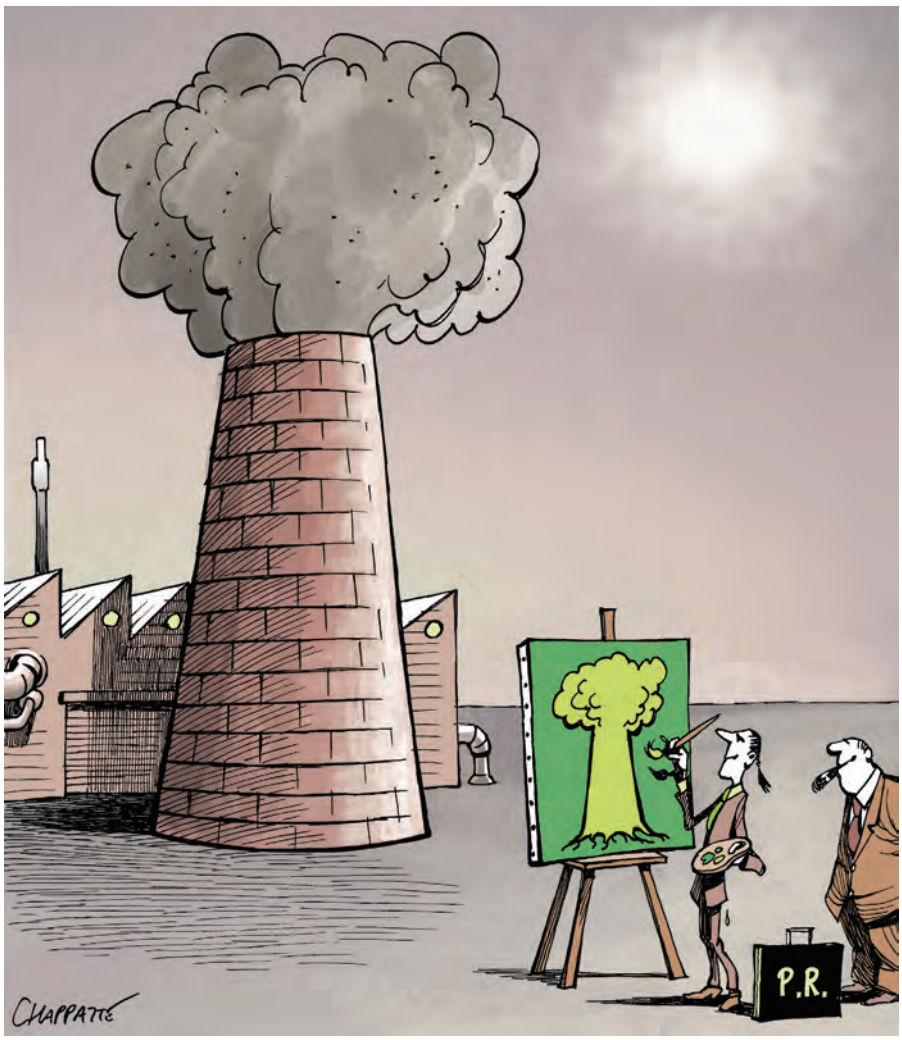
Public sector actors, in turn, have long approached various aspects of sustainable development from a regulatory perspective. The *Rio Declaration on Environment and Development, the Universal Declaration of Human Rights,* the *ILO Declaration on Fundamental Principles and Rights at Work*, and the *United Nations Convention Against Corruption*, are just some of the milestone agreements that governments have signed up to, and followed up with national legislation and associated policies and strategies.

However, while important achievements can be claimed on both sides, there is a gap between public and private sector activity to address sustainable development that remains wide open. Top-down public sector initiatives aim to ensure compliance with critical minimum requirements and punish wrongdoing in business. They don't encourage responsible business behaviour beyond the legal minimum or engage industry through incentive schemes and dialogue. In contrast, voluntary business initiatives typically address environmental and social concerns from the bottom-up. However, the objectives pursued by private business are rarely determined by sound socio-economic analysis or development approaches. Usually they are led by the most acute, humanitarian and "heart-breaking" issues, a quest for economic viability in a "business case" for CSR, or, in the worst cases, by public relations and marketing objectives.

It is not that public and private efforts in the area of sustainable development have never been aligned. Numerous CEOs have supported high-level public goals, such as the mitigation of climate change, through open letters to inter-governmental negotiations or through inter-business coalitions for joint action. Business actors have also recognized governments' regulatory work in the area of sustainable development as important pillars of their individual CSR initiatives and activities. At the same time, public sector-sponsored CSR awards and incentive schemes to promote responsible business practices are proliferating at national and international levels. These include UN-led activities, such as the Global Compact or the Growing Inclusive Markets initiative, multi-stakeholder processes, such as the development of the social responsibility guidance standard ISO 26000, and the development of CSR policies or strategies in countries as diverse as India, Lithuania, and Nigeria.

> "Private sector actors could draw on well-targeted (and meaningfully funded) incentive schemes and benefit from reduced regulatory uncertainty"

However, the potential for using CSR strategically as a vehicle to stimulate sustainable patterns of private sector development and to foster solid public-private partnerships for the greater public good has not been fully exploited – and particularly not in developing countries. While a better alignment would surely require a new culture of public-private dialogue on development issues that goes beyond making pledges for the achievement of broad and largely undefined values, the benefits to be reaped from concerted action could be significant for either side. Private sector actors could draw on well-targeted (and meaningfully funded) incentive schemes and benefit from reduced regulatory uncertainty. The public sector, in turn, would be able to stimulate and more effectively leverage



private sector activity to achieve priority development objectives and to mobilize a critical mass of support among key business players to implement its policies.

In a developing country context, the exploration of possible linkages between national policy frameworks aimed at poverty reduction, economic development, and environmental sustainability on one side, and the planned activities of business in the fields of socially and environmentally responsible business practices on the other, could be a good starting point for such public-private dialogue. National policy frameworks often tackle the key sustainable development issues under different pillars or headings – one related to the economic/industrial domain, another one emphasizing the importance of social, health and cultural issues, and a third one stressing the importance of efficient resource use and environmental protection. Whereas private sector involvement is usually encouraged to stimulate economic growth under the first pillar, its possible – and potentially significant – contribution to meeting social and environmental development objectives is often overlooked.

It is, for example, not too hard to imagine how a national policy towards an important development objective, such as increasing the proportion of population with access to clean drinking water, could be combined with a set of incentives that encourage enterprises to make relevant technologies and services affordable for target populations. At the international level, where governments struggle with such diffuse and complex challenges as climate change, energy security, or inclusive patterns of globalization, the importance of achieving the broad-based understanding and involvement of key business players in collective actions is even more significant.

The quest for the development of viable CSR-based public policy frameworks should therefore start with the identification of relevant entry points:

- Where and to what extent could business activities be brought in line with national or international development priorities?
- How could governments most effectively facilitate such behaviour?

If addressed in this manner, CSR-based policy initiatives could go a long way to closing the gap between 'doing well' and 'doing good'. ■

Greening industrial policy

by **TOM KENYON** – Industrial Development Officer in the International Financial Institutions Partnership Unit at UNIDO

What would 'green' industrial policy look like? We usually think of industrial policy as a process of public-private interaction geared towards: i) raising productivity in existing sectors, and ii) supporting the emergence of new ones. The first generally involves some combination of regulation or standard-setting, benchmarking, and the development of a market for upgrading services; the second, the elicitation of new investment proposals analogous to venture capital activity in more advanced economies, and the coordination of public inputs necessary for them to become viable. But how would industrial policy-makers in developing countries take environmental considerations into account in these processes?

To the extent that industrial policy is about raising productivity growth in existing sectors, the green analogy is clear: encouraging cleaner production and more efficient use of resources. The key is to convince enterprises that this makes financial sense, while tightening up regulatory enforcement and enabling the growth of financial and other business development services. But the more difficult challenge is to stimulate the structural transformation of whole economies towards sustainable growth. Conventional industrial policy was associated with encouraging a transition, first from agricultural to manufacturing activities, and then towards knowledge-intensive or service and export-oriented industries. In much the same way, 'green' industrial policy requires forming a judgment about which new clean-energy, low-polluting sectors are likely to succeed, given a country's comparative advantage, and taking measures to support private investment in them.

What institutions and processes might be required to achieve these objectives? Conventional industrial policy consists of structured dialogue between government agencies and the self-organized private sector, aiming to discover missing public inputs and organizing a supply response. The necessary institutional tools are well-known: deliberation councils that allow civil servants and entrepreneurs to exchange information about market opportunities; and representative bodies that ensure the political legitimacy of investment decisions and the accountability of those charged with implementing them.

Greening these processes involves bundling in other actors to internalize "new" externalities. Some countries have tackled this at the macro level through 'policy integration'. Singapore, for example, requires all firms receiving support from its investment promotion agency to meet the regulatory requirements of its Ministry of the Environment. At the micro level, countries, such as Costa Rica, have involved local stakeholders in strategic environmental assessments.

> "'Green' industrial policy requires forming a judgment about which new clean-energy, low-polluting sectors are likely to succeed"

Conventional industrial policy is also about the deployment of tools for influencing firm's behaviour – industrial zones, venture capital funds, licensing regimes for foreign direct investment, public support for research and development, and so on. What would green versions of these look like? Some examples:

- Industrial zones – Traditionally, industrial zones have been used to ensure adequate physical infrastructure and a hospitable regulatory environment in countries where state incapacity or political considerations prevent the extension of these amenities over an entire territory. But inducing – or requiring – potential polluters to operate from industrial zones also provides a means of monitoring and achieving cost-effective pollution control of their activities. The UN Environment Programme (UNEP) has produced several manuals to help policy-makers in deciding where to locate zones to minimize their environmental impact.
- FDI licensing – Most policy-makers recognize that foreign direct investment can contribute to productivity growth through the transfer of technology and know-how. But not all potential foreign investors are alike. Unfortunately, very few investment promotion agencies in developing countries possess the expertise to assess newcomers' likely environmental performance. And in recent years donors have emphasized rapidity of response and procedural simplicity over the development of analytical capacity. Awareness of simple signals such as

companies' possession of ISO 1400 certification, or the age of the technology they intend to use, could make a difference.

- Firm-level benchmarking – In many OECD economies, private companies provide benchmarking services that give industrial firms a sense of how their performance might be improved relative to international standards. The methodologies they use can quite easily be adapted to include environmental measures (e.g. atmospheric emissions, energy intensity, water use etc.). In South Africa, UNIDO is working with the government, the National Cleaner Production Centre, and a local benchmarking firm to assess the environmental performance of automotive components suppliers, and to stimulate the demand for cleaner production techniques and technologies. ■

Disclosing carbon emissions

by **PAUL DICKINSON** – founder and CEO of the Carbon Disclosure Project

The recent financial and economic turmoil has highlighted the importance of full disclosure and risk management. Rarely have we been more aware of how failure to manage risk can have impacts beyond our worst expectations. Many lessons learnt from the challenges in our financial systems are highly relevant to the challenges we face in our climate system.

There has been a transformation in the global approach to climate change in 2009. The Obama administration has introduced a new era in climate change policy in the United States; while China is set to meet ambitious renewable energy and energy efficiency targets, and hosts some of the world's largest renewable energy companies. Brazil entered the New Year with a new National Plan on Climate Change, and national governments in industrialized countries including Japan and the US are developing new legislation to reduce emissions. The political landscape has changed considerably since the Kyoto Protocol (2005). But there is still a long road ahead before the world develops concrete plans to reduce emissions in line with scientific recommendations of 50-80% by 2050.

Australia and New Zealand have postponed the development and implementation of their cap and trade schemes as a result of political difficulties. On the other side of the world, all eyes are on the proposed US Waxman-Markey cap and trade scheme bill. In the European Union, governments have committed to 20% reductions by 2020, with a commitment to go further if others do. However, the international community has not yet set global medium-term reduction goals.

An agreement in Copenhagen will be the first vital step to success, but it is just as important to look beyond Copenhagen, and to build the global systems required to combat dangerous climate change.

The Carbon Disclosure Project (CDP) works to collect and distribute high quality information in order to motivate investors, corporations, and governments to take action. The project furthers this mission by harnessing the collective power of the investment community to accelerate unified action on climate change. On behalf of more than 475 institutional investors, holding US$55 trillion in assets under management, the CDP requests some 2,500 companies to report their climate change strategies and greenhouse gas emissions. The information is used by financial decision-makers to identify both climate change risk and opportunity in the companies they invest in, lend to, or insure.

The CDP also extends awareness of an organization's carbon footprint by moving beyond the measurement of direct greenhouse gas emissions to include climate change risks and opportunities across the supply chain. In many sectors, supply chain emissions from activities such as processing, packaging and transportation often exceed those arising from an individual company's own operations. More than 55 organizations, including P&G, PepsiCo, and the British government, ask more than 800 suppliers to measure, assess, and report climate change risk and opportunity. Over the last year, there has been a significant increase in the use of CDP data in procurement operations, and companies such as Walmart are now using CDP response as part of their supplier performance assessment.

The new *CDP Global 500 Report 2009* analyzes responses from the world's 500 largest corporations. Fifty-one per cent of the Global 500 companies reported emission reduction targets, up from 41% in 2008. However, only 36% of reported carbon reduction targets stretch beyond 2012. The message is clear: a global agreement in Copenhagen in December 2009 is needed to provide increased certainty for Global 500 companies looking to set medium and long-term emission reduction targets. ■

Power to the people

HÉLÈNE PELOSSE, Interim Director-General of the International Renewable Energy Agency (IRENA), tells *Making It* about the new intergovernmental organization and its plans to help extend the use of renewables in both industrialized and developing countries.

IRENA's Hélène Pelosse meets UN Secretary-General Ban Ki-Moon in New York Photo: UN Photo/Paulo Filgueiras

What do you see as the particular importance of IRENA for the increased use of renewable energy across the globe?
Until IRENA was founded in January 2009, there was no single international governmental organization that was mandated solely with the promotion of renewable energy. The fact that 75 countries established IRENA, and that this number has risen to 137 only six months later, shows that countries all over the world felt the need for such an agency.

Renewable energy production has increased sharply during the last decade. Last year, both the United States and the European Union added more power capacity from renewables than from conventional sources. In the four years from the end of 2004, total power capacity from new renewables increased by 75% to 280 GW. Renewables are clearly a success story, but obviously the global use of renewable energy has to be scaled up further. We are faced with numerous challenges such as rising energy prices, climate change, and energy poverty in many regions of the world. Renewables are the answer to these challenges, and have to be introduced more quickly and used more extensively than before.

This is where IRENA comes in. Unlike other institutions that only partly deal with renewable energy, IRENA has been founded as a one-stop-shop. The agency will advise its members on implementing suitable policies, programmes, and regulations to stimulate the introduction of renewable energy. The right framework conditions are crucial in this respect. Countries have to create a favourable environment for renewables, and IRENA will assist them with this. Moreover, the agency will facilitate access to financing for renewable energy projects and technology transfer. I know that these two issues are of special importance for developing countries. And last, but not least, IRENA will help its members with training and capacity building – because the most sophisticated technology is worthless if a skilled workforce is missing.

Do you think developing countries have realistic ambitions of meeting the growing demand for renewable energy equipment, and, if so, how can policy-makers help this happen?
I am absolutely positive that developing countries will take part in the global development and production of renewable energy technologies. From solar home systems in Ethiopia, to cook stoves in India, to grid connections in Colombian slums, market-based solutions developed by entrepreneurs within their respective economies are delivering safe and affordable energy to customers. These market-based projects are either targetting the 1.6 billion people worldwide with no access to electricity or the three billion people using traditional biomass – fuelwood, charcoal and animal dung – for cooking. Companies all over the world are increasingly aware that these markets – that at first glance appear to be unprofitable – are huge. Estimates indicate that there is a US$500 billion market for safe, clean, and affordable modern energy – and it is increasingly serviced by entrepreneurs from within that market itself.

A good example is Grameen Shakti in Bangladesh, one of the largest and fastest growing rural-based renewable energy companies in the world. As of March 2009, Grameen Shakti had installed 220,000 solar home systems in rural areas, each one turning a house into a small power plant. Their business model is very convincing, and I do not see why similar enterprises should not be possible in other countries.

During recent visits to Morocco and India, I learned about their plans to create preferential zones for renewable energy technology production. The United Arab Emirates is, at this very moment, setting up such a zone in Masdar, the sustainable city project outside the capital, Abu Dhabi. I would highly recommend the establishment of such zones in countries all over the world. With fast-track administrative procedures, lowered or zero import tariffs and taxes, and additional benefits, they create a favourable environment for the development of renewable energy technologies. In the past, many countries have successfully established such zones to support specific sectors of their economy. Now is the time to do the same for renewable energy technologies.

The second issue of *Making It* will focus on energy for development. What can be done to help developing countries access appropriate financing in order to exploit their renewable energy potential?

I can see two ways in which IRENA can help in this respect.

Firstly, the experience of past years has demonstrated that investors need the right political and economic framework conditions to invest in renewable energy projects in countries all over the world. Some of IRENA's member countries, like Germany, Spain and India, have attracted investors because they introduced effective support programmes, guaranteed stable investment environments, and offered a skilled workforce. IRENA can provide its members with advice and assistance on how to adapt such tried and tested policies to specific national conditions, in order to stimulate investment in renewable energy projects. The Agency will thus help its members to profit from the experience of other countries and, at the same time, help them to avoid making the mistakes that other countries have made.

Secondly, IRENA can provide advice about grant programmes and funding mechanisms and instruments specifically for renewable energy projects. A large number of such mechanisms already exist and IRENA will try to systematize them in order to eventually establish a permanently updated financing database. This is clearly lacking at the moment, and it will, I believe, speed up the implementation of the many renewable energy projects that are currently in the pipeline. ■

Interview by Cormac O"Reilly and Ralf Bredel, UNIDO

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Friedman, Thomas – Hot, Flat and Crowded: Why the World Needs a Green Revolution – and How We Can Renew Our Global Future
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Jones, Van – The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems
UNIDO – Greening of Industry under the Montreal Protocol: Background Paper.
UNIDO – Manual on Operations under Multilateral Environmental Agreements
Weizsäcker, Ernst et al. – Factor Five, Transforming the Global Economy through 80% Improvements in Resource Productivity

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www.businessgreen.com – A business website that offers companies the latest news and best-practice advice on how to become more environmentally responsible, "while still growing the bottom line".
www.greenbiz.com – The self-styled "business voice of the green economy" is a leading source for news, opinion, best practices, and other resources on the greening of mainstream business.
www.greenbang.com – Greenbang tracks the explosion of developments affecting global business leaders working toward a low-carbon future.
www.edie.net – Environmental Data Interactive Exchange is an online resource for environmental professionals, researchers and all those with an interest in green issues, bringing together practical information and in-depth yet accessible news.
www.indiaenvironmentportal.org.in The India Environment Portal is "a one-stop shop of all that you want to know about environment and development issues".
www.iisd.org – The International Institute for Sustainable Development
www.wbcsd.org – World Business Council for Sustainable Development
www.unido.org/cp – UNIDO's Cleaner Production Programme
www.unep.org/greeneconomy – The Green Economy Initiative
www.bralirwa.com – Rwanda's soft drinks and beer company, Brasseries et Limonaderies du Rwanda

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