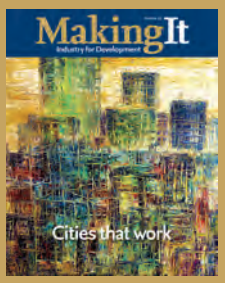
Number 19

# MakingIt

Industry for Development

## Water



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

**www.makingitmagazine.net**

# Editorial

A water footprint shows the amount of fresh water used to produce the goods and services we consume, including that used for growing, harvesting, packaging and shipping. The global average water footprint of industrial products is 80 litres per US dollar of the purchase price.

Every manufactured product requires water but some industries are more water-intensive than others. More than 4,600 litres of water are used to make one tonne of cement; 837 litres to make one kilogram of cotton; 458 litres to make one kilogram of synthetic plastic; 190 litres to make one litre of paint; and ten litres to make one sheet of paper.

Industrial wastewater is one of the most serious sources of water pollution. There are many types of industrial wastewater based on different industries and contaminants, with each sector producing its own particular combination of pollutants. The production and cleaning processes in the iron and steel, textiles and leather, pulp and paper, and chemicals sectors, amongst others, pose a severe threat to water resources around the world, particularly in the Global South.

More than 2.8 billion people in 48 countries will face water stress or scarcity conditions by 2025, yet at the same time global water demand for manufacturing is expected to massively increase.

For industrialization to be sustainable, it must be a process that reduces water use and improves the quality of wastewater. Enterprises, whether small, medium or large, must make more progress in evaluating and reducing their water use and that of their supply chains. Water-use efficiency across all sectors must improve to ensure sustainable withdrawals. Water pollution must be reduced and the release of hazardous chemicals and materials eliminated in order to improve water quality.

The greening of industry can help ensure safe and clean water for all.

MakingIt
Industry for Development

# Contents

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Design: Smith+Bell, UK – www.smithplusbell.com
Thanks for assistance to ZHONG Xingfei and Laura Gil Martínez
Printed by Imprimerie Centrale, Luxembourg, on PEFC-certified paper – http://www.ic.lu
To view this publication online and to participate in discussions about industry for development, please visit www.makingitmagazine.net
To subscribe and receive future issues of *Making It*, please send an email with your name and address to subscriptions@makingitmagazine.net
*Making It: Industry for Development* is published by the United Nations Industrial Development Organization (UNIDO),
Vienna International Centre,
P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0,
Fax: (+43-1) 26926-69
E-mail: unido@unido.org
Number 19, third quarter 2015

ISSN 2076-8508





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# 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 Editor, *Making It*, Room D2142, UNIDO, PO Box 300, 1400 Vienna, Austria. (Letters/emails may be edited for reasons of space).**

## LETTERS

### The ruins of capitalism

Dora Apel has written an interesting article, *The Ruins of Capitalism*, about ruin imagery (see the *Jacobin* magazine website). It gives a quirky twist on Seth Schindler's piece ("Degrowth machine politics" on the *Making It* website). She says that by depicting urban decay and ecological crisis, ruin imagery shows the people and places that capitalism left behind. Whereas Schindler writes that Detroit is managing inevitable degrowth through economic diversification and appears able to create a viable future within the existing capitalist system, Apel says Detroit is a global metaphor for capitalist decline.

**● Johnny Johnson, website comment**

Nicole Claes (in Letters, *Making It* issue number 18) writes that the International Monetary Fund (IMF) "has reduced its forecast again for global economic growth for 2015". Since then, the IMF has issued its latest six-monthly World Economic Outlook. It's worse.

It included a study that suggests that the economic and financial crisis has done permanent damage to global growth. It traces the growth of potential output, by which is meant the level of output that can be achieved without causing a rise in the rate of inflation. It predicts that in the advanced economies the growth of potential output would barely rise from an average rate of 1.3% a year in 2008-14 to 1.6 percent in 2015-20. This is way below the pre-crisis rate of 2.25% in 2001-7.

The IMF also predicts that the "emerging market" economies – the likes of China, India and Brazil – will slow down. Their rate of growth of potential output will fall from 6.5% in 2008-14 to 5.2% in 2015-20.

In June, the Organization for Economic Co-operation and Development (OECD) also reduced its forecast for global economic growth. It warned that weak investment and disappointing productivity growth risk keeping the world economy stuck in a "low-level" equilibrium. The OECD now expects the global economy to expand this year by 3.1%, a sharp downgrade from last November's forecast of 3.7%. The revision follows a weak first quarter of 2015 for the global economy, the softest since the great recession of 2008-2009, led by a sharp decline in the United States.

The IMF calculates that private investment in the advanced economies declined by 25 percent in 2008-14 compared to forecasts made in early 2007. But the cash is there. Rather than undertake productive investments in sustainable industrial development to get the world economy moving, the corporations are continually pouring money into the financial markets. Stock-market bubbles are busily inflating all over the world, most notably now in China.

**● Clemens Stefan, by email**


Why we need more women engineers

**Above: The interview with Roma Agrawal ("Why we need more women engineers") in *Making It* number 18). "Investment in women boosts economic development, competitiveness, job creation and GDP".**

### Women engineers

The interview with Roma Agrawal ("Why we need more women engineers", *Making It* issue number 18) is really interesting, particularly where she says that many women study science with a view to becoming doctors. "We should tap into their motivation to help people and encourage those who don't go on to do medicine to do engineering", she says.

She refers to an OECD report from 2011 that "showed that there is no intrinsic difference in the ability of men and women in science and maths." Recent evidence from the OECD shows that not only should we encourage women to be engineers or similar occupations on a moral basis but that in fact investment in women boosts economic development, competitiveness, job creation and GDP. Mari Kiviniemi, the OECD's Deputy Secretary-General, said recently. "We estimate that on average, across the OECD, a 50% reduction in the gender gap in labour force participation would lead to an additional gain in GDP of about 6% by 2030, with a further 6% gain (12% in total) if complete convergence occurred. Frankly, I don't think that our economies can afford to ignore such huge potential."

**● Joan Chiedozie, website comment**


**For further discussion of the issues raised in *Making It*, please visit the magazine website at *www.makingitmagazine.net* and our Twitter page, *@makingitmag*. Readers are encouraged to surf on over to these sites to join in the online discussion and debate about industry for development.**

# Caribbean tourism

I was pleased to see Keith Nurse's article on what he calls 'the creative sector' in the Caribbean (*Making It* issue number 17). I sincerely hope that the wealth of cultural output from the region, epitomized by the images of Bob Marley and Rihanna, can be an engine for economic growth. A tough ask, especially (as Nurse himself points out) given the fact that the Caribbean actually imports more 'creative' merchandise (such as CDs) than it exports.

Nurse highlights the creative industry's strong cross-promotional linkages with tourism, which he describes as "a key driver of the economy with the largest share of GDP, export earnings and employment."

The problem is that Caribbean tourism is dominated by a network of foreign multinational corporations, which makes the regulation of the industry virtually impossible due to the threat of relocation to a more lax environment. This is especially the case when it comes to matters of taxation. For example, a 2006 CARIFORUM study of the Caribbean tourism industry lamented that the project was "hindered by a lack of willingness by hoteliers in the region to share data" pertaining to issues of taxation and operating costs. Given the reluctance of the hotels to share such information, it can be assumed that they were seeking to avoid making the terms of their concessions public.


**Above: Keith Nurse's article ("Creative industries: a window of opportunity") in *Making It* number 17). There is a "disconnect between the reliance on tourism and its contribution to the region's economic base via taxation."**

The disconnect between the Caribbean's reliance on tourism and the sector's contribution to the region's economic base via taxation is demonstrated by the fact that tourism provides anywhere from one to three quarters of a country's income, yet tax revenue from hotel accommodation for example ranges from 0.5 to 3.2% of national GDP.

Due to the all-inclusive enclave structure of much of the Caribbean's tourism industry, according to the United Nations Environment Programme (see the UNEP's *Negative Economic Impacts of Tourism*) the region leads the world in tourism "leakage" with an estimated 80% of the money spent by tourists ending up leaving the region via foreign owned hotels, operators, airlines, imported food and drinks, and so on. The lack of regulation discourages the creation of much needed linkages with the local economy and job creation for farmers, food processors and artisans. Thus, due to the uneven nature of the Caribbean's tourism industry, out of 12 global regions, the 2014 World Travel and Tourism Council ranked the Caribbean as the most dependent on tourism (based on contribution to GDP in 2013).

I hope Nurse's call for the Caribbean's creative industries to "offer scope for innovation, economic diversification and global competitiveness", particularly, as he says, in the digital market, bears fruit.

● **Mick England, website comment**

# Turning on the heat

Assaad W Razzouk, in a thoughtful article on how we are going to finance the transition to a green economy ("Where's the money?" *Making It* issue number 16), says: "Governments are quite happy developing emission-reducing policies and measures on their own terms." He seems relaxed about this, but concludes that more effort might be devoted to "ensuring the integrity of underlying climate actions", rather than getting countries to agree on comparable targets. Fair enough, but there are going to be problems doing this.

In the United States, Barack Obama has pledged to cut emissions by 26-28% over ten years. In China, Xi Jinping has said their emissions will still grow but peak by 2030. But, as Assaad pointed out, "the Earth is set to warm by four to five degrees compared with pre-industrial levels that will wreak devastating effects on the planet." According to scientists Kevin Anderson and Alice Bows-Larkin, countries like the US and China need to reduce their overall carbon emissions by 10% every year, starting now if we are to give ourselves even a fifty-fifty chance of limiting warming to two degrees above pre-industrial levels.

It's one thing for politicians to debate numbers in international forums but it's an entirely different task to get them to control the output of fossil fuel.

● **Ger Bergsson, by email**

# A post-GDP world

**Lorenzo Fioramonti** on why it's time to end the tyranny of Gross Domestic Product

In global governance, a country's status is intimately connected with the size of its economy. In his influential book, *The Rise and Fall of the Great Powers*, Yale historian Paul Kennedy concludes that economic strength is more significant than military might when it comes to determining the international pecking order. This has certainly been the case during the 20th century, when Gross Domestic Product (GDP) became the key parameter deciding which countries should lead the institutions of global governance. Definitions of "superpower," "middle power," or "emerging power" have all been defined by GDP. The distinction between the "developed" and the "developing" world is also a result of GDP. Powerful "clubs" like the G7/G20, the OECD, and even the BRICS (Brazil, Russia, India, China and South Africa) are determined by actual or prospective estimates of GDP. GDP is not just an economic policy tool: it is first and foremost the leading parameter through which a nation can gain global clout and access the top echelons of global governance.

In the past few years, however, there has been a growing debate about the adequacy of GDP as an indicator of economic performance, let alone as a benchmark for international relevance. Indeed, GDP is not a measure of all gains and losses in an economy. While it counts the exploitation of natural resources as profit, it does not consider the economic costs of environmental degradation, and it completely disregards goods and services exchanged outside the market (within households, in the informal economies, through barter, etc.), which account for the bulk of economic activity in many countries.


Image: @cartoonralph

Chopping and selling trees adds to GDP but planting them doesn't. As a consequence, the measure yields a distorted perception of "wealth" and resulting global status: How rich are emerging powers like China and India if, as the World Bank estimates, most of their GDP will have to be spent to fix the environmental destruction caused by its growth?

The concept of the GDP was introduced in the 1930s, when the myths of industrialization were uncontested, and environmental and social concerns were less acute. But it is an outmoded tool for a generation increasingly concerned with social well-being and climate change. Against this backdrop, numerous calls have been made – not only by experts, but also by leading policymakers – to move beyond the GDP framework.

The French government established a high-level commission in 2008 to define post-GDP parameters of success, when both the OECD and the EU launched their "Beyond GDP" campaigns. In 2012, the Rio+20 Summit proposed the development of new measurements and targets, paving the way for the adoption of the Sustainable Development Goals (SDGs).

Even among the emerging powers, the influence of GDP has taken a knock. For instance, Chinese President Xi Jinping announced in 2013 that GDP will no longer be considered a parameter of success in China, ending the Communist Party tradition of rewarding officials that maximize GDP growth in their territory. A year later, over 70 Chinese cities ditched GDP as an economic policy tool. As admitted by the UN Secretary-General Ban Ki-moon, "[GDP] fails to take into account the social and environmental costs of the so-called progress.... We need a new economic paradigm that recognizes the parity between the three pillars of sustainable development. Social, economic and environmental well-being are indivisible."

But given that GDP has determined the leadership of global governance, how would international politics be affected by the adoption of new measures of well-

being, prosperity and sustainable development? Let's simulate the results using four leading alternative indicators: the Social Progress Index, the Legatum Prosperity Index, the Environmental Performance Index, and Ecological Footprint.

Using these measures, conventional powers – both in the West and in the East – would rank far below countries that have been more successful at building equitable and sustainable economies. The only current G7 members to survive the shift would be Germany (relatively high in its capacity to address basic needs and promote well-being) and Canada (mostly thanks to its education and social capital as factors of prosperity). By contrast, the world's largest economies (in terms of GDP) would slide sharply down the rankings. Indeed, the United States ranks 10th in prosperity (mostly due to its poor track record in safety and security), 36th in well-being, and at the very bottom in sustainable development (due to its massive ecological footprint). China is 51st in terms of overall prosperity, mainly due to limited individual freedom and security, 92nd in well-being, due to a shaky recognition of personal rights, and at the very bottom in environmental performance (118th).

The new global leaders would be countries that have been able to marry economic progress with human and ecological well-being. Among them we find dynamic economies with a high quality of life such as Costa Rica, New Zealand, and South Korea (leaders in their respective regions) as well as established social democracies such as Sweden, Norway, Denmark and Switzerland. We also find champions of good governance such as Botswana and Uruguay.

Things would change for Southern Europe too. By including the value of the informal economy and the variety of household and community services provided free of charge (which are neglected by GDP), the income of many European economies increases significantly. The infamous acronym PIGS, describing the allegedly inefficient economies of Portugal, Italy, Greece and Spain, would also need some rethinking, as their economies are much more prosperous – in non-GDP terms – than the current metrics reveal. Logically, a post-GDP scenario should lead to a revision of the European Union's Stability and Growth Pact, which forces member states to anchor their capacity to invest in welfare mechanisms to their GDP performance.

"Several countries have been able to maximize human and environmental well-being, but the GDP model of governance has relegated them to irrelevance."

Structural factors, too, are likely to accelerate the end of the GDP world. According to the IMF, the global economy is entering a "secular stagnation" – a prolonged phase of very low (if any) economic growth. International trade, a key driver of global GDP expansion, is also likely to contract, especially since fossil fuels (which can be easily transported) are becoming scarcer and more expensive, while renewable sources of energy (whose energy cannot travel long distances) become dominant. Global regulations to curb climate change will also make the resurgence of a GDP-fueled global economy very unlikely, especially as they will impose restrictions on emissions and environmental damage. But this will not mean a return to national economic self-sufficiency.

The post-GDP economy will be less global – but more regional. Trade within regions and subcontinents will offer opportunities for more inclusive and sustainable development, especially where territorial contiguity and shared energy sources provide new opportunities for cross-border cooperation.

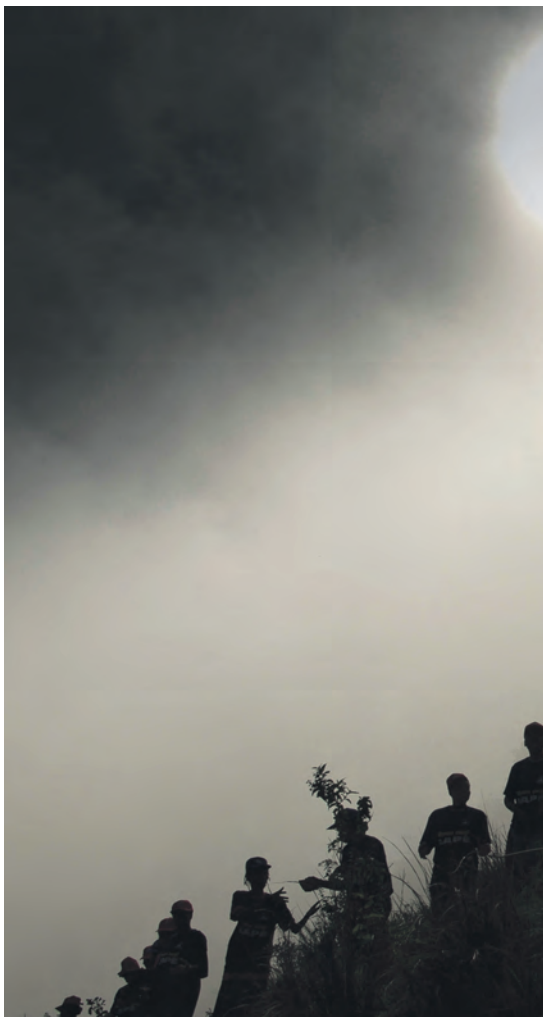
A post-GDP world is just a possibility. But with the convergence of economic, social, and environmental crises, there appear to be no reasonable alternatives. Ultimately, global governance is what states want it to be. As we have seen, several countries have been able to maximize human and environmental well-being, but the GDP model of governance has relegated them to irrelevance. As the world gears up to ratify the SDGs and embark on negotiations for a new climate change agreement, these nations have an unprecedented window of opportunity to present themselves as beacons of sustainable development. A WE7 or WE20, that is, an alliance of leading "well-being economies," would be better suited to address global challenges such as inequality and climate change than the current G7/G20, which is led by highly unequal and polluting countries. Time is ripe for major change.

● **LORENZO FIORAMONTI** is professor of political economy and director of the Centre for the Study of Governance Innovation at the University of Pretoria. He is the author of the award-winning book, *Gross Domestic Problem: The Politics Behind the World's Most Powerful Number*.

HOT TOPIC

# How does emigration affect the people left behind in poor countries?

**Paul Collier** argues that skilled migration from some low-income countries is so high that it undermines the development prospects of people "left behind"



That many countries still provide little hope of even basic prosperity to their citizens is the great global challenge of our century. It is a vital matter that the poorest countries catch up with the rich world, but it will require decades of sustained high growth. To see how emigration might affect this process of convergence we need some understanding of why poor countries have remained poor. Poverty persists in very poor countries because of weak political institutions, dysfunctional social attitudes, and a lack of skills. These all make it difficult to harness economic opportunities. Emigration can either help or hinder convergence depending upon who leaves, how many leave, and for how long they go.

Potentially the most important effect of emigration is on political institutions and social attitudes. There is now solid evidence that emigrants can be influential in their home societies. Students from poor countries who have studied abroad in democracies and then return home bring with them pro-democracy attitudes. They spread these attitudes and are sufficiently influential that they speed up democratization. An astonishingly high proportion of the political leaders of poor countries have studied and worked abroad, and this equips them with both new skills and new attitudes. Even migrants who do not return have some influence with their relatives back home. During elections they give advice and commentary, and they become role models for smaller family size.

There has been a lot of research on whether emigration causes a brain drain or a 'brain gain'. Intuitively, if educated people leave there can only be a brain drain. But we now know that this may be offset by an enhanced incentive to get education. If education is the prerequisite for getting to America, then the many youths who dream of going there will try harder at school. While some will achieve their dream, many will not but in the process will have acquired more education than otherwise. It turns out that which of these effects predominates depends upon how many educated people emigrate. In big countries that are already converging, such as China, relatively few educated people emigrate and so the brain gain predominates: China gains from emigration. But in small countries that are falling even further behind, such as Haiti, so many of the educated leave that the brain drain predominates. Many small, poor countries are unfortunately in the same position as Haiti.

● These two articles were first published on the *From Poverty to Power* blog: http://oxfamblogs.org/fp2p/ and are republished in accordance with a Creative Commons licence: https://creativecommons.org/licenses/by/2.0

Photo: Logan Abassi UN/MINUSTAH

The brain drain can potentially be reinforced by a motivation drain. Many poor societies are beset by opportunism: teachers don't show up for work, nurses steal drugs, policemen extract bribes. Those who are motivated to do their jobs properly can stick out as an uncomfortable minority. Emigrating to societies in which norms are more functional can be an attractive option for such workers, but cumulatively this is self-reinforcing: the more who leave the less attractive it is to stay. Whereas the brain drain is well-understood, the motivation drain has yet to be quantified but its analytic foundations have been set out by Nobel Laureate George Akerlof.

Finally, emigrants send remittances home. While this is helpful for the relatives left behind, the average remittance is only around US$1,000 per year. Workers would usually produce more than this if they were to stay home, so there is often a net loss to the economy.

In trying to weigh up these disparate effects it is clear that having some emigration is better for poor countries than having none. But this is a clear answer to the wrong question. The pertinent issue is whether poor countries would be better off with somewhat faster, or somewhat slower emigration than they have currently. The answer depends upon who is migrating: young people in search of an education, unskilled workers in search of a job, or skilled workers looking to use their talents. The evidence suggests that the more students the better, especially if they then return. Unskilled workers may well send back more in remittances than they would make at home. But the emigration of skilled workers may already be excessive. Recent evidence finds that for many of the poorest countries emigration rates are already beyond the point of peak benefit: these countries are haemorrhaging their scarce talents. The most severe effects are for fragile states emerging from conflict. During conflict they haemorrhage their most capable people. Post-conflict, they desperately need them to return but cannot compete with the lifestyles of the rich world. Emigrants considering return face a coordination problem: return would be less alarming were others to return as well but there is currently no mechanism for facilitating coordinated return.

Skilled and motivated people are the fairy godmothers in any society: they benefit ordinary people. As the fairy godmothers increasingly shift from poor societies to rich ones, they themselves benefit, but I question whether we should regard this as a triumph of social justice.

● **PAUL COLLIER** is a Professor of Economics and Public Policy at the Blavatnik School of Government and Director of the Centre for the Study of African Economies at Oxford University. From 1998-2003, he was Director of the Research Development Department of the World Bank. He is the author of *Exodus: How Migration is Changing Our World* (2013).

HOT TOPIC

# Migration and development: who bears the burden of proof?

**Justin Sandefur** responds to Paul Collier's article on the impact of migration on developing countries

I suspect many people reading this in Europe or North America share Professor Collier's scepticism about skilled migration. You are not racist or xenophobic. You are concerned about the plight of the global poor, and you welcome diversity in your community. But you worry that maybe Collier's right. Maybe the fate of your university-educated Haitian neighbour down the street, earning a good salary and sending her kids to good schools since moving to the UK, is a distraction from, and maybe even a hindrance to, reducing poverty in Haiti.

Before we begin, it's important to note that we're not really debating whether the rate of skilled emigration from Freetown to London or Port-au-Prince to Miami is too fast or too slow. We're really talking about whether to deport your neighbour. Or whether to refuse her a visa in the first place, and consign her and her family to a future of low wage employment, bad schools, and preventable disease "back where they came from." That is the policy proposal on the table for your consideration.

My argument is that the burden of proof here should be heavy, and it should rest on the shoulders of those who would build walls and tear apart families. If you think the prosecution has met that burden of proof, here are three reasons to reconsider.

**1. Empirically, the alleged "brain drain" from poor countries does not exist.**
Prof. Collier worries that while China wins from an emigration "brain gain", Haiti and other small, poor countries lose out to "brain drain". So let's have a look at the numbers.

Based on research by economists Frederic Docquier and Abdeslam Marfouk, I compiled a list of the ten low-income countries with the highest rates of skilled emigration. They are: Haiti (84% of secondary school graduates living overseas in an OECD country circa 2000 – though this exaggerates a bit, by counting Haitians educated abroad), Gambia (63%), Sierra Leone (53%), Mozambique (45%), Liberia (45%), Kenya (38%), Uganda (36%), Rwanda (26%), Guinea Bissau (24%), and Afghanistan (23%).

> "We're really talking about whether to deport your neighbour... or consign her and her family to a future of low wage employment, bad schools, and preventable disease..."

You might suspect that such high emigration among educated people has led to stagnation or decline in the share of skilled workers. You'd be wrong.

In the low-income countries with the highest levels of skill emigration, the stock of skilled workers left behind is going up, not down. Even after you exclude the migrants, the prevalence of both secondary and tertiary education more than doubled! This simple fact is often lost in fretting over a "brain drain".

Sceptical readers will rightly note that the counterfactual here is unclear: maybe residents' education would've been even higher without emigration. There's good reason to think the opposite. The opportunity to join the diaspora is a key motivation for pursuing higher education. Multiple studies looking at natural experiments from Cape Verde, to Fiji, to Nepal, have all found that new migration opportunities led to more investment in schooling not only for migrants, but for people who didn't end up migrating as well.

**2. Emigration is not an alternative to other drivers of development, it is a cause.**
Perhaps you feel letting poor people move to better opportunities is a distraction from the real work of promoting development within the geographic borders of poor countries. Rather than migration, we need more aid, more investment, and better governance in poor countries.

Consider Haiti again. The World Bank's bilateral remittance and migration matrices show that the 670,000 adult Haitians living in the OECD sent home about US $1,700 per migrant per year. That's well over double Haiti's US$670 per

Bangladeshi migrant workers wait patiently for a flight home.

Photo: DFID – UK Department for International Development

Migrant workers in Hong Kong, the home of some 250,000 migrant workers.

Photo: www.flickr.com/WongKC2012

capita GDP. And Haiti is not unique. On average, across the whole set of low-income countries, each migrant to the OECD sends home more than double her country's per capita GDP each year.

Remittances took a dip during the 2008 financial crisis, and have not yet fully recovered, but they still clock in at roughly US$400 billion worldwide, compared to a total foreign aid budget globally of about US$125 billion.

It's true that skilled workers earn more back in Haiti than the unskilled, but they also remit considerably more as well.

And it's not just remittances. Migrants also significantly boost FDI back to their country of origin. There's also tantalizing new evidence emerging from various corners of the globe about the effects that migrant diaspora have on home-country governance – some of which (to be fair) are summarized in Exodus. From Mali to Moldova and back to Cape Verde again, there is growing evidence migration exposes citizens to democratic values and strengthens demands for accountability and good governance at home.

**3. There is zero evidence that trapping skilled workers in places with few skilled jobs will generate growth.**

The argument put forward in Prof. Collier's article is that emigration deprives countries of the talented and skilled individuals that will drive broad-based growth. It's undeniable that education has huge economic and social payoffs for individuals and their families. And we probably all agree that in order for Haiti to grow in the long run, attracting and retaining more skilled workers will be a necessary step.

But it's also clear that education alone is insufficient for economic development without public infrastructure, functioning credit markets, tolerable government, etc…. the sorts of things places like Haiti and Afghanistan often lack. Knowing that those ingredients are lacking, are we confident enough to deny people the right to leave?

Bear in mind there is no study out there, from Haiti or anywhere else, showing any empirical evidence that migration restrictions have contributed to development. So this is a huge, evidence-free gamble we're taking with other people's lives.

Economist Branko Milanovic estimates that 80% of global inequality is explained by your country of birth. Through education and migration, skilled migrants from low-income countries have struggled to overcome their unlucky draw in this birth lottery. They owe us no explanation. Their success stories are what we mean by development. They're also a key motivation driving young people in poor countries into higher education, as well as a vital source of development finance far in excess of official aid.

So feel free to oppose immigration from poor countries if you'd like, but let's not fool ourselves into thinking there's anything altruistic about that stance.

● **JUSTIN SANDEFUR** is a research fellow at the Centre for Global Development. His research focuses on the interface of law and development in sub-Saharan Africa. The Centre for Global Development works to reduce global poverty and inequality through rigorous research and active engagement with the policy community to make the world a more prosperous, just, and safe place.

# trends

In July, 2015, the leaders of the BRICS countries (Brazil, Russia, India, China and South Africa) issued a declaration at the conclusion of the Seventh BRICS Summit highlighting the importance of industrial development as a fundamental source of growth. The Ufa Declaration emphasized that, in the context of the unstable global financial and economic system and price volatility in global commodity markets, the development of the real sector of the economy becomes particularly relevant. It stressed the "importance of intensifying cooperation of industrial production capabilities, establishing industrial parks and clusters, technology parks and engineering centres, with a view to developing and introducing cutting-edge technologies, and providing training for engineering and technical personnel and managers".

Leaders of the G7 countries, (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) issued a declaration at the end of their summit in June in which they stated, amongst other things, that the protection and efficient use of natural resources is vital for sustainable development.

According to the declaration, the G7 countries will strive to improve resource efficiency, which the leaders "consider crucial for the competitiveness of industries, for economic growth and employment, and for the protection of the environment, climate and planet".

The newly created G7-Alliance on Resource Efficiency

# BUSINESS MATTERS

## Where is best for female entrepreneurs?

The 2015 Female Entrepreneurship Index ranks the United States as the top country for female entrepreneurs. Since last year's Index, the United Kingdom, Denmark and the Netherlands have climbed into the top five, displacing Sweden, France and Germany. In Latin America, Chile outperforms the rest of the region and ranks at place 15.

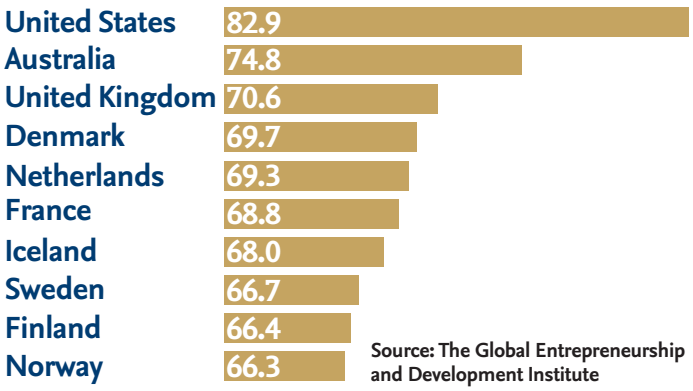
The 2015 Index shows that more support is needed to enable female entrepreneurship development worldwide. Analysis of the results indicates that there are systematic gaps around the world in terms of how well countries support women's aspirations to start high-growth-oriented firms.

Assessing everything from ecosystems to the aspirations of individuals, the Index gives each country a ranking score from 0 to 100. Forty-seven out of the 77 developed and developing economies included in the Index still score below 50 points – an indication that these countries must pursue significant changes in order to reduce barriers for female entrepreneurs.

The Index combines variables that measure individuals and institutions in a composite index in order to capture the multi-dimensional aspects of female entrepreneurship development. Data comes from sources such as the Global Entrepreneurship Monitor, the World Economic Forum, the World Bank, UNESCO and the International Labour Organization.

The analysis reveals opportunities for improvement within several geographic regions. Europe can improve the capacity of women to recognize good opportunities to start a business in the area where they live, and Latin America can improve its export focus so that female entrepreneurs have more customers outside their home country. Sub-Saharan Africa can improve women's access to bank accounts and financial training programmes, while East Asia can make improvements in the realm of skill perception – whether women believe they have the required knowledge and skills to start a business.

**TOP TEN COUNTRIES**




Source: The Global Entrepreneurship and Development Institute

## Nurturing an industrial cluster in Nigeria

The Panteka Market is a dynamic industrial cluster in Yola, in north-eastern Nigeria, writes Daniel Barkley. Hundreds of craftsmen, artisans, welders and blacksmiths work in the area to turn Yola's discarded metal and alloys into everything from deep freezers to automobile spare parts.

Clustering is the phenomenon whereby firms from the same industry gather together in close proximity. Economists explain clustering as a means for small companies to enjoy some of the economies of scale usually reserved for large ones. By sticking together, firms are able to benefit from such things as the neighbourhood's pool

will collaborate with businesses, small and medium-sized enterprises, and other relevant stakeholders to advance opportunities offered by resource efficiency, promote best practices, and foster innovation. The G7 leaders acknowledged the benefits of collaborating with developing countries on resource-efficiency, including through innovative public private partnerships.

■ Progress in making companies more environmentally and socially responsible has been slow and too many still focus on short-term financial gain rather than their long-term impact on people and nature, the head of the UN Global Compact told the Thomson Reuters Foundation in an interview in July.

The Compact, which celebrates its 15th anniversary this month, is the world's largest voluntary corporate sustainability initiative, with more than 8,000 members from over 150 countries.

"There has been a truly global, silent revolution of businesses taking on environmental, social and governance issues, and this is a total change compared to 15 years ago," said executive director, Georg Kell.

"But progress has been slow and there is still a long way to go," said Kell, noting that the Compact would like many more of the world's roughly 50,000 publicly listed companies to join.

Only about 10% of its members are "truly cutting-edge" in thinking about the longer-term implications of their business operations.

"Too many companies still focus on short-term financial gains and just react when they are hit by bad news about human rights abuses in their supply chains or environmental scandals."

According to Kell, the demand for ethical corporate leadership is bigger than ever due to the continued erosion of public trust in institutions and the "overwhelming evidence" that man-made global warming threatens the survival of our planet.

Image: Economics on the Move

**Panteka Market, Yola, Nigeria.**

of expertise and skilled workers; its easy access to components and raw materials; and its information channels (both formal ones and informal ones like everyday gossip in neighbourhood bars).

Clustering of similar kinds of enterprises is especially important in north-eastern Nigeria where poor infrastructure and weak information systems often constrain market transactions to face-to-face encounters.

The Panteka Market cluster could enjoy increasing returns from new capital and scale up production but the absence of reliable electricity to power modern machine tools limits the ability to expand capacity and improve productivity. For example, many of the ornate gate designs on display at some of Yola's upmarket homes are made by pouring liquefied metal into earthen molds, a technology developed hundreds of years ago.

The issues faced by Panteka firms are formidable and compelling. Clustering facilitates industrialization but does not guarantee it. Without the implementation of a comprehensive strategy that resolves Panteka's market failures, its firms are likely to remain in their current pre-industrial stage.

Normally, when private markets fail, some form of government subsidy or tax relief is applied to remedy the problem. However, so far, none of the Panteka enterprises have received any government assistance that could facilitate technological upgrading, expand market access or improve basic infrastructure.

Economics On The Move, a California-based non-governmental organization, is partnering with the Panteka Market Association to accelerate the transformation of Panteka firms by expanding demand through advertising, and improving quality and increasing productivity by introducing modern machinery.

● **DANIEL BARKLEY** is executive director of Economics On The Move, a non-profit organization that uses industrial and corporate tours to teach principles of economics to youth in underserved communities.

Photo: Reuters/Amit Dave

# The water–energy–food–health nexus

**Ursula Schaefer-Preuss** wants a water-secure world where the productive power of water is harnessed and its destructive force is minimized

**URSULA SCHAEFER-PREUSS is an economist who has been engaged in the field of development policy for more than 35 years. She is Chair of the Global Water Partnership, which was founded in 1996 by the World Bank, the United Nations Development Programme (UNDP), and the Swedish International Development Cooperation Agency (SIDA) to foster integrated water resource management.**

The Global Water Partnership is an international network open to organizations both within and outside the water community, including government institutions, United Nations agencies, non-governmental organizations, civil society groups and the private sector. Our vision is for a water secure world. A water secure world harnesses the productive power of water and minimizes its destructive force. It is a world where every person has enough safe, affordable, clean water to lead a healthy and productive life.

There is increasing global recognition and acceptance that the water-energy-food-health nexus is at the core of the post-2015 development agenda, where sustainable growth has become increasingly imperative to address climate change and the needs of billions of people without access to basic services. Let me elaborate further on these linkages, including with reference to agriculture and nutrition, closely linked to this theme.

The importance of water for agriculture and energy for food and nutrition as well as for health – in terms of both benefits and risks – is recognized now as never before. Yet links between and among the water, agriculture, energy, food/nutrition, and health communities are weak, with serious implications for the effectiveness of efforts to

People gather to get water from a huge well in the village of Natwarghad in the western Indian state of Gujarat.

improve health and nutrition. These need to be tackled through an integrated approach.

Agricultural intensification, for example, can lead to water pollution and/or disruptions to ecosystems and to the further spread of agriculture-associated diseases and the development of new ones. Agriculture could do a better job of providing access to nutritious food products and high-quality diets to supply essential micronutrients for poor and marginal groups, particularly young children and women. Agriculture policies could contribute to re-directing the nutrition transition, i.e., the changes in diets toward increased consumption of cheap, calorie-dense, nutrient-poor foods which are deepening the emerging epidemic of obesity and chronic diseases in countries undergoing economic growth and rapid urbanization.

Broader access to safe drinking water and sanitation, as well as more nutritious and diversified diets, can accelerate progress in reducing water-borne diseases, malnutrition and diet-related chronic diseases and infections. Improved nutrition and by that health, in turn, can reduce poverty for the 1.4 billion people living on less than US$1.25 a day. A greater focus on the role of women in agriculture – as potential mediators of household and individual food, and nutrition security and health – as well as on the allocation of food within households - could accelerate improvements in the nutrition and health of vulnerable household members, including women, infants and young children.

Making a difference to the lives of the rural poor (and this is just as valid, in principle, for the lives of urban poor) requires:

- Taking a systematic view of how water, agriculture, energy, health, and nutrition interact globally, nationally, and locally;
- Addressing gaps in our knowledge of these relationships (for example, by developing metrics that better capture the multiple burdens of water/agriculture-associated disease and that show the benefits of safe water/food-based nutritional solutions;
- Developing a strong body of evidence based on rigorous research to help decision-makers choose options and evaluate trade-offs related to health and nutrition interventions; and
- Fostering effective approaches in improving nutrition and health that cross sector boundaries.

It is evident that taking into account negative effects of climate change and not well-coordinated sector interventions can even be more harmful for the affected population, mainly the vulnerable.

In my position as Chair of the Global Water Partnership and being closely linked to the challenges of a water secure world, I would like to focus on this year which marks the end of the 'International Decade for Action, "Water for Life", 2005-2015'. It offers a wonderful opportunity to analyze the impact that the Water Decade has had on improving water management and in what way ensuing thinking has continued to change our water perception and to address the main issues of the post-2015 Sustainable Development Goals.

No doubt the Water Decade proved to be helpful in a number of respects, namely with regard to accelerating the achievements of the Millennium Development Goals (MDGs) in the water area. The Joint Monitoring Programme for Water Supply and Sanitation 2014 reports that, today, 116 countries have met the MDG target of access to improved sources of drinking water and 77 countries have met the target of improved sanitation.

There is also growing recognition that if we wish to manage water resources effectively, then we must approach this together in an integrated manner. And we have reached a lot already. From the relevant 2012 United Nations survey, it can be seen that of 134 countries, 82% have embarked on reforms to improve the enabling environment and integrate approaches to water resources management.

This decade has witnessed the emergence of new and modified paradigms. The Green Economy/Growth and the Water – Energy – Food Nexus have become subjects of international debate, reinforcing the need for an integrated approach. But the conceptual attractiveness of paradigms is not enough. They must be applicable in a fast changing world.

Despite tangible progress, many issues addressed in this decade remain unsolved. Evidently, major shifts in both policies and conceptual approaches to water and all relevant sectors closely interlinked with water are called for in order to reach a more desirable future and limit calamities that can otherwise be foreseen.

The message emerging from the current international debates on setting the SDGs in 2015 is one of urgency for the world to act to prevent water crises. The size of today s water security challenge should not be underestimated.

We in the Global Water Partnership strongly believe that the SDGs should set new strategies in motion governing the way we live and interact with our environment to ensure there will be enough water to support development and future generations. Global sustainability is, fundamentally, about our ability to influence the future of our freshwater resources and the future of humanity. We recognize this is a complex undertaking. Good management of both natural and human induced water problems requires a broad set of stakeholders to engage in long-term collaboration. This is also about the importance of integrated approaches for energy, water, food, and health. This is about stewardship of water resources for the greatest good of societies and the environment. Stewardship is a public responsibility, requiring dynamic, adaptable, participatory and balanced planning and, at the end of the day, it is all about coordinating and sharing.

# BREWING WATERSHED?

Photo: Tom Parker / OneRedEye

Water is a vital ingredient for brewers. **Anna Swaithes**, Director of Sustainable Development at SABMiller plc, shows how her company regards it as part of a broader global challenge

At SABMiller, our purpose is to bring refreshment and sociability, improve livelihoods and help build local communities.

We have a proud beer heritage. Our brewmasters make beers our consumers love by truly understanding local tastes. That's why we believe the value in beer for us and our communities is local. We know that by helping the businesses in our value chains – and their local communities – to grow, our business will grow too.

When they prosper, so do we.

Our sustainable development strategy, *Prosper*, is aligned with many of the themes contained in the new Sustainable Development Goals (SDGs) to be launched later this year by the UN – the Global Goals, as they are starting to be known. Unlike the MDGS, these new goals will explicitly recognize the role of the private sector in addressing global challenges.

Through five shared imperatives outlined in *Prosper*, we aim to tackle the issues that are most material for our business at a local and international level. We believe strongly that if we are successful in putting *Prosper* at the heart of our business, we can secure our long-term success and make a sustainable and measurable difference to the communities and ecosystems in which we operate. Our biggest contribution to the Global Goals will come from our core business, not from philanthropy or corporate social responsibility on the side.

We call these shared imperatives because we do not face these challenges alone, and nor can we solve them alone. *Prosper* broadens our focus beyond the direct impact of our own business and what we do within our fenceline, to how we can drive change across our value chain and beyond. We have set ambitious targets and are committed to listen, learn and collaborate to shape, deliver and scale local solutions. ➤

Checking beer in process at Onitsha brewery in Nigeria.

➤ One of our shared imperatives is our desire to have 'A Resilient World' where our business, local communities and ecosystems share uninterrupted access to safe, clean water. Increased water scarcity, driven by climate change, the growing middle class and population growth means that we need to play our part to ensure a reliable, clean supply of water that is managed and used as efficiently as possible.

Water is a vital ingredient in brewing and with breweries in diverse locations – from jungles to deserts to cities – we face diverse challenges in ensuring we have supplies for the future. We know that if we don't work on securing water resources for local communities, ultimately our business will not have the water it needs. Brewery by brewery, we are optimizing our own water use. But we are also building a detailed understanding of water risks and we are creating partnerships to tackle these risks with those that share them.

Over the last year, we have reached some milestones of which we are proud, including:

- We used an average of 3.3 hectolitres (hl) of water to produce one hl of lager, surpassing our target to reach 3.5hl/hl by 2015.
- Forty-six breweries across 21 countries have completed intensive water risk assessments, covering 63.8% of our lager volumes.
- We achieved US$117m in annual savings through water and energy-efficiency initiatives.

Improving water efficiency by 25% between 2008 and 2015 was a significant challenge. We met this target a year early, largely by focusing on improving operational processes, and developing a 'user pays' principle that put a true dollar value on the water used by each part of the brewery. Last year alone, we used 23 billion litres less water than we would have at 2008 efficiency rates, equivalent to saving enough water to fill London's Wembley football stadium to the roof 22 times.

We now have a better understanding of the financial value this drives for the business. Improving water efficiency has delivered additional energy, chemical and effluent cost savings. The less water we use, the less we have to pump, treat, heat, cool and discharge. We will continue to reduce our water use and, already, 18 of our breweries, across all five of our regions, use less than three hl of water per hl or beer, with our Yatala brewery in Australia leading the group at 2.5 hl/hl.

But we have set ourselves stretching targets for the years to come. By 2020, our water-related target is to:

- Secure the water supplies we share with local communities through partnerships to tackle shared water risks.
- Further reduce water use to 3.0 litres of water per litre of beer and 1.8 litres of water per litre of soft drink.

Photos: Tom Parker / OneRedEye


**Irrigation equipment in Lusaka, Zambia.**

Female employees lift crates at the Lusaka brewery in Zambia.

● Have programmes in place to mitigate shared water risks for our key crop origins at risk.

Across Africa, some of our breweries already face water supply challenges, from availability to quality. But water is more than an operational or even an environmental issue. Water scarcity limits prosperity and growth for thousands of communities and millions of people worldwide. Tackling the root causes of water stress will require all sectors of society to work collaboratively and at scale.

SABMiller has been investing in partnerships to secure water for our business growth and for the water users around us. For example, in South Africa we have taken a lead role in the ambitious public-private Strategic Water Partners Network, which is part of the Water Resources Group (WRG). In collaboration with other partners, we have created a platform for the government and the private sector to work together to develop policy-level solutions to address pressing water resource challenges. These include a focus on infrastructure challenges. Given the success of this approach in South Africa, we have funded a WRG partnership in Tanzania and are a leading WRG partner in India.

We also work at a local watershed level to address local water scarcity and quality issues by talking about their root causes. In Latin America, we and The Nature Conservancy are working together in three countries to build AquaFunds. These financial tools gather investments from water users and direct the funding towards conserving ecosystems that filter and regulate water supply while providing an effective model of payment for ecosystem services. In Colombia, the Bogotá AquaFund has funded 65 projects to date – eight of which have been directly funded by our Bavaria business – resulting in 7,800 hectares being set aside for conservation and protection; 1,255 hectares of intensive cattle ranching land being converted to environmentally friendly practices, and 554 springs being isolated and protected. We are now exploring opportunities to apply the model in Africa.

Within our business, we are encouraging leaders and operators to look beyond tackling water stress solely within our operations to more collaborative external efforts. Beyond SABMiller, we need to engage and incentivize more effectively the many small businesses that operate alongside us, to encourage them to step up to the challenge and recognize that, although their individual impact is small, collectively they can make a material difference. And we need to work with other big businesses, with governments and with civil society to ensure that the many initiatives in a given watershed are joined up and working in a cohesive manner.

# Greening industry, saving water in North Africa

Photo: www.istock.com/Elhenyo

**Igor Volodin** introduces a programme to demonstrate the benefits of adopting best available techniques, cleaner production technology, and appropriate environmental management and accounting practices

**IGOR VOLODIN is Deputy to the Director of the Environment Branch at the United Nations Industrial Development Organization.**

Green industry is an approach that realizes the potential for industries to decouple economic growth from excessive and increasing resource use, thereby reducing pollution and generating additional revenues. It foresees a world where industrial sectors will minimize waste in every form, use renewable resources as input materials and fuels, and take every possible precaution to avoid harming workers, communities, climate, or the environment. Green industries will be creative and innovative, constantly developing new ways of improving their economic, environmental and social performance.

Enterprises in developing countries and countries with economies in transition are facing numerous challenges in their effort to maintain or increase their competitiveness on the local market and access to international markets with good-quality products, comply with environmental standards and reduce operational costs. In order to assist companies in dealing with such challenges and to direct them towards the "green industry" paradigm, the United Nations Industrial Development Organization (UNIDO) designed a specific methodology, the Transfer of Environmentally Sound Technology (TEST), which exists as both an integrated approach and a global programme.

TEST combines the essential elements of tools like Resource Efficiency and Cleaner Production, Environmental Management Systems and Environmental Management Accounting, and applies them on the basis of a comprehensive diagnosis of enterprise performance. As a result of the customized integration and implementation of these tools and their

## Demonstration project highlights

**The effectiveness of the TEST approach has been demonstrated in the 43 participating companies through the implementation of a large number of resource-efficiency measures and cleaner technology investments. The benefits of TEST at the management and strategic levels have resulted in the adoption of new vision and policies by top management, as well as in the implementation of management systems (e.g. ISO 14001) that integrate the environmental dimension.**

**A total of 765 measures were identified, of which 76% have been implemented, 14% retained for further technical and economical investigations and only 10% discarded. Approximately 54% of the total identified measures had a return on investment of less than half a year, with the rest equally split among measures with a payback period of between six months and one and a half years, and between one and a half and four years.**

**In the three countries involved, the project identified total annual savings of approximately US$17m in energy, water, raw materials and increased productivity, corresponding to a portfolio of around US$20m of private sector investments in improved processes and cleaner technology. These investments do not include end-of-pipe solutions, which in some companies have also been launched in order to achieve full environmental compliance with national laws. The total annual water and energy savings are, respectively, 9.7 million cubic metres and 263 gigawatt hours.**

elements, the key output is the adoption of best practices, and new skills and management culture, as well as corporate social responsibility, enabling the company to carry on the improvement journey towards sustainable entrepreneurship.

The first TEST pilot programme was launched in 2000 in the Danube River Basin. Since then, TEST has been replicated in several regions worldwide within industrial hot spot areas, contributing to the prevention of the discharge of industrial effluents into international waters (rivers, lakes, wetlands and coastal areas) and thereby protecting water resources for future generations.

In 2009, UNIDO launched the MED TEST initiative with the financial support of the Global Environment Facility (GEF) and the Italian government to promote the transfer and adoption of cleaner technology in industries in three countries of the Southern Mediterranean region: Egypt, Morocco and Tunisia.

The project aimed to demonstrate the effectiveness of introducing best practices and integrated management systems in terms of cost reduction, productivity increase and environmental performance. A pool of 43 manufacturing sites – mostly small and medium-sized enterprises – across seven industrial sectors in Egypt, Morocco and Tunisia actively participated in MED TEST during 2010-2011.

A core objective of the MED TEST initiative was building national capacity. This was achieved by extensive training and a technical assistance programme that targeted six national institutions and service providers and 30 local professionals, in addition to the staff of the 43 demonstration companies. As a result, a network of local resources is now engaged in promoting the TEST approach and will be able to extend the experience gained to other industries in the region.

The active participation of the staff of the demonstration companies in the training and in the implementation of the project ensures the sustainability of all identified actions at company level, as well as that of newly developed projects.

## Some examples of water savings

### Egypt

**EL-NILE SOFT DRINKS COMPANY (Crush) produces different types of soft drinks for the local market: Hi-Spot lemon, Crush orange and Sport cola. The company joined MED TEST to identify opportunities for increasing resource efficiency and productivity, reduce pollution loads so as to comply with environmental legislation and minimize investment and operating costs of the planned wastewater treatment plant.**

**Water costs are being reduced by more than 85% as a result of the installation of new Clean-in-Place (CIP) technology, good housekeeping, and preventive maintenance measures and process water recycling. The new CIP unit uses Electro Chemical Activation technology that dramatically reduces water, energy and chemicals consumption during the cleaning and disinfection of bottles and bottling equipment, as well as increasing productivity due to a reduction in time needed for cleaning.**

**ATEF EL-SAYED TANNERY joined the MED TEST project to identify opportunities for increasing resource efficiency and productivity and reduce pollution loads to minimize investment and operating costs of the planned wastewater treatment plant.**

**Water costs will be reduced by 30% through the application of good housekeeping measures, implementation of a monitoring and controlling system for water consumption and the recycling of pickling bath. The latter measure reduces the salinity of discharged wastewater, and will achieve a 15% reduction in water costs and lead to a reduction in chemical use of 23 tons per year.**

### Morocco

**BOYAUDERIE DE L'ATLAS is a company in the agro-food sector, specialized in the production of salted and tubular casings in various calibres. It joined MED TEST in order to identify opportunities for resource efficiency (water and energy), water recycling, recovery of production waste, and minimization and treatment of liquid effluents.**

**Energy savings represent 26% of the annual energy bill, while the water costs reduction amounts to 48% of the annual bill. The latter will be achieved through recycling wastewater from the calibration and soaking processes, optimizing the washing of floors and crates, and better monitoring of water consumption per production unit.**

**CERAMICA DERSA produces ceramic tiles of various designs and patterns. The company joined the MED TEST project in order to identify opportunities for effective use of resources (heat, water, electricity and chemicals), reduction of production costs, recovery of solid waste and minimization of waste water effluents.**

**All the effluents are now recycled on site. They are collected in a decantation pit, filtered, and reused for cleaning and within the process (watering). Dyes and enamel residues are recovered, filtered and reused within the first treatment layer of the tiles.**

### Tunisia

**COMPANY CAP-BON – SCAPCB processes fresh tomatoes. The company joined the MED TEST programme in order to identify possibilities to increase efficiency in resource management and productivity, reduce the pollution costs and minimize investments and operational costs of the used-water processing plant.**

**Water costs have been cut by 44% by the retrieval of 50,000m$^3$ of well-water that was previously discharged, and its reuse for the pre-washing of fresh tomatoes; the optimization of water sprinkling on conveyor belts used for tomato washing; and the installation of a water tank with a 300m$^3$ capacity which has allowed for a more efficient distribution and a more economical use of drilling water.**

**TEINTURERIE FINISSAGE MÉDITERRANÉENNE (TFM) specializes in textile dyeing and finishing. TFM was among the first companies to implement the MED TEST project in order to improve productivity, resource efficiency and waste minimization, and ultimately to reduce waste treatment costs.**

**TFM consumes water at the average rate of 650m$^3$ per day. The company will be able to reduce the cost of water by 56% thanks to the installation of a treatment and recycling system for wastewater, which subsequently will be reused in the process at a rate of 80%.**

# IS WATER THE NEXT CARBON?

The global certification leader DNV GL – Business Assurance, in cooperation with the United Nations Industrial Development Organization (UNIDO) and supported by the international research institute, GFK Eurisko, has investigated the water management approach adopted by companies in Europe, North America, South America and Asia. The survey, involving 1,907 professionals from businesses in different sectors, was conducted in December 2014 and investigated the importance of water issues and the way companies deal with them, together with the initiatives implemented by DNV GL – Business Assurance customers.

Just over half of the companies in the survey use water in their production process. The majority of companies are from the secondary sector, including producers of metals, machinery, food, plastics, electrical goods and chemicals. The tertiary sector companies provide services including electricity, gas and water supply, construction, wholesale and retail trade, and transport.

The full *ViewPoint* survey: *Is Water the Next Carbon?* can be read online at www.dnvgl.com

## KEY INITIATIVES

**43.9%** of the companies have undertaken water management initiatives in the last 5 years.

**27.4%** Actively track water usage

**21.8%** Have specific goals on water management

**20.6%** Invest in water efficient devices and equipment

## KEY DRIVERS

Why companies undertake initiatives.

**29%** Compliance with laws and regulations

**24.4%** Economic reasons

**22.4%** Internal policies

How companies profit from managing water issues, and what is preventing more progress.

## MAIN BENEFITS

**27.2%**
Compliance with laws and regulations

**24.5%**
Financial savings

**17%**
Decrease of environmental accidents

## MAIN OBSTACLES

**21.1%**
Lack of management awareness

**17.2%**
Lack of financial resources

**16.5%**
Lack of return on investment

## 4 STEPS TO A MORE EFFICIENT WATER MANAGEMENT

Companies should...

1. Set specific goals
2. Measure their water footprint
3. Conduct a water impact assessment
4. Define a roadmap to water usage reduction and improvement

MakingIt25

Photo: www.flickr.com/photos/asiandevelopmentbank/

KEYNOTE

# HOW INDUSTRY CAN ADDRESS CRITICAL WATER-RELATED CHALLENGES

Increasing industrial production will lead to increased water use, with potential impacts on water quality. In certain areas, where water use for industrial production is not well-regulated or enforced, pollution could increase dramatically. The **Water Management Unit** at the United Nations Industrial Development Organization and **John Payne** of John G. Payne and Associates Ltd consider how industry can use water for increasing economic activity without degrading the environment

The scope of water-related challenges across the industrial spectrum is a function of scale. The *OECD Environmental Outlook to 2050* predicts that global water demand for manufacturing will increase by 400% from 2000 to 2050, which is much larger than any other sector. Most of this increase will be in emerging economies and developing countries, with implications for water supply, allocation and quality. Large corporations, often multinational or global, have made considerable progress in evaluating and reducing their water use and that of their supply chains. Small and medium-sized enterprises (SMEs) are faced with similar water challenges on a smaller scale, but have fewer means and less ability to meet them. Moreover, large companies and SMEs are faced with different water sustainability issues depending on whether they operate in developed or developing countries.

In developed countries, the emphasis is mainly on efficiency measures to conserve water resources that already exist. For developing countries, however, the priority for industry is to gain and secure access to water supplies that are reliable, which is often a challenge in water-stressed areas.

Various possibilities for water efficiency are available for each of these situations, depending on the progress of industrial development and the business climate. Sustainable industry may be achieved by ➤

➤retrofitting old facilities and plants, or by building new ones specifically designed for efficiency and, in some locations, interlinked in eco-industrial parks.

### Water and wastewater in eco-industrial parks

Industrial parks have existed for some time in both developing and developed countries. Most are created by formal planning processes, but some have grown organically. They provide competitive advantages for the businesses within them and also social, economic and environmental benefits beyond the confines. Usually, industrial parks separate a collection of factory premises from domestic habitation and other activities. However, this does not apply universally. For example, the China-Singapore Suzhou Industrial Park in China combines over 60 *Fortune 500* companies with a current residential population of 600,000 people.

Eco-industrial parks ensure effective management of water and effluents, together with liquid and solid materials recovery. They:

- permit 'tailored' water supply, effluent collection, and treatment that maximizes the use and reuse of available water and other materials;
- aid the optimization of processes to reduce carbon footprints and ensure compliance with regulations; and
- enable the whole water cycle to be linked with successive steps in the value chain of the processes and products of industries in the park.

A good example is the Shanghai Chemical Industrial Park, which groups chemical companies working in chlorine chemistry and has an integrated water, wastewater and solid waste services operator, Sinofrench.

At the conception stage, industrial parks bring the full benefits of specialized design, pooling best available technology, risk reduction and risk sharing in ways that optimize future technical performance and provide security for investors. At the operational stage, they provide the benefits of a committed and specialized operator with high levels of operation and management skills, rigorous quality control procedures backed by on-site laboratories and often with an additional research and development facility.

In some cases, the provision of specialized effluent treatment to preserve a country's specialized industry has been the reason for creating a park. The Tuzla Organized Leather Industrial Zone Project in Istanbul is an example. In other cases, by integrating water and wastewater challenges it has been possible to ensure continuity of traditional industry groupings threatened with closure on environmental protection grounds, such as Bran Sands on Teesside in the United Kingdom and Villers-Saint-Paul in France.

### Challenges

The shape and form of industry's plans and actions and the degree to which they are executed are conditioned by prevailing national and local regulatory regimes, as well as by certain trade- and investment-protection agreements. Collisions of policy with regard to water in different sectors – for example, the water-energy nexus – lead to functional trade-offs in water use.

Balancing the requirements of sustainability against the conventional view of industrial mass production creates a number of conundrums for industry. This stand-off can only be resolved by effecting trade-offs and changing paradigms. Water use is central to these dilemmas.

On the largest scale, the challenge of globalization is how to spread the benefits of worldwide industrialization equitably and without unsustainable impacts on water and other natural resources. While UN-Water has proposed a 'dedicated global goal for water' with targets designed to be tailored to the contexts and priorities of each country, the reality of national and local politics in regulating water, as well as geography, will involve compromises.

Industry's priority is to maximize production, rather than water efficiency and conservation. Even in the case of improved water efficiency, there may be a rebound effect where the water savings obtained are reinvested to increase production. Therefore, though the process may be more efficient, total water use may not decrease. In parallel, industry seeks to be either self-supplied or to obtain water from public supplies at the lowest price possible, neither of which encourages water efficiency, though the value of water to industry may be high. Moreover, cost-benefit drives water efficiency as it relates to maximizing company profit, rather than optimizing water use. Within industries, water hotspots can be identified that present the highest risks and highest opportunities.

The business case for water efficiency frequently requires a financial trade-off. The common problem is the internal rate of return. Investment in efficient water treatment technology or cooling processes may have

longer payback periods than the immediate returns of alternative short-term investment in production. Moreover, low (or non-existent) water prices do not encourage investment in water efficiency, which may have other drivers, such as water allocation restrictions or the need to apply for water management permits. On the upside, in the long-term, investment in sustainable technology provides extended savings. Conversely, it may be less expensive to pay the fine for pollution than to pay for better water treatment. Managers have to see and make the business case to offset shareholder and stakeholder pressure. However, it is incumbent upon the political and legal authorities to develop appropriate incentives for industries (standards, permissions, prohibitions, fines, charges, etc.) with objectives to align business decisions with the public interest.

Directly related to the debate over water efficiency are predicaments arising from the introduction of new water technology. There are many good ideas and innovative approaches. There are even technological solutions developed for niche applications, such as the removal of specific contaminants, which may struggle for acceptance outside the mainstream issues of more effective and efficient overall water treatment. But it can be difficult bringing new technology from concept to laboratory to pilot scale and to full commercial implementation. Investors with venture capital are looking for the best bets and industrial managers are looking for reliability and track record; neither of these views is conducive to moving innovation forward quickly.

## Water sustainability

Thoughtful policy and regulation combining compliance and incentives may provide a balance between supporting the needs of industry versus overall economic results, social benefits and the environment. Additionally, the application of sustainable measures requires assistance, education and finance. In this respect, agencies such as the United Nations Industrial Development Organization (UNIDO), can act as intermediaries and provide a necessary stimulus, particularly in developing countries and countries with economies in transition.

Actions to improve water sustainability in industry commonly originate from one of two directions. First, top-down approaches are those initiated by government at various levels. They include command-and-control (carrot and stick) methods of policy, regulation, enforcement and incentives. Manufacturing as a point source of pollution is a good target. In the past, these methods focused on technology and performance ignoring preventive approaches and resource efficiency. Second, bottom-up approaches come from industry as it reacts to government approaches, a company's own internal policies, customer demand and public pressure. The industry approach is more hands-on and applied, and often dependent on technology and engineering to deliver results and meet needs. Corporate and managerial buy-in is necessary to enable industry to produce the deliverables.

Intersecting these top-down and bottom-up actions are initiatives from intergovernmental agencies which, acting as intermediaries, provide guidance, targets and expert advice. Other players include non-governmental organizations and academia that contribute certain specialties at various levels.

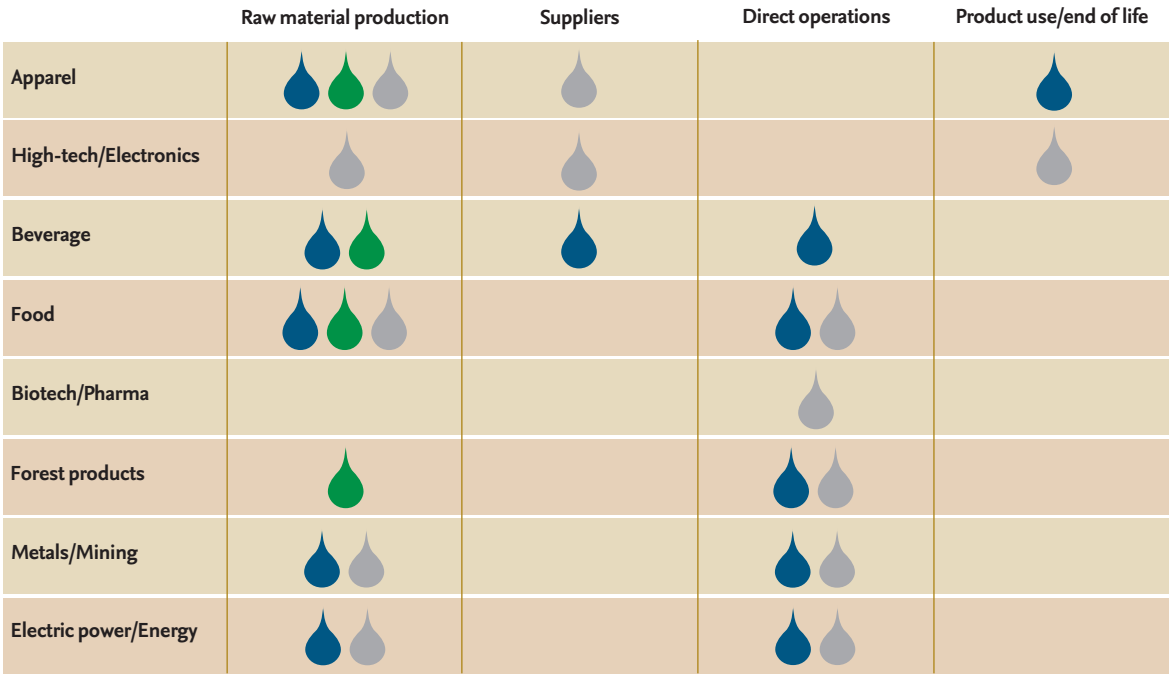
Policy for sustainable industry has four main instruments:

**Regulatory and control mechanisms** usually target water abstractions and effluent discharges, and include legislation, standards and licensing. On the upside, they can promote best available techniques/technology and the polluter-pays principle, which encourages manufacturers to recycle. On the downside, the standards may not keep up with technological progress, yet industry requires predictable regulation to enable long-term planning and investment in order to accommodate change.

**Economic or market-based instruments** can include monetary penalties for non-compliance and charges for water withdrawals and wastewater discharge. To promote integrated water resources management (WRM), prices can be influenced through taxes and royalties and quantity may be regulated through tradable permit systems for water which currently exist in only a handful of countries. Credit and trading schemes can be introduced in developing countries through industry initiatives and projects. In such countries, it may be possible to apply water sustainability approaches to specific industry sectors in a similar way to those proposed for climate action. Similarly, such sector approaches would run the risk of targeting high polluters, as opposed to the full value chains of supply and demand involving these and other industries.

**Fiscal instruments and incentives** are comprised of public expenditure, subsidies ➤

## Relative water footprints of various industry sectors




**Blue water footprint** – Volume of surface and groundwater consumed as a result of the production of a good or service. It is the amount of water abstracted from groundwater or surface water that does not return to the catchment from which it was withdrawn.

**Green water footprint** – Volume of rainwater consumed during the production process. This is particularly relevant for products based on crops or wood.

**Grey water footprint** – An indicator of freshwater pollution that can be associated with the production of a product over its full supply chain. It is the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed water quality standards.

Source: Morrison, J., Morikawa, M., Murphy, M. and Schulte, P. 2009. *Water Scarcity and Climate Change: Growing Risks for Business and Investors*. Boston, Ma, USA, Ceres.

Photo: Christopher Craig / https://creativecommons.org/licenses/by/2.0/

➤ and taxation that can affect cost-benefit analyses in industry and change the 'business-as-usual' status. Taxation can drive technology change and conversely tax exemptions can apply to specific products that are more water efficient. There is an increasing trend, particularly in developed countries, to abolish subsidies that distort the price of water below its full cost. It is recognized that inefficiencies in water use are the result of users, including industry, who do not pay the full cost. Funds of various sorts are available to support sustainable manufacturing and environmental subsidies can encourage innovative water technology. SMEs with limited access to commercial financing could receive preferential loans funded by environmental taxes.

**Voluntary action, information and capacity-building** based on information instruments, such as product data and labelling reporting, could have a water efficiency or pollution component. Eco-labelling and consumer awareness can influence water use and pollution. Support programmes aimed at SMEs could improve resource efficiency and recycling.

## Industry reaction

The efforts of governments need a corresponding response reaction from industry to effect improvements in water use and efficiency.

For the application and success of sustainable water initiatives, they must be referenced to baseline evaluations. A Water Footprint Assessment (WFA) accounts for the direct and indirect use of freshwater in industry. WFAs apply to the supply chain as well as to the production process. Most companies have a supply chain water footprint much larger than their operational one, and it may be more cost-effective to shift investment in sustainability in that direction. More than 80% to 90% of a company's footprint, and most of its water risks, may be beyond its direct operations. The analysis may also include water use downstream

Irving Pulp and Paper Mill, Saint John, New Brunswick, Canada.

from where the product was produced then purchased or used to the point of its disposal. Water footprinting also changes the concept of water use to incorporate consumptive water use with withdrawals, and the focus from complying with discharge standards to managing the grey water footprint from an ecosystem perspective. Notwithstanding, the WFA methodology has shortcomings and its relevance is being questioned in different situations.

Water stewardship concerns how a company performs and behaves in terms of its operations and supply chains. Stewardship means being proactive in conservation, restoration and management at the watershed level and balancing internal and external action. Communication with other stakeholders in the same watershed and engagement in forums is essential. At the plant level, approaches include cleaner production and zero discharge and associated technologies, life-cycle management and eco-design. At the industry level, there are sustainability initiatives for supply chains and industrial clusters in economic zones to maximize the use of available water resources and reuse of wastewater. These are moves towards closed-cycle manufacturing.

## Green industry

UNIDO is actively promoting a Green Industry initiative that is directly applicable to water efficiency. The initiative has two components: greening existing industries and creating new green industries. The former involves helping enterprises to improve resource productivity and environmental performance, while the latter helps establish new operations delivering environmental goods and services, such as pollution control technology and equipment, and waste management and resource recovery.

● A version of this article was originally published in *Water for a Sustainable World*, the 2015 edition of the United Nations World Water Development Report.

# Tough love: China gets serious about water pollution

**Debra Tan** outlines China's new plan to fight industrial and agricultural pollution of its drinking water sources

China's water pollution prevention and control action plan – the "Water Ten Plan" is finally here. Commentary across the board points to the fact that the Water Ten Plan is stricter than expected. The fact that tasks/ actions in the plan are designated to different departments from various ministries has also received positive feedback. There is consensus too that the plan has a new focus on water treatment and the potential upsides in the wastewater and sludge markets, with bullish recommendations for listed companies along the whole environmental and water value chain.

Less obvious is which sectors will be hit most by the plan. The English summary masks tough measures outlined within the ten action points. Already the Chinese press is saying that it will lead China to the "new norm". Indeed, a circular economy plan following hot on the heels of the Water Ten Plan might be a not-so-subtle way of telling us where the top brass intends to take China.

How serious is China? Very. If you haven't caught the drift yet, it is all about un-siloing. To solve water issues effectively, the government has to plan a coordinated strike across the board – to prevent and control pollution from agriculture, industrial sectors, municipal water and rural water. It also needs to rein in water use. Therefore, the Water Ten Plan is not one plan but an "umbrella plan" that ties in other plans, policies and standards that have wide-ranging and game-changing impact across sectors.

This umbrella plan forms part of a remarkable vision that will transform China and bring it to the "new norm", an "ecological civilization", with an ambitious new economic model. Whether China can get there is another question. But for now, at least, there is a plan in place.

One of the key points to note is that the new plan recognizes the geographical mismatch in water resources and arable land, and acts accordingly. Water Ten actions show that the dire groundwater situation (from severe pollution to over-extraction) in the north of the country is well-acknowledged. A series of measures, across the board, prioritize groundwater protection.

## Water scarcity

Since pollution exacerbates water scarcity, water-scarce regions are also prioritized. Beijing, Hebei and Tianjin, in particular, face stricter targets all round for municipal and industrial water, as well as wastewater management and reuse. These three provinces also face tighter deadlines compared to the rest of the country, underscoring the urgency of their plight. Other geographical areas of focus that have been singled out with tighter deadlines are the Yangtze River and the Pearl River Deltas.

Actions and targets laid out in the Water Ten Plan basically boil down to the protection of water sources – both groundwater and surface water. For surface water, the focus is on China's seven key rivers: the Yangtze, Yellow, Pearl, Songhua, Huai, Hai and Liao Rivers. For many cities in China, groundwater is their only water source. Protecting drinking water sources (be it ground or surface) is imperative. The plan has tailored action to tackle water pollution in rural areas, as well as urban areas.

There is no doubt that all industries and agriculture will be affected but especially those industries located along the seven key rivers and in urban areas. Since most of China's population and industry (and hence the industrial pollution) are clustered around 1) Beijing, Tianjin and Hebei, 2) the Yangtze River Delta and 3) the Pearl River Delta, it comes as no surprise that these areas face tighter compliance deadlines. However, given the enormity of the problem, protecting water sources will remain an uphill struggle despite the new targets set.

Perhaps the question at this point is not 'whether China has the political will to stomach a costly clean-up of industrial and agricultural pollution of its drinking water sources' but 'what happens if this is not done'. Since maintaining stability is an even more cherished mantra than food security, there is little room to manoeuver.

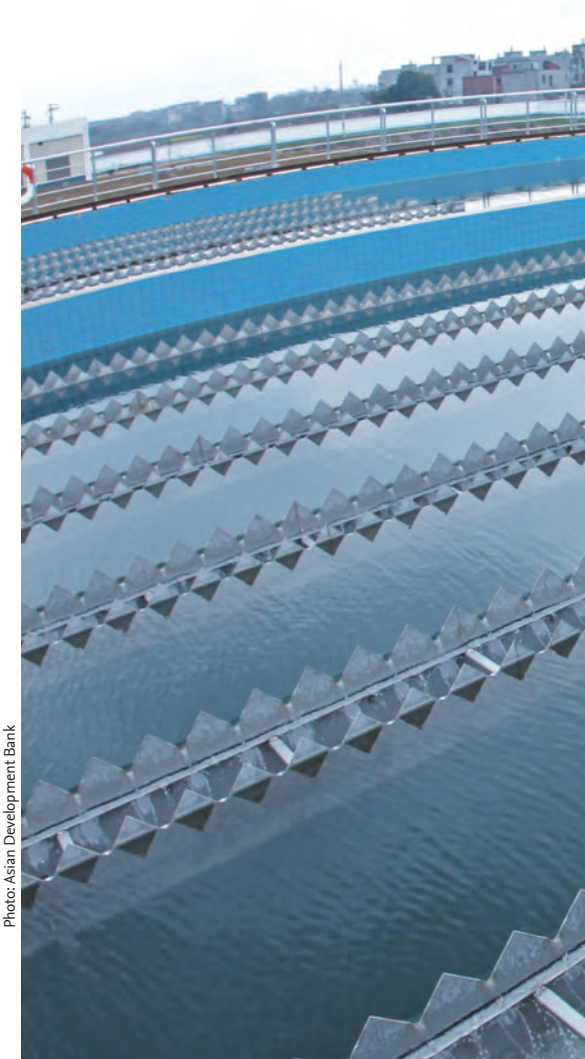


Photo: Asian Development Bank

### Industrial water use

A nod to rampant pollution exacerbating existing water scarcity is clear in the push to 'restructure' both the composition of industrial sectors and of crops grown. As expected, heavily polluting and water-intensive industries have been singled out for compliance and upgrading. Agricultural water use is also targeted.

The combination of the use of wastewater discharge permits and new stricter industrial standards will hurt some industries, even without rate hikes. Investment in wastewater treatment plants means not just upfront capital expenditure, but annual operational costs, as well. Only those with a long term commitment to the sector will remain.

Across China, textiles, dyeing and finishing, and pulp and paper industries will be hardest hit. Textiles, dyeing and finishing is the only industry singled out for action across all key target areas. Moreover, new stricter standards and tighter deadlines in the Yangtze River and Pearl River Deltas, where the sector is concentrated, amount to a triple-whammy hit.

The plan is actually tougher than many had expected, closing old loopholes caused by a mismatch in standards. These standards vary from sector to sector and it is important to note here that, in the past, some industrial processes were not subjected to any industry specific standards. Previously businesses could be fully compliant despite discharging untreated wastewater into water sources. So, on top of the impending water and wastewater tariff hikes, these new and/or more stringent industrial standards will hurt.

### Wastewater

Factories will have to treat wastewater to higher standards or face high violation fines under the amended environmental law. Also, parties responsible for the pollution violations could go to jail for offences. This means it will no longer pay to pollute.

In reality, the high cost of installing and operating wastewater treatment equipment will likely mean that some smaller factories with thin profit margins may be forced to close or merge with others, leading to consolidation within some industries. The fact that over 90% of the textile factories are small medium size enterprises makes this sector particularly vulnerable.

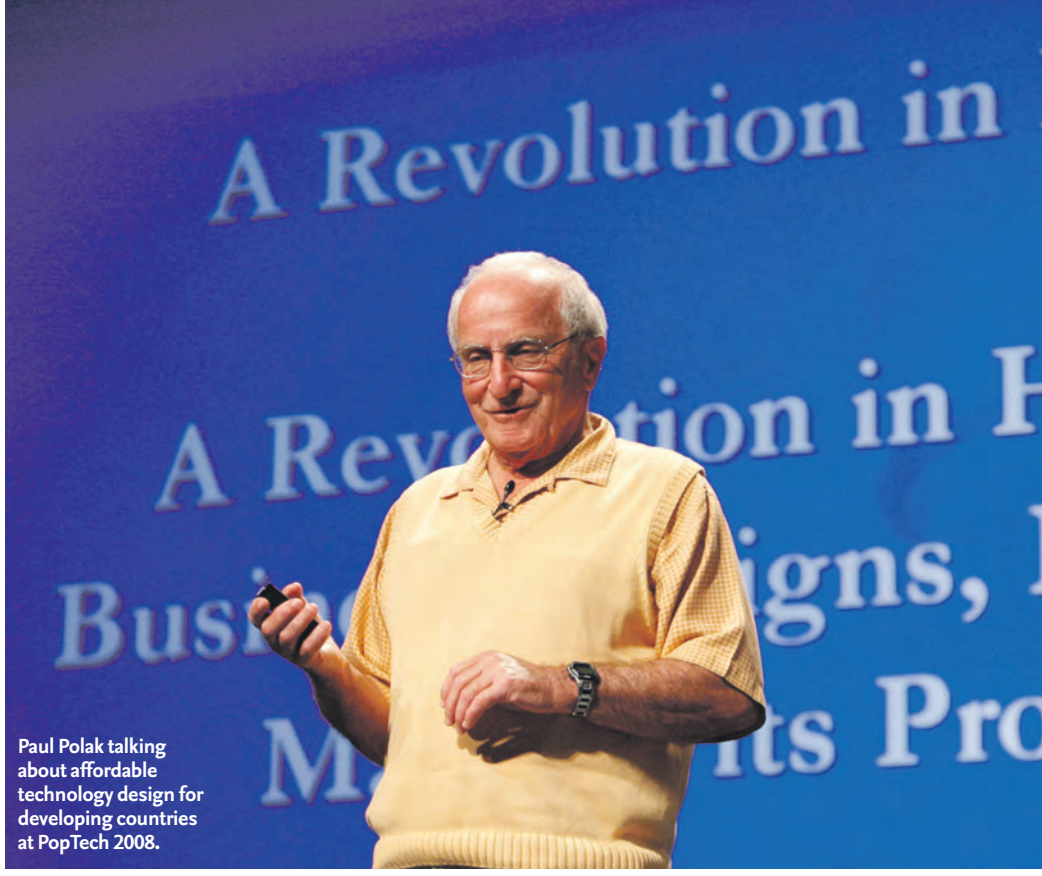
But it is not just the textile sector. Six new industrial pollution discharge standards, including petroleum refining and petroleum chemistry, are in force as of 1 July 2015. Watch out for crackdowns on illegal activities, such as secret groundwater discharge, and the use of fake environmental impact assessment approvals and monitoring data. The simultaneous anti-corruption campaign mounted by the current administration should go hand-in-hand with a pollution crackdown.

Someone said recognizing a problem is halfway to solving it. The recognition of key stumbling blocks by the plan is another indicator of China's seriousness in tackling pollution. Overlapping and unclear responsibilities between ministries have resulted in poor enforcement and mismatched standards. These disparate responsibilities, which could have hampered pollution prevention and control, are addressed in the new plan with tasks designated to different ministries. Now, under the new plan, each action has a 'lead ministry', which takes primary responsibility, and 'supporting ministries', which will have to work with the lead ministry to get the job done. That said, coordination between departments will still require much effort. We remain cautiously optimistic that this will ensure the proper execution of the policies.

● This article is an edited and abridged version of Debra Tan's original review, "Water Ten: Comply or Else", published by www.chinawaterrisk.org

**Water quality test at the Shahu Water Supply Plant in Gao'an City, Jiangxi Province.**

**DEBRA TAN is the director of China Water Risk, a non-profit initiative designed to help investors, businesses and individuals understand and mitigate risk around water.**




Paul Polak talking about affordable technology design for developing countries at PopTech 2008.

# An affordable water pump system using solar power

In this interview (right) Sunwater project leader, **Paul Polak**, explains the ideas behind the project

SunWater is a project to build an affordable solar water pump for farmers earning US$2-a-day farmers. It aims to transform small-plot agriculture, create new water markets and significantly increase incomes to raise bottom-of-the-pyramid families out of poverty.

To break out of the poverty cycle, poor farmers in Asia and Africa need to grow cash crops to increase their income. Cash crops are crops above and beyond the farmers' needs, but growing them is a challenge. Many farmers pump water by hand or carry it in buckets from a village pond to their crops. Not only is this a slow and physically grueling task, but often the shallow wells and seasonal rains mean farmers can't grow crops in the dry season.

Farmers need a reliable, low-cost water pumping system to grow the extra food they need to make profits. Diesel pumps are one option, but they use diesel fuel, which is expensive, break down often and blow carbon into the atmosphere. Diesel pumps cost US$500 to buy and usually require an expenditure of around US$700 a year for fuel and maintenance. Over a three year span, the costs can reach US$2,600.

Electric pumps are another option. They're cheap, but they use grid power, which is unreliable in many developing countries, meaning that most farmers who have an electric pump have to have a back-up diesel pump. Electric pumps can alternatively be powered with solar energy, but current systems can cost US$5,000 or more, which puts them out of the reach of poor farmers.

The SunWater design, instead of having several solar PV panels, uses flat mirrors to reflect more sunlight onto a single solar panel, thereby boosting the power output of that panel by a factor of 10.

SunWater is creating a pressurized irrigation system that brings water to a one-hectare plot for a cost target of US$2,900. This cost includes well drilling, water storage, tubing, installation and the solar pump itself. The whole system will be cheaper than buying just the panels and pump in the current solar-powered systems. The much lower cost means farmers will be able to pay off the loans they use to purchase the system in less than two years. Plus, there will be no fuel to buy.

Between November 2014 and June 2015, SunWater ran a field test with 11 installed units in Gujarat, India, which confirmed the viability of the technology and markets. Farmers using the solar water pumping and irrigation system showed that, by growing high-value, off-season cash crops, incomes can be improved by as much as 80%.

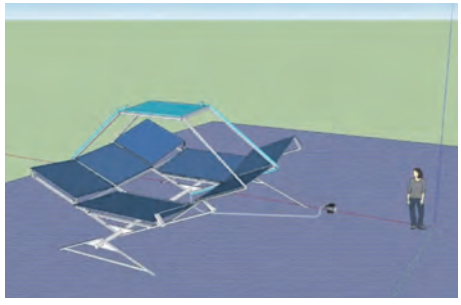



Photo: Kris Krüg – https://creativecommons.org/licenses/by/2.0/

**PAUL POLAK leads the SunWater project team. He is internationally known for fighting poverty using business and technology, and is the author of the book, *Out of Poverty*. He founded the non-governmental organization, International Development Enterprises, and has sold one million foot-powered treadle pumps to farmers in the developing world.**

**Why solar-powered pumps?**
Solar-powered pumps don't use diesel fuel, they rarely break down, and when they do they can be repaired easily. This system has very low operating costs compared to a diesel pump. Plus, they don't create carbon emissions.

**Why are you using mirrors?**
The single biggest cost in the system is the solar panels. One panel can be several hundred dollars or more. A mirror is a few dollars and is widely available. By using a mirror to shine extra sunlight onto the panel, we are increasing the energy output for a tiny fraction of what it would cost to buy another panel. Calculations show we can get the energy we need to run the pump with a set of these mirrors, saving thousands of dollars in the process.

**Why don't you give these away for free?**
Charity is a wonderful, and often necessary, act of giving that will always have a place in the world. However, long term solutions to large problems need to scale up rapidly and be able to support themselves. That means a commercial enterprise. If the solution is profitable it can generate the resources needed to reach hundreds of millions of people. SunWater will help farmers make more money, which will drive interest in other farmers buying their own pump, enabling the benefits to be provided to more and more people.

Our team has also found that solutions are more successful if farmers own the pump. When a poor village receives a free water pump, it almost always falls into disrepair and disuse because there's no ownership of it, even when water is one of their key problems. But when a poor farmer buys his own pump the results are vastly different: it stays well-maintained, it is used as effectively as possible, and creative ways of extending the benefits to the farmer are found. If we want to solve long-term problems in a long-term way the poor need cost-effective solutions they can own instead of handouts on a sporadic basis.

**How effective do you really think the project will be?**
This matters on a large scale – we think we can install one million of our pumps in India in the first 10 years. This will reach 50 million people, raising millions of them out of poverty. In addition, through future extensions of the core technology, there will be the potential to turn millions of farmers into energy entrepreneurs, bringing solar electricity, household lighting, and cell phone charging to millions of rural households that will never connect to the grid. All this, plus we'll reduce carbon emissions by replacing the diesel pumps with clean solar pumps. We feel this is the kind of game-changing project that can make a difference.

**Can you share more information about what these pumps are for and how you plan on making this work?**
There are two key components to this project: develop and field test cost-effective solar powered pressurized irrigation systems and establish a commercial enterprise to promote their adoption by farmers in India.

Pumping surface or groundwater for irrigation is energy intensive and traditional photovoltaic (solar) powered irrigation systems can't compete with fossil fueled surface irrigation systems. To make it work we have to minimize the energy requirements of crop irrigation. We will accomplish this by applying a systems approach for optimizing the series of water flow components from the water supply to the irrigated crops. The critical design tasks include:

- The well filter and screen must be designed to reduce drawdown.
- The solar panel array, mirror concentrators, and pump mechanism must be optimized to produce pressurized water using the sun's energy.
- The water distribution system must be optimized to increase the crop production per unit of irrigation water applied.

Giving away the system will be ineffective in the long run; farmers must invest in the pumps in order to create the motivation that ownership brings. To do this, a commercial company will be established first in India and then in Africa. The business model will integrate solar-powered pumping systems with a package of services including financing (lease to own or loan), support for design, installation and operation/maintenance training, and farm advisory services to enhance farming enterprise profitability.

**How is the proposed technical solution different from currently available technologies?**
The pump will be much cheaper than available options, but it's not just the pump that will make this work. We're using our collective field experience with small plot irrigation in Asia to create an end-to-end system specifically designed to help poor farmers irrigate their crops. We are taking a zero-based design approach to the problem, improving the whole process of irrigating crops with no limiting preconceptions.

It's worth noting that solar powered pumping systems with water delivery similar to five horsepower engine pumps are being promoted in India, but they require subsidies of up to 86% to make them attractive. Subsidies are costly and practically impossible for small plot farmers to obtain.

# Economic reforms to consolidate democracy

Tunisia, the birthplace of the Arab Spring, is on its way to becoming the first genuine democracy in the Middle East and North Africa region. After overcoming a deep political crisis and adopting a consensual constitution, Tunisia celebrated fair parliamentary and presidential elections between October to December 2014. In a regional landscape marked by civil strife, sectarianism and military intervention, Tunisia stands out as a role model for peaceful democratic change.

One of the most positive signs is that all major political actors share a common view. They believe that now that the political demands of the Jasmine Revolution – a democratic constitution and individual and civil liberties – have been achieved, the government should focus on the people's socio-economic demands.

Parliamentary leaders of the country's major political forces have stated that the new government must undertake wide-ranging structural reforms during the next five years in order to stimulate the economy (increase productivity and investment), promote regional development and create employment.

They have also stressed that Prime Minister Habib Essid's cabinet, in office since February 2015, should prioritize a number of economic reforms. The main priorities for the economic reform agenda are the investment code, the public-private partnerships framework, the taxation system, the banking sector and the integration of the informal sector into the national economy.

The general objective of the reforms is perceived to be the dismantling the old regime's stagnant economic model, characterized by rent-seeking, corruption, administrative barriers and numerous obstacles to local and foreign trade and investment. A recent report by the World Bank, titled "Unfinished Revolution", describes the Tunisian economy as "performing below its capacity, with persistent unemployment, low productivity, misallocation of resources, weak structural change and feeble export performance".

Despite a partial economic recovery recorded in 2012 and 2013, 2014 saw a downturn. In December 2014, the Tunisian Central Bank raised concerns about the low economic growth rate recorded during the year, and limited the growth forecast in 2015 to only 3%. Moreover, a slow recovery in the industrial and tourism sectors will reduce the

Photo: www.istock.com/Franck Prevel

Photo: Simon Blackley


Photo: Arne Hoel / World Bank

options for creating new job opportunities, leading to a persistence of social tensions.

Improving the labour market will be a major challenge. Unemployment has dipped slightly after a peak rate of more than 18% was reached in 2011. However, it still remains at 15.2%, representing 600,000 jobless people. The high rates of unemployment amongst graduates, particularly in the central and southern regions are considered to have been one of the main reasons behind the popular uprising of 2010-11. According to the African Development Bank, the challenge is to develop a productive sector with a higher added value capable of absorbing the 60,000 university graduates joining the job market each year.

One of the two major cleavages that the government has to face is the existing disparity between the economic elite and, according to recent figures provided by the Minister of Social Affairs, the two million people living in poverty. The other is the imbalance in economic activity taking place in the Mediterranean coastal areas compared with that in the rest of the country. Poverty rates provide a clear indicator of the divide. In the north-west and centre-west regions – where the Revolution began – poverty rates stand at 26 and 32 percent respectively, according to the World Bank, compared to just 8% in the capital and northern coastal region. Most investments in the country have been targeted on the coast, leaving the interior cursed by poor infrastructure. The economic activity of only three coastal cities, namely the capital, Tunis, Sfax and Sousse, accounts for 83% of Tunisia's GDP. These three cities together host 92% of all industrial firms in the country.

The current effervescence in the social and economic arenas indicates that there cannot be a consolidated democracy without the formation of a more inclusive *economy*. Civil society and politicians – from liberal and leftist to Islamist ideological orientations – agree that economic restructuring is necessary to achieve inclusive growth combining more employment, a better regional balance and a more egalitarian distribution of wealth and income. This, they also agree, can be achieved through good governance in the framework of a free market economy regulated by the state.

● *By Rosa Álvarez Fernández, a specialist in Middle East and North Africa regional politics, currently based in Tunis.*

## At a glance

***Head of state: Beji Caid Essebsi, leader of the Nidaa Tounes party, won the country's first democratic presidential elections in December 2014***

*Government: A coalition, led by Prime Minister Habib Essid, composed of Nidaa Tounes, which won the largest number seats in the October 2014 elections; Ennahda; the Free Patriotic Union; and Afek Tounes.*

***Population: 10,982,754 (2014)***

*Percentage of total population living in urban areas: 68% (2014)*

***Main industrial sectors: textiles and clothing, agro-industry and mechanical, electrical and electronics industries (including automotive and aeronautics components). The three sectors account for 75% of the country's export firms, and more than 65% of jobs in industry (2013, African Economic Outlook)***

*Main exports: textiles, agricultural products (olive oil, citrus, vegetables), phosphates and chemicals, mechanical and electrical goods, hydrocarbons*

***GDP composition by sector: agriculture: 9%, industry: 30%, services: 61% (2013)***

*Internet connections for 44% of population in 2013, up from 27.5% in 2008 (ITU)*

# ‘Participating in the global economy is an opportunity, not a constraint’

## Interview with YASSINE BRAHIM, Minister of Development, Investment and International Cooperation

**Will the Essid cabinet essentially be a government to enact structural reforms, as the major political parties have demanded?**

Exactly. First of all, we have the opportunity to have a bit of stability, we hope. We are in an international environment where terrorism is quite tough but, politically speaking we have stabilized with the elections of the president and the parliament for five years, and we are able to start real reforms, and can now put the economy and the social reforms as priorities for the country.

**What major changes do you think will take place in the Tunisian economy over the next five years?**

The direction is quite clear. We are a small country in terms of size, with a population of 11 million people, but we are very well-positioned in the centre of the Mediterranean. Historically, what has made Tunisia successful has been its openness. We are an open country, able to have many citizens of the world visiting us, because we represent the history of humanity. We had so many civilizations in Tunisia, and so we had so many people wishing to come to Tunisia. That is why security is so important, and confidence in the fact that the Tunisian government can handle security is important. And when I say security, it is not just in terms of the security forces and army but also in terms of education, culture and the social equilibrium between cities and regions.

After the Revolution, we already had a kind of zoom-in on the poorest regions of the country. Our existing policies, especially the investment code and the fiscal and tax incentives, will be clearly targeted. It is happening at a good time because the more developed regions on the coast, and the largest cities, like Tunis, Sfax and Sousse, are starting to have the same problems as European cities, because we have strong development, urbanization and pollution problems, like any classical north Mediterranean city. This stress and pressure will naturally mean that there will be more interest in the interior regions. That is the first direction.

**YASSINE BRAHIM was Minister of Transport and Equipment in the transitional government formed in early 2011. He resigned in June to become general secretary of the newly founded, secular, liberal Afek Tounes party. In the 2014 legislative election, Afek Tounes won eight seats, including Brahim himself who was elected to represent the coastal city of Mahdia. In February 2015, Afek Tounes agreed to participate in a unity government, and in Prime Minister Habib Essid’s cabinet, Brahim became Minister of Development, Investment and International Cooperation.**

Second, even if in Tunisia we talk a lot about environment and green economy, it is at a step back compared to even some regional countries like Morocco. We will also have incentives and encouragement and strong public-private partnership projects on waste management and environmental topics. Renewable energies will be a priority for the future.

Also, we will look more to Africa as a market and at the way to develop more cooperation with African countries, either bilateral cooperation or multilateral cooperation with European countries. We will think about all Asian countries as well because we think of Tunisia as a hub to develop more exchanges. We need as well to concentrate on enhancing our relationship with Algeria – as investor in Tunisia and as a market for Tunisia and international companies. Algeria is the largest market in North Africa.

Overall, Tunisia will see reforms in education, health care, incentives and the investment code, and in tax and customs in order to make the country more open and closer to international standards in terms of doing business. We consider that participating in the global economy is an opportunity for Tunisia, not a constraint.

**What is the new strategy to foster domestic and foreign investment?**
Investors were waiting for political stability and we have it. Now we need to have some signals of positive decisions in terms of reforms. They need to see the public-private partnership law voted in the Assembly. They need to see a new investment code more open than the last one, and then they need clarity – whether they have incentives and less complex laws. I am quite confident about Tunisian investors. The international ones will look at security issues, but this is quite a regional topic. Terrorism is a fact we have around the world. There is no one day without a terrorist attack in the world, from Asia to the USA. So, they need to be confident in the Tunisian state's ability to be able to handle this, like any well-structured and well-managed country.

**The economy of some regions depends heavily on parallel trade and activities. How is the government going to integrate the informal sector into the national economy?**
If you have a parallel market that is becoming too important, it means your tax and laws are not appropriate, so you need to progressively reduce bureaucracy and bring taxes down. If you bring taxes down, the people paying taxes will benefit from it and the people who don't pay taxes will be encouraged to come into the system. In fact, at the beginning, people paying less tax will have an impact on tax revenue, but very quickly more people will be incorporated in the system. We are a small country, so my party's idea is to bring taxes and customs duties down and then we will see that the situation will get better. I hope that I will be able to convince the other political parties, the partners in my government, to go in that direction.

**"Tunisia will see reforms in education, health care, incentives and the investment code, and in tax and customs in order to make the country more open and closer to international standards in terms of doing business."**

**The highest rates of unemployment are amongst young graduates. How will the government address this?**
In my opinion, we need Tunisia to become a country of investment, with more projects, and to make Tunisia a competitive country. We need to have a discussion with our friends from the European Union about how to make Tunisia more competitive in terms of productivity, to have maybe a little more flexibility in terms of delivery times, and to also be able to bring in some more experts and international managers, so as to have a transfer of knowledge and expertise.

● *Interview by Rosa Álvarez Fernández.*

GOOD BUSINESS

In the latest of a series about remarkable companies, *Making It* looks at a Brazilian company converting sugarcane into plastic

# Braskem

Thanks to its cheap, enduring, mouldable and versatile characteristics, plastic has entered every facet of modern life. From food packaging to household products, to cosmetics, toys, auto parts, pipes, footwear, clothing and sports goods, it plays a vital role in making many parts of our lives more convenient.

Most of the plastic used today is made from fossil raw materials such as oil and natural gas. According to one report, making 1,500 plastic bags from natural gas consumes almost 33 pounds of fossil fuel and 58 gallons of fresh water, and produces some 15 pounds of solid waste and 0.04 tons of $CO_2$.

## Green plastic

Since oil and natural gases won't last forever, the current way of making plastic is not considered sustainable. A Brazilian petrochemical company, Braskem, is providing a new way to produce plastic on an industrial scale. It has pioneered the production of 'green plastic', also known as 'green polyethylene', from a common agricultural crop – sugarcane.

Headquartered in São Paulo, Brazil, Braskem is the leading producer of thermoplastic resins in the Americas and the world's largest producer of biopolymers. Its annual report for 2013 states that it manufactured 16 million metric tons of products, attaining gross revenue worth US$22bn. Founded in 2002, it has 36 industrial plants spread across Brazil, the United States, Argentina and Germany, and employs 8,000 workers worldwide, among them 340 scientists and researchers in its two innovation and technology centres. Each year, the company invests a total of US$80m in research and development.

"For Braskem, progress means sustainable growth. Taking oil out of plastic production is one step forward. We strive to discover new processes and solutions to make our products more sustainable, and therefore make the world more sustainable," said Jorge Soto, the company's Sustainable Development Director, in an interview with *Making It* magazine.

At its Triunfo Petrochemical Complex in the state of Rio Grande do Sul in the south of Brazil, Braskem now produces 200,000 tons of green polyethylene each year.


The company unveiled its initiative to produce green polyethylene in 2007 and, in 2010, after improving the production process, it started to produce green polyethylene on a commercial scale.

But just how exactly does Braskem manage to transform sugarcane into a seemingly unrelated thing like plastic? First, sugarcane is crushed, fermented and distilled, yielding the product called ethanol. Then, at the Braskem plant, the ethanol undergoes a dehydration process during which it is transformed into green ethylene. The green ethylene goes through a polymerization and then an extrusion process. The resulting green polyethylene has the same physical and chemical characteristics as conventional plastic, so it can be processed using the same machinery. Braskem supplies its green polyethylene to manufacturers and convertors which use it to produce plastic products.

To identify products that have green polyethylene in their composition, and to help consumers to recognize them, Braskem created the *I'm green* trademark seal. Today, the *I'm green* seal can be found on products from 19 companies, including big corporates such as Nestlé, Johnson & Johnson and Walmart.

## Reducing greenhouse gas

"The green polyethylene has an outstanding environmental performance. In 2007, Braskem conducted a 'cradle-to-gate' study to compare the eco-efficiency of *I'm green* polyethylene with conventional fossil-sourced polyethylene. The study showed that producing polyethylene from fossil sources generates two times more carbon dioxide than producing the same amount of *I'm green* polyethylene. Braskem's green plastic helps reduce greenhouse gas emissions in its production process," said Jorge Soto.

"Producing green plastic is also resource efficient. All waste materials generated during the processes are re-used, for example, filter cake and wastewater are later used as natural fertilizer, reducing the need for chemical fertilizer, and bagasse – the fibrous matter that remains after sugarcane stalks are crushed to extract their juice – is used to generate bioelectricity, reducing the use of fossil resources," added Soto.


Besides greening the production process, Braskem also keeps eye on its product's life cycle. Since plastic litter is such an enormous problem across the globe, Braskem tries to ensure that its sugarcane- plastic has a green end. Soto says, "It is not biodegradable or compostable but like resins made from petrochemicals, green polyethylene is a recyclable material and in fact can be recycled normally using the processes in use today. Since green polyethylene is not bio-degradable, the $CO_2$ captured during the sugarcane cultivation process remains sequestered during the plastic's entire life cycle."

The company has discovered ways to transform recycled plastic waste into small-sized items of furniture. It has also been developing initiatives with environmental engineering companies to create a new post-consumer cycle for its plastic products.

"Our main focus within our biopolymer range is renewability and recyclability. We believe that there is more value in re-using products made from our polymers rather than bio-degrading them," said Marco Jansen, Braskem's Renewable Chemicals Commercial Director Europe and North America, in an interview with *Plastics News*.

### Sugarcane – a renewable resource

Braskem's strategy of producing plastic from sugarcane also takes into account making use of the local renewable resource. Brazil has the ideal climate for growing sugarcane, and there is almost no need for irrigation of the crop. In fact, it is the world's largest sugarcane producer, harvesting almost 600 million tons of sugarcane in the year 2013-14. According to Braskem, to produce one ton of green polyethylene, only about 27.5 tons of sugarcane is needed, indicating that the country has an abundant renewable resource from which to produce plastic.

Asked whether growing more sugarcane for green plastic would use more agricultural land that could be used for food crops, Jansen replied, "Sugarcane does a lot with a relatively small portion of land. It requires less than one quarter of the land used for corn, one eighth of the amount for soybean production, and one thirty-fifth of the land for cattle ranching. Sugarcane ethanol production currently occupies 4.6 million hectares of farmland, which is only around 1.5% of Brazil's arable land. Yet from this small portion of land, Brazil has been able to replace almost 40% of its gasoline needs with sugarcane ethanol, while also exporting ethanol to other continents."

"This means that on the one hand, there is more than enough land available in Brazil for sugarcane expansion, without encroaching on other economic activities, while, on the other hand, producing sugarcane polyethylene is an ideal solution to reduce dependency on oil and maximize resource efficiency. And, in the long run, it improves the carbon balance. This all chimes with Braskem's commitment to preserve nature resources, to provide an alternative for people looking to reduce their carbon footprint, and to create a green economy by adopting renewable and sustainable technologies."

● Interview by ZHONG Xingfei

# Ecological enterprise zones: next generation industrial strategy or fool's gold?

By **PHILIP MONAGHAN,** director of the Infrangilis research agency, and author of the books, *Sustainability in Austerity and How Local Resilience Creates Sustainable Societies*

Enterprise zone (EZ) policy deploys spatially targeted fiscal and deregulatory incentives for development such as tax relief, planning simplification, or removal of social rights. There are estimated to be over 3,500 EZs in 130 countries in the developing and developed world, which account for more than US$200bn in exports and directly employ at least 40 million workers. An examination of the history of EZ theory shows that the policy idea has been around for centuries and continues to thrive in different forms to the present day, the types of which vary in terms of purpose and application: emerging in the 1800s to take advantage of port routes (e.g. Hong Kong), and resurfacing in a new form during the 1970s to reverse city decay (e.g. the Isle of Dogs in London). More recently, in the 2000s, EZs have evolved again, to accelerate low-carbon growth in the guise of ecological enterprise zones (EEZ) (e.g. New York's solar empowerment zone). But what evidence is there that EZs deliver lasting benefits for local communities in the form of social mobility? Or that EZ policies will also help to tackle climate chaos?

**Triumph of neo-liberal policy over evidence**

There appears to be an inverse pyramid of evidence to support the case for the blanket application of EZs, whereby a lot of theory is stacked on top of little evidence. Yes, there is compelling evidence to suggest that different versions of EZs do contribute to growth or regeneration, for example in Shenzhen, China, the Isle of Dogs/Canary Wharf, and Indiana in the USA. Yet a distillation of various studies by Infrangilis finds the rationale for EZ policy over other types of economic instrument (e.g. education, place-making, or community enterprise) to be inconclusive, given that there are many examples of failure too in terms of high-cost per job created, no significant local employment impact or a shift of value from the public purse to private landlords via increased land values, such as in Colorado, USA, and Salford, UK, respectively. The process of policy mobility is important in explaining why EZs remain politically popular: the spread of a neoliberal idea to remove the dead hand of the state and unleash market forces to tackle unemployment; and ill-conceived state implementation whereby a policy label is adopted without proper consideration for clear definition or special measures. Another explanation is the confusion caused to policymakers by contradictory think-tank studies about the success of different types of EZ policy regimes, which do not make recommendations that are relevant and lead to policy improvement.

> "...enterprise zones have evolved again to accelerate low-carbon growth in the guise of ecological enterprise zones... But what evidence is there that they will deliver lasting benefits for local communities in the form of social mobility or that they will help to tackle climate chaos?"

**Can an enterprise zone be ecological?**

Compared to their high-carbon cousins, as an emergent phenomenon there is sparse empirical studies on the impact of EEZs. Despite this, a global mapping exercise by Infrangilis suggests that they are on the rise: there are already 52 EEZs in operation, spanning 23 countries in Africa, Asia, Europe, the Middle East, Latin America and North America. Examples range from the A19 ultra low carbon vehicle corridor in north-east England and New York's solar empowerment zone, to Chittagong's low carbon garment export processing area in Bangladesh and Cape Town's Atlantis green manufacturing zone.

However, there may be inherent contradictions for an EEZ between unabated growth and abated emissions.

A woman rides past a Yingli Solar logo on a wall outside Yingli Solar, in the Chinese city of Baoding, Hebei province.


Photo: Reuters/Petar Kujundzic

In the case of Baoding, in Hebei province, China, the economic boom from its solar panel industry means its carbon intensity – the amount of emissions per unit of Gross Domestic Product – appears to be higher than peer city equivalents. Baoding may not actually be a 'green' EZ because while it is manufacturing low-carbon products, in the absence of a decarbonized national power grid, it is doing so in a carbon-intensive way.

It has also been suggested there may be limitations to what a city can do by itself when it comes to green growth, because without a national strategy for EEZs, they may be inappropriately selected, non-complimentary, fail to build trust and create unnecessary competition. For instance in England, UK, 15 of its 24 EZs have an explicit focus on exploiting some form of green technology, ranging from marine energy to electric vehicles; and, in November 2014, the then Secretary of State for Communities and Local Government, Eric Pickles, proposed plans for a second wave of EZs. But without clarity on a British vision for national green growth which dovetails with local development plans, it is unclear whether this is gold dust or fool's gold.

These insights highlight the importance of better understanding the potentially signification contribution of EEZs to next generation industrial strategy around the world, especially in terms of helping to make a big shift to inclusive and sustainable growth. Consequently, the next phase of Infrangilis' work aims to: understand why and how the policy is being transferred in different contexts, identify good (and bad) practice examples from around the globe; and distil a set of practical recommendations for the benefit of the policy community.

# Three keys to successful industrial policy in developing countries

By **AMANDA JANOO**, industrial policy analyst

In recent years, we have seen the re-emergence of industrial policy, which can broadly be understood as the molding and directing of the economy by the state in line with its societal objectives. However, despite industrial policy's comeback and the acknowledgement of the failures of the "free market", "growth-first" approach to development, we have not yet seen many states breaking the mould and implementing radically different economic policy agendas. What then is inhibiting greater experimentation and self-determination in industrial policymaking? And how can developing countries move towards more successful and innovative industrial policies in the future?

As a way of stimulating debate, I suggest that there are three major obstacles that must be overcome in order to make industrial policy in developing countries more successful:

**Beware bad economic advice**

One of the primary challenges facing industrial policymakers in developing countries is the constant bombardment of economic advice which simply replicates past development failures. Most developing countries would like to utilize industrial policy to tackle the most pressing socio-economic issues facing their populations, such as high underemployment, poverty or economic volatility. However, the majority of economists are still peddling the same market-freeing policy prescriptions (e.g. trade liberalization, economic deregulation and privatization of state-owned enterprises) which dominated development for the past three decades and which delivered disappointing societal outcomes. An industrial policy practitioner from a sub-Saharan African country recently expressed her frustration with the "industrial experts" who keep coming in and telling them to liberalize trade. "What is the point of more trade if we don't produce anything?" she sighed with exasperation.

With a growing demand for industrial policy advice, economists are increasingly re-packaging the same "free market", "business enabling environment" agendas under the stamp of industrial policy. The past three decades have illustrated the strengths and weaknesses of this approach and if developing countries wish to experiment with *new* policy prescriptions oriented towards new objectives they would be wise to learn through trial and error, rather than depending on economic advice, which derives from the same abstract, outdated models.

**Beware of those who would do the work for you**

There is no shortage of development agencies and private consultancies which say that they have identified *the* best practice and can provide you with a golden ticket to economic prosperity if you simply stand aside and let them get to work. Across the globe, industrial policies are being crafted, drafted and implemented by bi-lateral and multilateral development agencies which believe that what worked in Country A will work in Countries B-Z. At best, these programmes lead to an over-reliance on development agencies, as the logic underpinning them is not embedded in the local government and therefore lacks sustainability. At worst, the programmes completely disregard the development objectives of the country in question and are simply based on the ideology or interests of the implementing party. In both situations, developing country governments are once again made spectators of their own economic transformation, which defeats the point of industrial policy altogether.

**Beware roaming capital**

One of the greatest challenges facing industrial policy in developing countries is that the space to institute effective regulatory or taxation policies is constrained by the allure of foreign direct investment (FDI), the threat of relocation if their demands are not met and, perhaps most importantly, the idea that they can never compete with the economic giants even if they try. This approach only highlights the benefits of a globally fragmented production system, suggesting that now countries can easily insert themselves into global value chains without having to build their own competitive industries from scratch. However, this argument denies the very important fact that, by "chasing FDI", developing countries become passive recipients of the manias and innocent victims of the panics which characterize global business and financial flows. Due to

their weak negotiating position, they are frequently exposed to high risks with little prospect of reward

The success of industrial policy in developing countries will be greatly enhanced by recognition of the wealth latent in their own *national* value chains and of their right and responsibility to limit foreign presence when it infringes on their capacity to build an economy which serves their populations' needs.

Industrial policy provides a unique opportunity for developing countries to assert greater self-determination over the shape and form of economic development and to pioneer new blueprints for the better world we envision. However, the space for innovative industrial policy is being constrained by external influences which come under the guise of benevolent economists, development agencies and transnational corporations. To enhance the success of industrial policy, developing country governments should strive to emancipate themselves from these influences so that they have the space to experiment and adapt their industrial policy programmes in a manner which serves the needs and desires of their society.

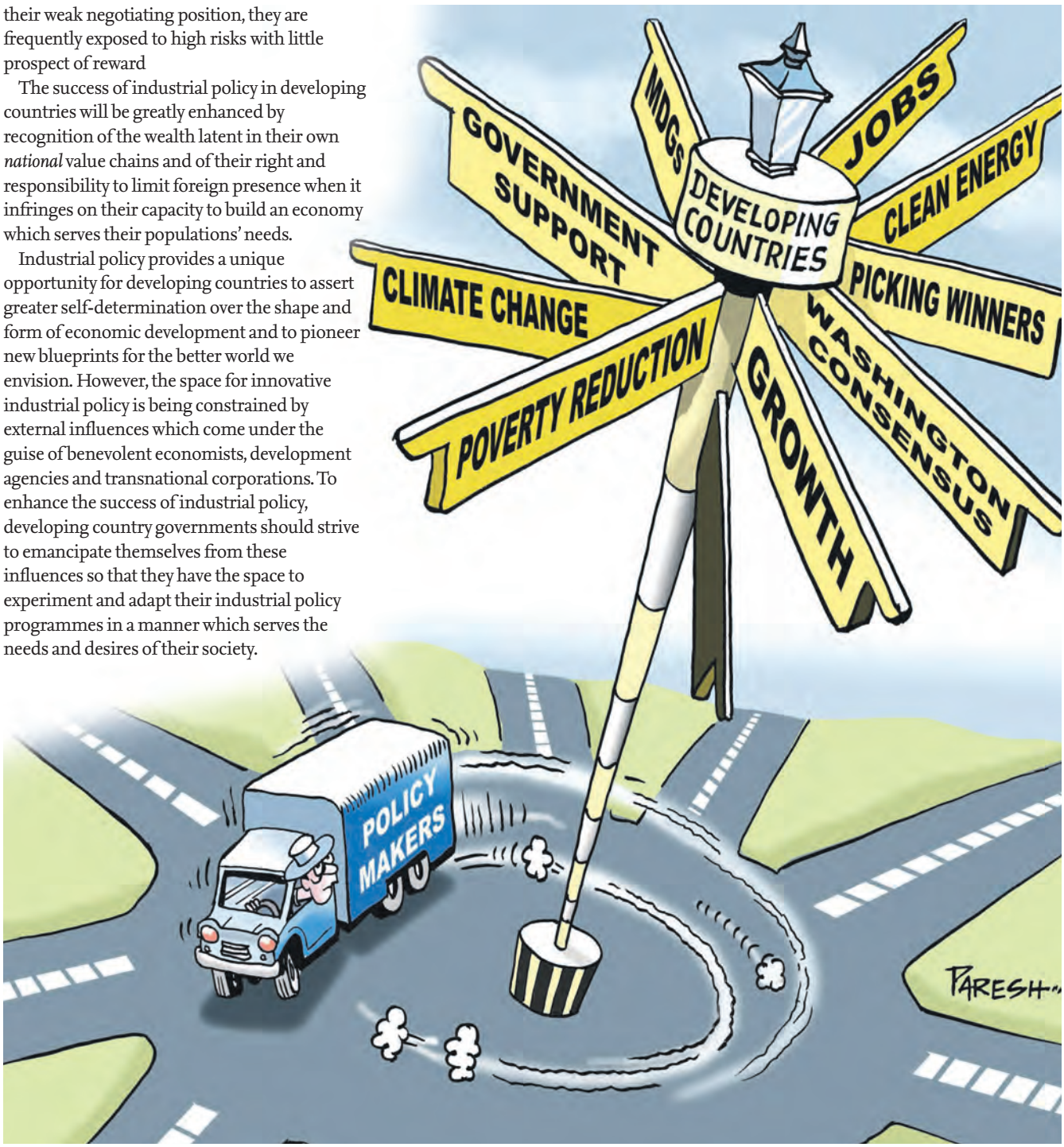



Illustration: Paresh Nath

# Exploring climate change from a gender perspective

By **VIRGINIE LE MASSON**

What does gender have to do with climate change? It's a question I often hear when engaging with practitioners and policymakers. I am a researcher who advocates for attention to gender to be integrated in efforts to address climate change – in climate change mitigation, in strategies to adapt to climate impacts, and in negotiations towards a global climate change agreement.

To answer that question, I tend to avoid using the mainstream argument that women are more vulnerable to climate change than men. Many studies have documented that women are part of households and relationships from which they cannot necessarily be separated. Whatever impacts women will also impact those around them, albeit in different ways. This is why we must work on gender relations, rather than on women only.

Instead, I show that men and women across societies have different roles and perspectives, which make their relation with their environment unique. For instance, while conducting research in the Himalayan province of Ladakh in India, I realized that when asking local villagers questions concerning water access, I received very different answers from women compared to those that my male research colleague received from men that he interviewed.


Photo: istock/Andy Parker

**Below: People's Climate March, New York, USA, 21 September 2014.**

People in Ladakh rely on water from glaciers and melted-snow for daily consumption and irrigation. Changes in temperatures, combined with increased demand for limited water resources, make water availability fluctuate dramatically.

At one particular site, men did not raise any concerns about access water, yet almost all the women I interviewed said that availability and access to water is one of their main daily challenges. Women are responsible for fetching water and for irrigating fields, and therefore they have first-hand knowledge of the availability of water and how climate change is impacting this resource.

Differences in roles and status, and the socio-economic context in which people live, also affect their different abilities to cope with extreme weather events. As part of other research in India, I talked to inhabitants of a low-income urban area in Gorakhpur, in the eastern part of the state of Uttar Pradesh in India, about how they cope with regular floods. Those who rely on growing and selling crops as their main source of income develop strategies to adapt to recurrent flooding. For instance, women farmers grow climbing beans or cucumbers on long sticks so that their crops are not destroyed even when flood waters up to two metres deep inundate fields for several weeks. In parallel, men selling food or clothes use a small cartwheel in order to place their business in strategic locations, safe from hazards, and to follow the crowd at different moments of the day.

However, those strategies might be disrupted when people suffer from health problems that restrict their physical ability to look after their garden

or go to the market, particularly when they do not benefit from social security from the state. In order to cope with the loss of income, people take out loans that they can only pay back by selling their main asset, which is often their plot of land. This is when gender becomes a key analytical lens. Although women are the primary users of the land to cultivate crops, men are those owning the title of the land and therefore they decide if and for how much they want to sell it. In a context of poverty, owners – therefore men – are pressured by real estate corporations to sell their land at a cheap price, often bribed with gifts in kind, such as alcohol.

A study by the World Health Organisation states that alcohol abuse is one of the main killers of young men in India, and has severe repercussions on the social and family dynamics (e.g. domestic violence) and economic resources (e.g. reduced wages, increased medical expenses, loss of assets).

There are countless other examples showing that attention to gender differences matters when working on disaster risk reduction and adaptation to climate change, and this is also true for climate change mitigation. The European Institute for Gender Equality reports that women and men living in Europe contribute differently to greenhouse gases. For instance, its 2012 study shows that more women use public transport but that men tend to be more conscious about purchasing energy-efficient cars. Women also more often declare themselves willing to choose low-carbon practices and make changes in their everyday lifestyles, like choosing a cleaner power supply.

Attention to gender and gender relations helps us understand how differences in access to resources and power between men and women influence how populations interact and care for their environment. Gender constructions – such as social norms, traditions and cultural aspects of the societies we grow up in – influence who we are, how we interact with each other and what roles we are supposed or able to play in our societies.

I believe that only when we seriously listen to and integrate the perspectives of those we rarely hear from can we reconcile development progress and the imperative to care for the environment.

Beyond the question of gender differences is the issue of gender equality and access to power. Tackling gender inequalities is necessary to achieve sustainable development (not to mention to respect basic human rights), and vice versa.

Only when we recognize differences but challenge inequalities can we ensure that those who suffer from discriminatory laws or unfair economic practices will not further suffer from the adverse impacts of climate change. Only when we confront gender imbalances can we create an enabling environment for those traditionally excluded from power positions, to participate equally in making decisions and creating policies that will affect their lives positively.

● **VIRGINIE LE MASSON** is a Research Officer working for the Social Development and Climate and Environment programmes at the Overseas Development Institute, London. She is also the gender focal point for the Climate and Development Knowledge Network.

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## FURTHER READING

Ahmed, Nafeez – New age of water wars portends 'bleak future'
Davies, Wyre – Brazil drought: Sao Paulo sleepwalking into water crisis
Greenpeace International – Hidden Consequences: The costs of industrial water pollution on people, planet and profit
Hoekstra, Arjen – The water footprint of modern consumer society
Leahy, Stephen – Your Water Footprint: The Shocking Facts About How Much Water We Use To Make Everyday Products
OECD – Tunisia: A Reform Agenda To Support Competitiveness and Inclusive Growth
Polak, Paul – Out of Poverty: What Works When Traditional Approaches Fail
Stuchtey, Martin – Rethinking the water cycle: How moving to a circular economy can preserve our most vital resource

## FURTHER SURFING

http://lkyspp.nus.edu.sg/iwp/ – The Institute of Water Policy (IWP), a part of the Lee Kuan Yew School of Public Policy at the National University of Singapore, is a research centre focused on water governance and policy
http://markandfocus.com/category/water – Blog about the risks and challenges provided by the world's mega-trends
http://water.jhu.edu – The JHU Water Institute: solving the global water challenge through innovation, education and collaboration
www.allianceforwaterstewardship.org – The Alliance for Water Stewardship operates a global water stewardship system, launched in 2014 to promote and reward sustainable use of water by users
www.brookings.edu/research/topics/tunisia – The Brookings Institution conducts independent research covering foreign policy, economics, development and governance
www.chinadialogue.net/topics/water – Chinadialogue is devoted to the publication of high-quality, bilingual information, direct dialogue and the search for solutions to our shared environmental challenges
www.c-win.org – California Water Impact Network is a non-profit organization that advocates for equitable and environmentally sensitive use of California's water
www.recpnet.org – The Global Network for Resource Efficient and Cleaner Production provides a comprehensive strategic framework to scale-up and mainstream resource efficiency and cleaner production activities
www.siwi.org – The Stockholm International Water Institute provides and promotes water-wise solutions for sustainable development
www.switchmed.eu – SwitchMed is an initiative that supports and connects stakeholders to scale-up social and eco-innovations in the Mediterranean
www.unwater.org – UN-Water is the United Nations inter-agency coordination mechanism for all freshwater and sanitation-related matters

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