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The Environment

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Articles

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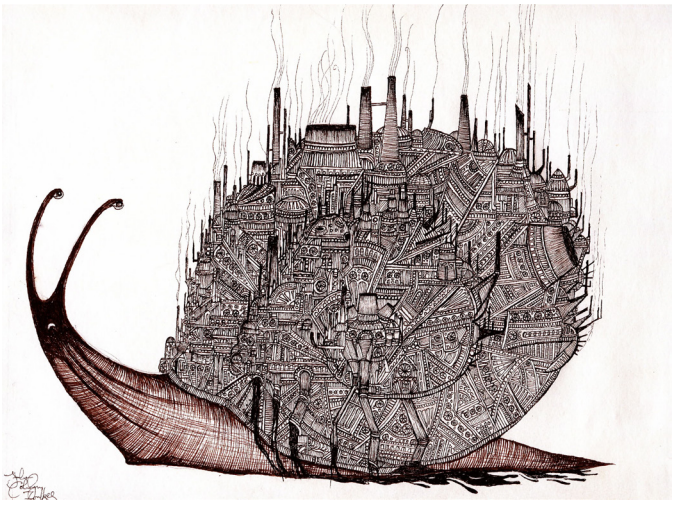
Dear Reader,

As Leviathan enters its third year of production, I wish to extend a warm welcome to our readers, new and old. Leviathan aims to shed light on the crucial yet sometimes overlooked issues of our political environment, stimulating thought-provoking analysis and debate. We examine today's issues through a variety of themes in an effort to offer new perspectives. The theme of this issue is "The Environment".

As a generation, we face unprecedented obstacles. We face mounting debt, social unrest, and environmental decline, among a multitude of other quandaries. This issue of Leviathan features articles on topics from climate change to energy harvesting, the global food crisis to humanitarian development. On such a vast scale, it is difficult to gauge our role as individuals—how much power do we have, both independently and collectively, to affect positive change? Is our generation to blame? Re-usable shopping bags and eco-bulbs may not change the world, but they have clearly contributed to a trend. Businesses find increasing incentives to "go green", but at which point do commercial interests and the environment come into conflict? Can we achieve economic prosperity without causing environmental degradation? And how do resources and environmental policies figure in the grand scheme of geopolitics and power?

With a constant focus on the international sphere, this issue includes discussions on solar energy in Europe, pollution in China, the presidential election and energy policy in the US, water scarcity in South Asia, and more. We invite you to read, ponder, and offer critique by sending your feedback to leviathanjournal@gmail.com.

As each issue is put together solely by Edinburgh University students, many thanks are due to the hardworking and tireless efforts of Leviathan's writers, editors, illustrators, fundraisers, and production team members, without whom this journal would not exist. Leviathan is generously supported by the University's Politics and International Relations Department, who have enabled us to pursue professionalism and quality, and to whom we owe boundless gratitude. The Politics Society has also been a steadfast foundation for our work, and continues to offer enlightening political discussion though its many events during the year. Finally, my personal appreciation goes out to Uday Jain and Ryan Jacobs, my predecessors, who through unwavering dedication founded and built this journal.



Slow Progress? Illustration by Julius Colwyn, with permission.

Cheers, and enjoy.

Natasha Turak
Editor in Chief

'Beyond geology': the

Professor Elizabeth Bomberg explores the

Trapped deep underground in shale rock beds, massive gas deposits have been identified in North America, Europe, China and Africa. Exploitation of this shale gas has been described as 'one of the most significant innovations in energy' this century.[1] The potential benefits from shale gas exploration are huge: new mining techniques allow firms to tap vast natural-gas reserves previously deemed impenetrable. Unleashing this hidden natural gas would allow states to replace dirtier fossil fuels such as coal and oil (natural gas produces about half as much carbon dioxide as the energy-equivalent amount of coal). Moreover a shale gas bonanza could bolster the domestic production of energy, thereby freeing states from dependence on dodgy foreign sources. Finally, the extraction industry promises local jobs, cheaper gas, and a general boost to the local economy.

But the method used to extract natural gas from shale fields – hydraulic fracturing (or 'fracking') – is increasingly controversial, especially in Europe and North America. Fracking involves pumping a mixture of water, chemicals, and sand deep underground to fracture rocks and release deposits of gas. It uses a huge amount of water, most of which remains below ground. But it also spews out 'flow back' or 'slick water' containing the original chemicals used in fracking, as well as additional toxic chemicals including chromium and radium. Opponents to fracking have highlighted the considerable environmental dangers and risks, including triggering of earthquakes, the risk of methane (a potent greenhouse gas) escaping into the atmosphere and, most importantly, concerns of contamination of local ground and water supplies. The latter concerns received considerable publicity following the release of Josh Fox's controversial film Gaslands, which depicted residents living near fracking sites lighting their 'burning faucets' for the camera; their tap water contained enough leaded methane to make them as flammable as lighter fluid.

Dr. Elizabeth Bomberg is a Senior Lecturer in Politics and International Relations. Photo: Edinburgh University staff profiles, School of Social and Political Science.

While the benefits and risks of fracking are similar across the globe, the process has been developed in dramatically different ways. In the US, shale extraction has proceeded at fever pitch, prompting a remarkable land rush with firms seeking to lock up drilling rights on land previously considered of little value. A decade ago shale gas was an insignificant source of energy; today, shale comprises nearly a third of America's total gas supply. If the trend continues the industry could employ millions of people and generate billions in tax and licensing revenues.[2] In Europe shale reserves are also massive. France, the UK, the Netherlands, Poland, and Romania all feature significant shale gas basins. Yet enthusiasm for shale gas is decidedly mixed in Europe. In 2011, Britain's Cuadrilla Resources halted fracking test operations after minor earth tremors were linked to its drilling in Lancashire. Operations slowed in Poland due to perceived drilling costs; and test drilling was suspended in Germany for safety concerns. France banned fracking in 2011, citing environmental concerns. It later withdrew exploration permits held by extraction firms. Meanwhile, Bulgaria stripped Chevron of a drilling licence after thousands of protesters worried about health and environmental risks took to the streets in Sofia.[3]

How might we explain the different approaches adopted in the US and Europe? Geology is clearly a factor: although considerable shale exists in both the US and Europe, the local geology is more accommodating in the US. Shale basins are easier to access and tend to occur in places far from densely populated centres. But we need to look beyond geology for a full explanation. In particular, a focus on political factors gives us deeper insight into states' different approaches to fracking. Key amongst these factors are competing interests, different legislative frameworks, and different public attitudes to science and risk.

Shale gas is described as an 'unconventional' fuel, but the political debates surrounding its extraction are nothing new. As is the case with other environmental issues, fracking features powerful industries, elected officials keen to increase employment and revenue, public concerns about safety and pollution, and environmental groups keen to stop what they see as an environmentally devastating development. All sides seek to use the media and contested science to win the support of lawmakers and the public.

The US already has a vast extractive industry infrastructure. Its oil services industry is well positioned – and eager – to contribute to the extraction of shale. Firms such as Exxon, Chevron, and local subsidiaries have invested huge amounts in drilling technology, as well as exploration permits and lobbying. Much of the legislation regulating the process is based at state level, where firms work closely with state legislators. For instance, in Pennsylvania – the centre of Marcellus Shale, the largest shale

comparative politics of fracking

development of natural gas extraction across polities

gas reserve in the US – the industry-led 'Marcellus Shale Coalition' ran an influential multimedia campaign emphasising the positive element of shale gas, sponsoring public rallies and 'advisory sessions' with elected officials.[4] In Washington DC these firms also lobby heavily, and to good effect. In spring 2012 federal legislation intended to tighten disclosure of chemicals used in fracking was watered down following significant lobbying by oil industry trade associations and major producers.[5]

Most major US environmental groups are actively opposed to fracking, but they cannot match the resources of established extraction firms and, in any event, are wary of dismissing completely a process that promises to bring down gas prices and create jobs, often in deprived communities.[6] Moreover, while all environmentalists share profound concerns, some are more willing to embrace shale as a 'bridge' to renewables and welcome the shift away from coal. Others see it as a dangerous detour, less a bridge and more a 'rickety pier' to a polluted future.[7] Such ambivalence reflects the divided public opinion in the US. For instance, in Pennsylvania, the state at the centre of the shale rush, the public is worried but still broadly in favour of operations.[8]

In Europe, major environmental groups are adamantly and consistently opposed to fracking, and public opposition based on environmental and health risks is widespread.[9] Broadly different approaches to science and risk are helpful in explaining the gaps in attitudes and strength of opposition. In the EU, a 'precautionary principle' prevails amongst the public and policymakers. That principle stresses the need to move proactively in the face of risk, to take preventive action (often in the form of legislation) even if the science is not clear – so long as there is reasonable cause for concern. Thus, fracking operations within Europe are approached with extreme caution and are subject to robust EU and national environmental regulations and laws. The precautionary principle is weaker in the US; so whilst the effects of fracking are still unknown – the chief medical officer at the US National Center for Environmental Health noted that 'We don't have a great handle on the toxicology of fracking chemicals, '[10] – US operations have continued apace.

In contrast to the extensive legislative constraints that firms face in the EU, many shale-rich states in the US are notable for their lenient regulation. In Pennsylvania, state authorities have not even levied a severance tax (usually imposed on the removal of nonrenewable resources) on the gas generated in the state. Moreover, drilling companies have been exempt from federal safe drinking water statutes and hence are not required to list the chemicals they push down wells.[11]

Another notable difference concerns property rights. In the US, property owners tend to own the minerals under their property. Consent is easier to obtain if landowners feel they will benefit personally for operations on their land. In most European states, by contrast, mineral rights mainly belong to the state, so incentives for public consent for potentially harmful – and certainly disruptive – drilling are considerably reduced. These differences suggest that attitudes, rules, norms, and 'regulatory terrain' are just as important as the geological terrain in explaining different approaches to extraction in particular, and environmental policy in general.

> "Comparing fracking's development across polities draws attention to the profoundly political decisions at heart: how much risk is acceptable?"

The debates over fracking are just beginning. Comparing fracking's development across polities draws attention to the profoundly political decisions at heart: how much risk is acceptable? Are strict regulatory standards and rigorous monitoring (as recently called for by President Obama) sufficient? Or are unknown risks too great? Can public concerns be assuaged by greater transparency and community engagement? Who stands to benefit most from fracking? Who should benefit? What are the implications of not embracing fracking – greater attention to renewables or just greater reliance on coal? These are practical, but also profoundly political, decisions. Analysts hoping to understand this so-called 'unconventional' fuel will need to pay attention to its novelty, but also to the enduring political questions surrounding it.

[1]Yergin, D. (2011). The Quest. Energy, Security and The Remaking of the Modern World NY: Penguin.
[2]Economist (2012) 'America's Bounty. Gas works' Special Report on Natural Gas. 14 July, p 5-6.
[3]Clark, P. (2012) 'Fightback against the frack attack' Financial Times 26 April.
[4]Rabe, B. and Borick, P. (2012) 'The Conventional Politics of Unconventional Drilling: the Case for Shale Gas Development in Pennsylvania'. Paper presented at the Annual Meeting of the Canadian Political Science Association, Alberta, June 2012.
[5]Broder, J. (2012) 'New Proposal on Fracking Gives Ground to Industry' NewYork Times 5 May, p.A16.
[6]Marcellus Shale sits below some of most economically deprived communities of the US.
[7]McKibbon, B. (2012) 'Why Not Frack?' New York Review of Books 8 March.
[8]Rabe, B. and Borick, P. (2012) 'The Conventional Politics of Unconventional Drilling: the Case for Shale Gas Development in Pennsylvania'. Paper presented at the Annual Meeting of the Canadian Political Science Association, Alberta, June 2012.
[9]Clark, P. (2012) 'Fightback against the frack attack' Financial Times 26 April
[10]McKibbon, B. (2012) 'Why Not Frack?' New York Review of Books 8 March.
[11]McKibbon, B. (2012) 'Why Not Frack?' New York Review of Books 8 March.
[12]There are important exceptions, including the extremely unlucky residents of western Pennsylvania who were sold land, but not mineral rights (New York Times 30 June). They suffer considerable side effects and risks, but for no individual gain.

A common global effort or the

Marcus Gustafsson takes a critical look

As a delegate to the Rio+20 UN Conference on Sustainable Development in June, I saw first-hand how the international political system failed. As I followed hour upon hour of negotiations, I saw the hope for renewed political commitment, new environmental institutions, and a worldwide green economy slowly being reduced to nothing. As the environmental dangers facing our planet grow more urgent, the political will to change is becoming weaker.

In his documentary *An Inconvenient Truth*, Al Gore points out that we seldom notice incremental change – as a frog submerged in slowly heating water does not notice the heat until boiled alive. Now, as world leaders focus on the economy while turning a blind eye to sustainable development, they are making the same

> "Are global solidarity and a worldwide sustainable development possible?"

mistake of not looking at the overall picture. It does not currently seem that international politics will be able to solve what is likely to be the greatest challenge facing humanity this century: how, as we approach the limits of the planet's finite resources, are we to restructure our societies to live within our means?

National leaders continue to prioritise short-term goals over long-term sustainability. With a system of nation-states and no global government, are global solidarity and worldwide sustainable development possible? Has the progress of human civilisation and political organisation reached a dead end?

The climate failure

The Rio conference is not the first environmental failure, but rather part of a recent trend beginning with the annual UN climate summit in Copenhagen in 2009, where leaders were unable to agree to a second period of the Kyoto Protocol. At the Durban climate summit last year – where, as in Rio, I found myself in the midst of a frustrated civil society – Canada announced that it would quit the Protocol altogether, with Japan and Russia following suit. Together with the United States, which has never ratified the Protocol, these countries represent close to a third of global CO_2 emissions.[1]

Illustration by Holly Jameson, with permission

It has been noted before that the UN is too weak to exert any real influence in an anarchic international system; the failure of the environmental conferences exemplifies this truth. The realist assertion that without global government nations will act in their own interests seems true in view of international climate and sustainable development negotiations. Canada, for example, left the Kyoto Protocol, having increased its emissions in recent years, to avoid the financial punishments it would have suffered going into a second period.

The United States behaves in an equally realist fashion: self-interestedly and with a focus on relative rather than absolute gains. From the very beginning, the main obstruction to a global climate deal has been the United States' refusal to accept the notion of 'common but differentiated responsibilities', which implies that developed nations, having

dead end of international politics?

at realism in environmental politics

polluted far more historically, and without the need to lift their populations out of poverty, should make greater emissions reductions than developing nations. The United States maintains that all nations should reduce emissions equally; as the elder George Bush infamously put it during the UN sustainability conference in Rio in 1992: "The American way of life is not up for negotiation."

The obstruction of justice

Yet the realist paradigm does not hold true across the board. There are clear elements of constructivism in the consistently ambitious European stances on sustainable development and climate change. European states, in contrast to

"Calls for global justice and democracy will fall on deaf ears as long as the realist paradigm continues to be pursued."

North American ones, are acknowledging historical responsibility, as well as heeding scientific data.

However, as environmental issues are global in nature, everyone must participate. This need for consensus means that a single large nation, acting on a realist basis, can bring negotiations to a standstill. While the US holds justice and democracy in very high esteem domestically, it is effectively blocking both in the international arena. It is particularly African and small island states, who happen to have the world's smallest carbon footprints, that stand to suffer the greatest impact from climate change – climate change caused primarily by the industrialised West.

Our minority's high standard of living is directly contributing to the worsening of the majority's; but calls for global justice and democracy will fall on deaf ears as long as the realist paradigm continues to be pursued. Why should the principles of democracy and equality between individuals, held domestically in many states, not transcend national borders?

The momentum of catastrophe

A fundamental ideological shift is needed – away from a pure growth focus to also account for environmental costs. We cannot afford not to pay for our environment; and we must recognise that we are trespassing on the planet's limits. With the growth rate of today's developing world, the notion that we might be able to balance or decouple growth without forceful political intervention, and before those limits are breached, is a utopian illusion.[2]

The Rio conference had the potential to signal such a shift. It was an opportunity missed. Will a catastrophe be required to create enough momentum for the nation-state to abandon realism, and embrace global solidarity?

The EU shows that the momentum of catastrophe need not be a requirement for solidarity. And not even the US wants

"It is time to abandon realism and narrow-minded nationalism, and embrace globalism."

to see human civilisation regressing, even if their continued pollution makes sense from a realist perspective. Today's wars, poverty and famines are not global occurrences; in these cases, realism is a tenable policy alternative. For sustainable development, it is not: no one gains from the destruction of a common planet.

Neither is it tenable for the US and other western nations to ignore the the notion of global democracy. The unwillingness to cede western influence over the IMF and the World Bank recently led to the announcement of a new international development bank by Brazil, Russia, India, China and South Africa at the latest BRICS-summit. If international institutions are not reformed to respond to the emerging global landscape and its contemporary challenges, they will become obsolete. The UN, with its archaic Security Council structure (where, once again, the US is the major reform opponent) will quickly lose its relevance. Western nations will be better off reforming the institutions that they themselves created and are already part of, than seeing the international community become divided beyond their influence.

The train of globalism

The world is moving. Fast. It is time to abandon realism and narrow-minded nationalism, and embrace globalism. Globalism with all its implications: the need for sustainable development, climate change mitigation, and global democracy.

Is our main political institution, the nation-state, suited to this shift? Let us hope so. Let us hope that realism and self-interest can be overcome without the momentum of a catastrophe. Let us hope that human greatness amounts to more than, like the frog, being cooked alive as each of us navel-gazes at our national interests.

[1]Interntional Energy Agency (IEA) (2011), CO2 Emissions from Fuel Combustion: Highlights, Luxembourg: IEA Publications.
[2]Jackson, Tim (2009) 'Beyond the Grwoth Economy', Journal of Industrial Ecology, 13(4), pp.487-490.

Bisphenol-A: Chemical found in plastics is toxic to humans

Alex Ross on the health dangers posed by a widely used chemical

John Peterson Myers and his family have stopped buying canned food. "I refuse receipts whenever I can. My default request at the A.T.M. is 'no receipt.' I never ask for a receipt from a gas station".[1] Peterson is not an irrational conspiracy theorist; he is Chief Scientist at the National Institute of Environmental Health Sciences. He is concerned about the threat posed by the chemical Bisphenol-A (BPA).

BPA has been used to make plastics since the 1950s. It is widely used in plastic food packaging, tin cans (as a barrier between food and metal), receipt paper and water bottles. A particularly frightening characteristic of BPA is the ease with which it is absorbed, even at room temperature. A 2007 study found that BPA in the epoxy lining of cans had contaminated half the canned food, beverages and infant formula randomly bought at US supermarkets . Large quantities of BPA in receipts can be absorbed through skin. Just leaving a receipt in your wallet for twenty four hours can cause the paper money it is in contact with to absorb dramatic levels of BPA, creating a secondary source of exposure. These frightening findings may explain why a US Center for Disease Control and Prevention study found BPA in the urine of ninety three percent of Americans over the age of six.

> "...typical BPA levels found in most people can lead to 'changes in the prostate, breast, testis, mammary glands, body size, brain structure and chemistry.'"

But how does BPA affect us? In 2006, a review of the literature concluded that typical BPA levels found in most people can lead to "changes in the prostate, breast, testis, mammary glands, body size, brain structure and chemistry". A Tufts Medical School study established a connection between BPA levels and various types of cancer . For children the effects are amplified. They have the highest daily intake of BPA of all groups and their underdeveloped livers struggle to break down the toxin. The dangers of BPA are finally being realised by governments. In 2010 Canada declared BPA a 'toxic substance' and it has since been banned in baby bottles in the EU, Canada and the US. France has taken more decisive action, passing legislation that will ban all products containing BPA by 2014. This move is a victory for the health of French citizens and will help introduce the issues surrounding BPA to the mainstream medias of other nations. If the European Union takes the health of its citizens seriously, it too should look into implementing a ban. Under the World Trade Organisation's Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) the EU has the right to restrict imports that use BPA on the grounds that it threatens consumer health. If the EU does not feel the scientific evidence is strong enough to justify an outright ban, it can act on the 'precautionary principle' established in the Lisbon Treaty and recognised in the SPS agreement, and temporarily ban a good, or substance, if a threat to public health is established but the scientific evidence is inconclusive. Of course, invoking the right to restrict imports under the SPS agreement or the precautionary principle would be met with hostility from US exporters, as they would find their markets reduced. In the late 1990s the US reacted angrily to a precautionary EU ban on hormone treated beef during the Mad Cow Disease scare; it subsequently imposed $125 million of extra tariffs on EU goods. With the Eurozone still in a precarious financial position they will be anxious to avoid a similar dispute. However, the evidence demonstrating the danger of BPA is mounting. For a substance so ubiquitous in our society, the threat must be taken seriously. How many more lives are to be risked before governments take action?

[1]Kristof, N, D. (2012). How Chemicals Change Us. Available: http://tinyurl.com/7wacgst. Last accessed 13th Aug 2012.
[2]Lunder, S. (2010). BPA in Store Receipts. Available: http://tinyurl.com/3xtjbfd. Last accessed 12th Aug 2012.
[3]Liao, C., Kannan, K. (2010). High Levels of Bisphenol A in Paper Currencies from Several Countries, and Implications for Dermal Exposure. Enviromental Science and Technology. 45 (16), pp6761–6768.
National Institute of Environmental Health Sciences (2011). Since You Asked - Bisphenol A. Available: http://tinyurl.com/6kak7ss. Last accessed 12th Aug 2012.
Vogel, S. (2009). The Politics of Plastics: The Making and Unmaking of Bisphenol A 'Safety'. American Journal of Public Health. 99 (3), pp559-556.
Soto AM, Sonnenschein C. (2010). Environmental causes of cancer: endocrine disruptors as carcinogens. Nature Reviews Endocrinology. 6 (7), pp363–370.

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Don't cry over the price of milk

How we are to feed the increasing global population? By Rory Martin

Few things create a more hostile attitude towards big business than when bankers line their pockets with bonuses paid for by mortgages and taxes. After the recent strikes by dairy farmers, it now seems that the likes of Tesco are taking aim at Farmer Clive and the common cow. George Orwell's famous Animal Farm has seemingly become reality.

Although there should be concern about the survival of farmers, there are major challenges and opportunities ahead as farming globalizes. The survival of farming in this country is dependent on many changes taking place. Emerging markets, such as China, India and Brazil, have grown both economically and demographically – Brazil has grown more than the population of the United Kingdom in thirty years. The world population has grown exponentially during the past century, surpassing any period of human history. This means, of course, more mouths to feed.

Continent-sized swaths of rainforest have been uprooted and cleared for agricultural use, while China's economic boom has been so great that there are simply not enough people moving to the cities. Its growing middle class coupled with the aging population - caused by its one child policy - has meant that there are not enough young Chinese workers either. Instead it has had to look abroad to feed itself as well as fuel its factories.

British farming risks, in spending all its energy on a domestic fight, missing out to foreign competition. According to the Environment Secretary Caroline Spelman, after Ireland the U.K. is the best climate for grass in Europe, an enormous advantage that is not being exploited. Clearly, it makes sense to find different sources of revenue as the British market faces price deflation.

Structurally there are weaknesses too. Even though statistics suggest that farm productivity is high, considering it makes up only 0.7% of Britain's GDP, it is not nearly as much as it could be. Despite the cries of environmental and animal rights activists, the U.K. needs to further open up, intensify, and industrialise the sector. For too long there has been a highly conservative and protectionist culture both in Britain and in Europe, perpetuated by the Common Agricultural Policy. There should be no fear that Chinese imports will harm our market, as current trade negotiations with Switzerland have proven enormously positive.

Developing nations face the exact opposite problem. They must provide enough food for their populations while still exporting enough to promote economic growth. This is critical because agriculture generally accounts for 45-90 percent of total output and 60-90 percent of employment. In 2008, before the start of the current global economic crisis, the World Trade Organisation's Doha talks collapsed amid India's concerns over the impact of trade liberalisation on food security for its two hundred million famers. There still remains a lack of equal access for many third world farmers, and stagnant Western demand holding back economic activity.

"Despite the cries of environmental and animal rights activists, the U.K. needs to further open up, intensify, and industrialise the sector."

The global economic situation, development, and farming are all issues that are inextricably linked. Increased competition drives down prices to more affordable levels for both domestic and foreign consumers, as techniques are made more efficient to produce more for less, thus increasing food security. More wealth will mean that developing economies can diversify and specialize. Therefore, how we manage our land requires fair, careful, but real liberalisation.

Although some would say that increased industrialisation and liberalisation comes at the expense of increased greenhouse gas emissions, this is not necessarily true. Total greenhouse gas emissions produced from UK agriculture have come down from nearly 64 million tons in 1990 to just over 52 million tons in 2010. In contrast, in the USA emissions have risen in the same period by 14.5 per cent and have been more or less stable for the last five years. Environmental concerns can be allayed because it is not conclusive as to whether agriculture in a more industrialised world will lead to higher carbon emissions and perpetuate global warming. Numerous other factors such as culture, climate, and diet make this reasoning a bit simplistic. Unless overnight India, China or even Thailand switch from eating rice - which is not a high emitter – to a western diet then we have nothing to fear.

Illustration by Holly Jameson, with permission.

To look beyond our wallets and onto the horizon of the world's problems is critically important, and not entirely removed from our immediate concerns. A few pence on the price of milk then pales in comparison to the basic question of how to put food on the table of billions. Are we getting ready?

The politics of water

How water scarcity threatens geopolitical

All life is water. It makes up 70% of the human body and composes 95% of our blood. Modern society allows us to take water for granted, since its consumption requires only the turning of a tap. We grow up in an environment where water scarcity is neither experienced nor heard of. Access to potable water must, however, be taken seriously. Of the planet's total surface area, 71 percent is composed of water. Of this vast amount, 97.5 percent is saltwater, leaving 2.5 percent as freshwater available for consumption. But of this portion, 70 percent is frozen in icecaps while 29 percent lies underground as soil moisture. That leaves us with a minuscule one percent freshwater available for human consumption.

Besides consumption, we depend on water to produce goods from food to industrial products. Water is critical to the production of electricity, coal mining, and oil and gas refineries. Yet we are unaware of water scarcity, and so many of us lead lives oblivious to the consequences of this diminishing commodity. Water scarcity affects 40 percent of the world's population and by 2025, two-thirds of the global population will be living in water stressed conditions.[1]

A water crisis is looming—75 percent of the world's population could potentially face freshwater scarcity by 2050.[2] The availability of water is thus essential in the development of national economies and government policies in the future. Global water shortages are already threatening economic growth and geopolitical stability.

This article will draw its focus on South Asia's water crisis and its politics, where the matter is gaining increasing attention and has major implications for the region's population.

The politics of water

Water will inevitably become a source of conflict in South Asia. The region's three major rivers — the Indus, Ganges, and the Brahmaputra — sustain water supplies for China, India, Pakistan, and Bangladesh. These countries fall into a region classified as water stressed; meanwhile, the region's population increases by 25 million per year.[3] According to the Asian Development Bank, South Asia's per capita water availability has dropped by 70 percent in the last 60 years.

India as both an upper and lower riparian country finds itself in dispute with downstream neighbours Pakistan and Bangladesh, who accuse it of attempting to dominate water flows. India, meanwhile, fears the same of upstream China who is planning extensive dam building projects over the Tsangpo River, the largest river in eastern India.

The construction of Baghilar Dam in the disputed Kashmir region near Wular, the largest freshwater lake in India, has triggered fierce opposition from Pakistan, who sees it as an effort to withhold and divert their rightful water. The view is that the Baghilar Dam marks the beginning of Indian control over the headwaters of the Indus.[4] The accusation is that India intends to block Indus River access to make Pakistan entirely dependent on India.[5] The cumulative effect of Baghilar Dam and similar projects could enable India to store enough water to limit the supply to Pakistan at crucial times in the monsoon seasons[6], fomenting significant bilateral tension.

Illustration by Julius Colwyn, with permission.

Upstream, India dismisses these allegations, stating that projects like Baghilar Dam consume nothing since water must flow to run turbines and such dams merely delay a river. India claims to abide by the Indus Water treaty of 1960 which sets out how water is to be shared post the partition of the Indo-Pak subcontinent. The treaty details exactly how each side must use cross-border rivers—mainly applying to the streams that flow from Kashmir to form the massive Indus River which is Pakistan's lifeline.[7] Pakistan's objection to the Baghilar Dam design has invited international arbitration in the past. India has accepted modifications to the design of the dam based on this arbitration.

To add to the geo-political tension of the region, more dams and hydropower projects in Kashmir are on the agenda as India grows economically. The Indian senate reports 33 hydro projects in the border area with over 60 dam projects planned.[8] This could easily spark new confrontations. The latest is on the Kishanganga River, where both countries are racing to build a hydropower dam on their respective sides of Kashmir's disputed line of control. India's dam will divert river water, decreasing water flow to Pakistan's downstream dam, diminishing planned power capacity and depriving an expected 600,000 people of adequate irrigation water.[9] Once again, in September 2011, India was ordered to suspend building for further arbitration.[10] Pakistan's concern over India's control of water flows and the building of hydro projects will only increase with time. The Indus waters over 80% of Pakistan's irrigated land and serves 180 million people, making the coun-

in South Asia

stability in South Asia, by Ally Memon

try deeply sensitive to water scarcity.[11] More political row is certain in the future between India and Pakistan as both nations become increasingly desperate for water access. India may continue dismissing Pakistani concerns quite easily given its convenient position upstream. But India faces its own is downstream concerns thanks to its border with China.

China refuses to recognise Arunachal Pradesh as India's land, and disputes over the region's rivers create rifts over territory. One of India's largest rivers, the Brahmaputra flows south from Tibetan Plateau into Assam. Most recently, India has faced China's blockage of an attempt by the Asian Development Bank to prepare for a dam project in Arunachal Pradesh.[12] India appears very concerned over the construction of several hydroelectric schemes being built upstream on the Tsangpo and the alleged intentions of China to divert the Brahmaputra to farmers in the water-scarce central and eastern regions. India's position downstream fosters its fear that China will control the Tibetan plateau, an important source of water for the densely populated states of northern India.[13]

An inevitable problem and growing concern

What remains certain is that South Asian basins depend on China to let water flow freely to them downstream. That is because the main river systems—the Indus, the Ganges and the Brahmaputra—are all connected to the Tibet Autonomous Region of China.

With China and India's speedy construction of dams and hydropower plants to meet their water and energy needs, the region is witnessing cross-nation dependence. Imbalances of water availability present potential for inter-state conflict. The Indus Water Treaty of 1960 and other bilateral treaties are not adequate to stop the dam-building races of upstream countries spurred by the need for energy and the insecurity of diminishing water sources. Put simply, what upstream nations view as a need, downstream nations view as a threat.

Scarcity of water will become harder to manage as the region's population grows by 1.7% yearly, creating more demand for food as water tables diminish and as uncertain climate change increases. The effects are already apparent—increased pumping for groundwater because of dry water tables has led to arsenic poisoning of over 77 million people in Bangladesh.

Weak river flows in several south Asian rivers are unable to dispose of waste (both natural and artificial) and the waters are becoming increasingly unsafe for drinking, cleaning, and cropping. This leads to parasitic diseases such as Naegleria and deadly viruses like dengue fever. Filthy waters and poor sanitation spread disease such as diarrhoea and cholera, killing millions every year in repeated epidemics. Water tables are dropping, evidenced by the Ganges' entrance into Bangladesh and the delta of the Indus in Pakistan, which are becoming walkable deserts.[14]

Governments in South Asia can deal with the growing water scarcity by improving water management systems and collaborating with one another rather than sprinting to build dams and divert water. If grim relations between South Asian countries persist, then they will provoke clashes rather than cooperation over water.

Unwillingness to negotiate on river sharing issues signals impending discord over water in South Asia. Urgency is needed to create multilateral arrangements under international law and to practise inter-basin water sharing; otherwise, armed conflict may be on the horizon for the increasingly water-stressed region.

In the words of Alexandra Cousteau, "Water will be the defining crisis of our century, the main vehicle through which climate change will be felt—from droughts, storms, and floods to degrading water quality. We'll see major conflicts over water; water refugees. We inhabit a water planet, and unless we protect, manage, and restore that resource, the future will be a very different place from the one we imagine today."[15]

Benjamin Franklin once said, "When the well's dry, we shall know the value of water." It is time to wake up to the fact that the wells are running dry. Water scarcity is—and increasingly will be—a threat to geopolitical stability in South Asia and beyond. The escalating rivalry between South Asian countries over their region's rivers only intensifies the problem. Diplomatic dialogue and political cooperation is the only way forward.

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Ethicool – Offering a rebranding opportunity for environmental causes

Will Ross on commodifying the 'environmental' for all the right reasons

The last four years of economic uncertainty have provided a useful vortex for the consumption of ideas and objects. Financial uncertainty, for all its problems, forces a refreshing reassessment of what is valuable, and what we really need. For environmentalists, the recession is a godsend, providing the climate to promote their cause on economic grounds. Aside from the leverage that price-point marketing has in a financial downturn, now might be the time to adopt a new line of argument to promote more persuasive feedback loops for environmental products and practice than mere cost.

Wandering down Rue du Bac in Paris during my first university summer, I stumbled upon a bookshop with a selection of coffeetable books. With an hour to spare, I started to dig into two books, one on green architecture and the other on sustainable design. Leafing through them, I started to gain a new awareness of what is functional and what is fashionable within an environmental context. Great design and stunning aesthetics make prompt a new discussion on the marketability of the environment at a micro level. By highlighting the detailed sophistication of many environmental opportunities and their direct relevance to the agent, a new and fashionable lifestyle choice becomes available.

Photos of Mayor of London Boris Johnson cycling on Barclay Bikes during the Olympics brings to light both real and symbolic benefits of this particular environmental practice. Regardless of the current price of motorised public transport in London, the riding of a bike in London, given the depth of its underground network, and congestion at street level, promises outstanding savings in commuting times for metropolitan commutes. Add to the equation the health benefits of cycling, and the welcome alternative to sweltering underground in the summer months, and you have a wholly defensible and sophisticated feedback loop. Instead of pitching the practice as 'moral' or even 'Conservative', cycling takes on a new value to the individual who gets an immediate stimulation from participating in a new scheme that happens to reduce the carbon emissions in London's city centre.

Ethicool - Illustration by Holly Jameson, with permission.

Though globalising environmental issues for climate change builds a compelling moral argument to reduce carbon emissions, demonstrating the immediate and long-term individual benefits of an environmental practice or product raises the chances for mass dissemination and subsequently wider adoption. By linking environmentalism with tangible returns, practices like cycling to work are essentially commoditised, driving a consumer demand based on individual benefit.

In recent years, agribusiness has benefitted from the steady growth of organic food and beverages in Western economies. Despite the drawbacks of the recession, U.S. organic food and beverage sales increased by 7.7 percent in 2010 according to the Organic Trade Association's 2011 Organic Industry Survey[1]. Whilst organic food production helps maintain natural ecosystems at the site of growth and processing, the effects on the food chain's end consumers is perhaps most profound. After all, the same pesticides, herbicides and antibiotics used to increase yield ultimately contribute to the diets of human beings. Again, while there is an important moral obligation to prevent the degradation of ecosystems outside your immediate surroundings, the compelling evidence that poisonous substances reach our own bodies is perhaps more convincing in driving sales of organic food and beverages.

Being accountable for one's own choices breeds the need to justify choice outside social derivations or arguments on cost. If the internet has shown us anything, it has demonstrated the need to be accountable for our choices. No longer is it sufficient to justify purchases merely on cost.

Californian-brand Patagonia Sportswear[2] is one of the leading advocates of environmental causes in the outdoors industry. It has made the most of its online space by listing environmental essays, projects and information on its products. Beyond campaigns aimed at reducing the impact of manufacturing upon the waterways of the world, Patagonia also includes an app on its site to outline its supply chain, The Footprint Chronicles. As well as listing the name and street address of its manufacturers around the world, they also include information on the composition of the workforce, the gender ratio of the factory and their languages spoken. These details on the environmental and social responsibility of the company add depth to product lines which enter at the premium end of the market. By effectively promoting environmental causes through effective campaigns, Patagonia has mustered an incredibly loyal following that look well beyond the product itself when making purchases.

In the pursuit of sophistication, designing environmentally allows for a reassessment of functional and aesthetic principles that were often defined by financial restraint. In many ways, it is no surprise that Patagonia comes up with some of their best performing products when their design and manufacturing principles are under scrutiny. Architects too contribute to the community of growing eco-design by constructing magnificent buildings that incorporate operational excellence with aesthetic elegance.

In an era when greenwashing has left many consumers disenchanted by the promises of environmental causes, it appears that new marketing options might be the way forward in selling environmental causes to consumers and politicians. While responding to economic concerns is always valid as the end result of any good investment, the design and engineering detail of refined supply chains ought to be promoted, as should their direct implications for individual benefit. By emphasising the human effort involved in creating certified products and practices, environmentalism might take on a wider, more humanitarian appeal

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The US election and energy policy

Pauline Op de Beeck determines whether the candidates' respective energy policies help or hurt them.

Many interesting debates arise over the energy policies proposed by the candidates in the upcoming US elections. Those who argue that climate change can be ignored no longer seem to be supported by the record-breaking heat and devastating tropical storms in the US this summer. However, it seems that Mitt Romney is not really paying heed to this global problem, while Barack Obama's attempts have been mostly unsuccessful.

Romney has stated that, if elected, he will give the coal industry a serious boost. This could be a good move, politically: it is argued that West Virginia voted for George Bush in 2000, having voted Democrat in every election since the Great Depression, because of Al Gore's hostility towards the coal industry. Furthermore, since 2000 West Virginia has consistently voted against Democrat measures to reduce greenhouse gas emissions in order to protect their coal industry. Romney's firm position against wind energy is alarming, though[1]. What exactly is he hoping to achieve by ending wind tax subsidies and thus impeding the growth of the renewables industry? Subsidies not only create jobs, but also help to mitigate energy dependence on foreign oil

> "it is interesting to see how the energy industry in the US is still an issue of tradition and money"

and make energy production cleaner. It is estimated that in Iowa, a classic battleground state, 37,000 jobs could be lost if the wind energy subsidies were discontinued[2]. Romney's current stance is therefore unlikely to gain him many votes in the state. If all energy was 'green', it would undoubtedly benefit the world at large; thus it is interesting to see how the energy industry in the US is still an issue of tradition and money, and it manages to swing the vote in favour of the candidate who promises support to environmentally unfriendly industries.

One of the first advertisements of Obama's 2012 campaign was on clean energy, promising funding for solar, wind, and clean coal technology. Although the mention of renewables will

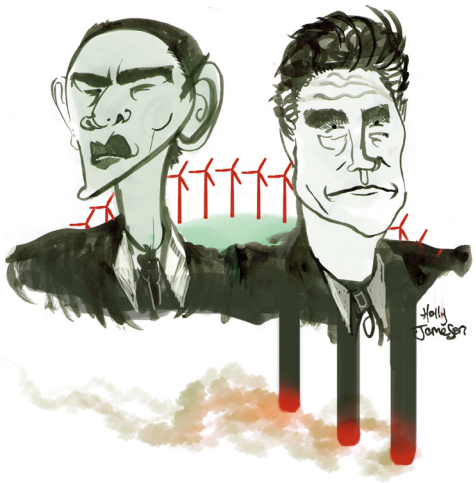

Illustration by Holly Jameson, with permission.

sit well with environmentalists, support for coal is less agreeable. It does, however, give Obama a stronger position in coal-rich states such as Ohio and West Virginia[3]. Although only 16,000 jobs were created in the green energy sector during Obama's administration (instead of the promised 200,000 per year), this would most likely still be more than what Romney's opposition to green technology would result in. Nevada, Colorado and Iowa are all known swing states with vested interests in wind energy, so Obama is expected to address this in the hope of gaining votes.

A frequently voiced concern surrounding Romney's energy policy and campaign and is whether he actually has a "core belief system"[4]. If one tracks his movement along the political spectrum, he gradually shifts from a moderate republican in 2005 further toward the right, in an effort to gain more conservative votes. This begs the question of whether his energy policy stems from sincere conviction or is merely a means to an end. The issue surrounding Obama is his record of under-delivered promises. In a recent advertisement, he aims to produce clean coal with a five billion dollar investment plan. Critics argue that no such technology actually has the ability to produce clean coal on new plants, let alone 60-year-old ones[5]. In addition, the Obama administration gave $535 million to Solyndra, a California-based solar panel company, which ended up declaring bankruptcy and was forced to make 1,000 redundancies[6].

Romney's main focus is minimal government interference with the market, whereas Obama is attempting to combine environmental concern with economics. The contrast between Obama's efforts to create jobs through clean energy and Romney's plans to cut tax credits and fully use America's energy resources for economic recovery might turn out to be a key factor for voters, bringing these energy issues to the forefront.

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Climate change and

Joshua Weininger on why the debate on climate

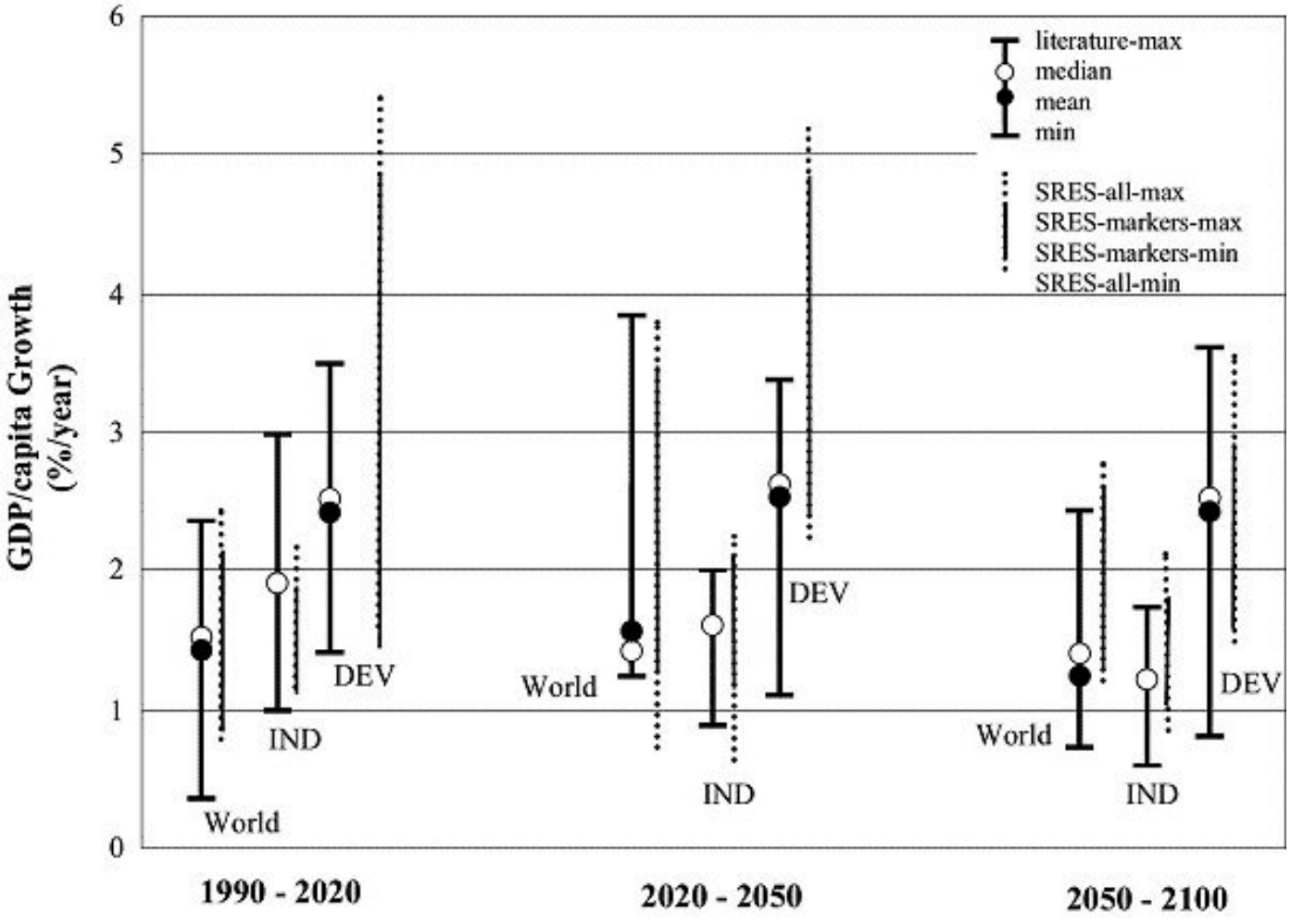
While the controversy over the science of climate change has given way to a powerful consensus, the environmental and economic community still lacks a necessary common ethical framework for formulating a response. The 'difference principle' and utilitarianism are two opposing approaches that could provide such a framework, with powerful implications for the discussion over the value of climate change mitigation efforts.

It is important to establish the fact that, on balance, burning fossil fuels improves the overall welfare of the present generation at the expense of future generations. As a result, climate change mitigation can be seen as the redistribution of wealth from ourselves to our descendants. The question of what the appropriate level of abatement should be leads to a more fundamental question: What level of wealth inequality between the present and the future is ethical?

The difference principle, posited by John Rawls, is one possible answer to this dilemma. The principle is based on viewing inequality from the standpoint of a person who is deciding how society should be ordered but does not know what position in society he or she will have. Rawls argues that this person would try to minimise the risk of having a low living standard and would come to the conclusion that inequality should only be tolerated so long as the poorest in society are made better off than they would be in a society where all people have equal levels of consumption[1]. This approach allows us to view the problem of climate change from an objective participant's standpoint where all humans have an equal claim to our concern.

"What level of wealth inequality between the present and the future is ethical?"

This principle is not only relevant to inequality within a society, but can also be applied to the question of



Source: Intergovernmental Panel on Climate Change

intergenerational inequality

change mitigation requires a common ethical framework

intergenerational inequality. If we did not know which society we were to live in – from the present one to one indefinitely in the future – we would see which society was the poorest, and would try to increase its lot. An environmental policy formulated from this perspective would be averse to any inequality between present and future societies.

"(...) no climate change mitigation investment today should be made unless it is also to the benefit of the current generation."

In order to apply the Rawlsian model to the real world we have to identify which of these societies is likely be the least well off. The answer, according to a variety of projections, is our own. Most estimates predict future per capita economic growth rates ranging from 1.1% to 3.6%[1]. In contrast to the current world average of $11,800 per capita[1], the people of the year 2100 may have extraordinary incomes somewhere between $31,000 and $150,000 in current US dollars[4]. These figures appear even more optimistic when we consider that most of the income growth in that time is expected to be achieved in developing countries[5]. The conclusion is simple; from a Rawlsian perspective, no climate change mitigation investment today should be made unless it is also to the benefit of the current generation.

This view of ethical distribution is in opposition to the utilitarian model. Utilitarianism asserts that the just policies for a society are those that create the greatest amount of happiness for the aggregation of all of the individuals in society[6]. The implication is that inequality within a society should be tolerated to the extent that the overall happiness of the community is maximised.

Unlike the difference principle, when utilitarianism is applied to societies across a time span, the welfare of the poorest generation can be sacrificed if that allows a greater amount of happiness for other generations. When weighing the effects on poor and rich societies, the fact that wealth has a greater impact on the happiness of the poor than on the rich needs to be taken into consideration. Climate change abatement investment may not be worth undertaking even if it requires the sacrifice of several per cent of world GDP to increase the wealth of the average person in 2100 by a possible 20%[7].That loss in our world prevents masses of people from getting out of poverty. That action in 2100 would affect people who may be as wealthy as advanced countries in the world today and may not enjoy a 20% higher income very much, relative to the suffering of our poor.

"Climate change abatement investment may not be worth undertaking even if it requires the sacrifice of several per cent of world GDP to increase the wealth of the average person in 2100 by a possible 20%."

The Rawlsian approach towards inequality leads to the conclusion that despite the sincere intentions of those in support of climate change mitigation, the fact that such investment may increase inequality across generations makes it unethical. The utilitarian perspective, despite having a distinct ethical framework, provides a similar result when applied to climate change mitigation because of the relative poverty of the present generation. Future generations that are likely to have eradicated extreme poverty may in retrospect view such investment as having been deeply unethical towards those who experienced suffering in our own generation. Ethical responsibility does not only lie in our resolve to help others in the future, but also in our willingness to help others in our own time who need it greatly.

Photo by Paris Ackrill, with permission.

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The end of the Caspian Sea

Sebastian Fish discusses the ecological danger posed to the Caspian Sea in wake of the oil boom

Covering an area greater than Germany, the Caspian Sea is the world's largest isolated inland sea. With potential oil reserves exceeding 200 billion barrels[1], the Caspian is second only to Saudi Arabia in its potential wealth. Although the region has been famous for its 'black gold' since the days of Alexander the Great, the sheer extent of the area's reserves of oil and natural gas were only realised in the mid-1990s. This turned out to be the economic catalyst that the Caspian states desperately needed after the disintegration of the Soviet Union and the turmoil that followed. But in 1991, bureaucratic and inefficient Soviet control over the Sea was replaced by corrupt and careless management by its surrounding states.

Due to the Sea's isolated location and low salinity, a unique yet vulnerable marine ecology has emerged in the Caspian. 90% of the world's caviar production comes from a 'critically threatened' 300 million year old species of sturgeon, whose caviar can be sold for up to $10,000/kg in legal or illegal markets. Weak environmental laws and unregulated over-fishing has led to a sharp decline in the annual tonnage of sturgeon caught, from 30,000 in 1985 to a mere 2,400 in 1994. Pollutant poisoning led to 11,000 sturgeon washing up in Kazakhstan in 2000. The population of this fish has decreased 90% since the turn of the 20th Century[2]. The Zander and Caspian Thorn fish are deemed extinct, in addition to numerous potential extinctions of various species of sturgeon[3].

Wikileaks revealed how lax safety standards almost led to disaster in September 2008. A blowout in a gas injection well prompted the evacuation of the entire workforce of BP's Central Azeri platform. Production was halted for months until BP concluded that a "bad cement job"[4] had caused the leak - the same reason for the blowout in the Gulf of Mexico. In 2003 Kazakhstan fined Chevron $600 million for environmental negligence whilst developing the gigantic Tengiz oilfield[5]. Mais Gulaliyev of Azerbaijan's Green Party is worried: "The accident in the Gulf of Mexico shows us that such a disaster could happen anywhere. The United States, with its super-modern technologies, is barely capable of stopping this disaster. You can imagine the scale of the damages to the environment from such incidents in countries like Azerbaijan."[6]

Russia's construction of dams and industrial facilities on the Volga and its tributaries, where 80% of the Sea's freshwater comes from, have put further strain on the wildlife and environment of the Caspian. Untreated municipal waste, industrial pollution, and agricultural runoff, from the outskirts of Moscow to the Ural

Source: Research Institute of the Islamic Consultative Assembly

Mountains, and all of the industrial heartland in between, empties into the Caspian. Infertility in marine life resulting from this pollution is a main contributor to the decline of the Caspian's biodiversity. But fish, seals, and birds are not the only creatures affected. Local inhabitants are also suffering, with higher rates of cancer and miscarriages recorded throughout the region[7]. Many areas are deemed too hazardous to swim in, whilst the bay around Baku is perpetually coated in oily slime.

The Caspian oil boom has only just begun. Serious changes are required to prevent reckless development of the region's energy industry from spiraling this precarious environmental mess into utter destruction. Lessons do not seem to have been learned from the geographical, social and economic collapse of the region surrounding the shrinking Aral Sea, once the size of Lake Ontario. But as the fast-track development of the littoral Caspian states continues, the social dynamic is bound to evolve. Environmental issues may take a greater priority as local inhabitants continue to voice frustration and anger at the worsening condition of the Caspian Sea. Could this combine with other dissatisfactions and lead to Arab Spring-style revolutions?

Western countries, in particular the US, will need to be more guarded in their support of pipeline projects from the region if they want to be credible advocates of environmental protection. The Caspian's strategic central location makes it a resource tug of war between the globally dominant West and the emerging nations in the East. Each side will be battling for influence and access in order to fuel their hungry economies whilst reducing their dependency on Middle Eastern oil. Sitting in the shadow of political powerhouse Russia and neighbouring turbulent Iran, the Caspian region is due much more international attention in the coming decades. We can only speculate as to whether greater international scrutiny will be enough to change the course of the future before it is too late.

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Record-breaking gas deposit discovered in Eastern Mediterranean

Environmental concerns take a backseat in the fight for land rights by Milena Askentijevich

The recent discovery of a natural gas basin in the Eastern Mediterranean has ignited further conflict in a region already deeply embroiled in political turmoil. The basin is estimated to contain 1,025 billion cubic feet of recoverable gas — reportedly enough to fuel Israel for 150 years. The majority of the discovery lies in the Levant basin off of the coasts of Israel, Lebanon, Cyprus, and Turkey who are aggressively competing for rights to the highly coveted land.

The basin is extremely valuable due the allure of natural gas, which is a clean-burning and efficient yet relatively rare energy source.[1] Natural gas is a basic composite of carbon and hydrogen, in the same chemical family as oil and gasoline. Unlike its relatives, however, natural gas comes out of the ground as a gas and has to undergo extensive processing before it can be transported and used as a fuel.[2]

The origins of natural gas can be traced back millenniums to ancient microscopic plants and animals living in the ocean. When these organisms died, they would sink to the bottom of the sea and decompose under layers of sediment which released heat and pressure. If the heat was high enough and the biomass predominately composed of decayed plants, the material would yield natural gas instead of oil. This byproduct, diffused through the ocean, settled into tiny pores in rocks where it was trapped under layers of heavy clay and rock[3] until its extraction millions of years later by energy companies performing highly invasive offshore drilling to excavate the treasured fuel.

Though very similar in composition, oil and natural gas differ in number of ways. Due to the latter's gaseous state, it bears certain advantages and disadvantages that make it more valuable than other fossil fuels.[4] Natural gas yields lower emissions (30% less carbon dioxide than burning oil and about 45% less than burning coal) and burns more cleanly than other fossil fuels. Like coal, natural gas is also imperishable and can be stored in underground reservoirs when demand is low or to preserve for use in the event of a natural disaster.[5]

The exportation of natural gas, however, is challenged by the expense and difficulty of processing it into a transferrable liquid[6] or developing the extensive underground infrastructure to transport it in its original form to local shorelines. These logistical restrictions have prevented the emergence of an international market.

As such, the discovery of the Levant Basin has placed considerable pressure exclusively within the Eastern Mediterranean region. Israel, Lebanon, Turkey, and Cyprus, already entangled in political incongruities, are now confronted by an even further reaching dilemma—one that

> "The general risks associated with deep sea drilling are amplified in this particular territory."

could bear, according to the World Wildlife Fund, irreparable damage on the environment.[7] The general risks associated with deep sea drilling are amplified in this particular territory. According to Gilad Erdan, the Minister of Environmental Protection, this is partly due to "Israel's short and crowded coast along the Mediterranean [which] is relatively more susceptible to pollution and spills than many other countries."[8] The depth of the Levant Basin also poses greater risks as it lies more than a kilometer beneath the ocean's surface and would require drilling more than four kilometers deep.[9] Even with advanced drilling technology and extensive preventative measures, an accident is still possible and would severely and irreversibly damage precious aquatic life and the surrounding environment.

Approximate boundary of Levantine Basin indicated by white polygon. Source: Oil and Gas: *Mergers and Acquisitions Review.*

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Fracking

Hallam Tuck on the cost

Until the late 20th century, natural gas seemed relatively useless. Gas was disposed of during drilling operations, and, until it began gaining popularity as a home heating fuel during the 1950's, most in the U.S. considered it worthless. The volatility of natural gas made it difficult to transport while the relative ease and price of alternate fuels like coal, oil, and nuclear power kept demand for gas low.. In the past two decades, however, the energy sector has faced dramatic change. Major disasters like the Deepwater Horizon oil spill in the Gulf of Mexico and the meltdown of Japan's Fukushima plant have called into question the stability of conventional energy technology. Additionally, innovation such as hydraulic fracturing has allowed the extraction of previously unimaginable quantities of natural gas. This year, the International Energy Agency proclaimed a forthcoming "Golden Age of Natural Gas".[1]

According to the IEA's predictions natural gas will make up a greater share of the energy mix than coal within the next five to ten years, and could become the bedrock of American energy policy by the end of the century. This growth, however, is not without major risks. Technology allowing us to drill in more remote locations runs the risk of polluting ground water. Hydraulic Fracturing, or "fracking", has drawn major criticisms from environmental groups for ruining aquifers near drilling sites in the Marcellus Shale region of Pennsylvania. Additionally, there are worries that natural gas may not be as clean as it seems. Will the short-term benefits of natural gas extraction outweigh the risks of unfamiliar technology and overconsumption? Further research is required to prove that natural gas is a cleaner alternative to oil or coal. There may well be a golden age for gas, but its price has yet to be determined.

"The low price of gas in the U.S. compared to other regional markets is enough of a comparative advantage to produce a significant manufacturing edge."

The economics of natural gas

George Mitchell, the man who spent ten years and six million dollars developing hydraulic fracturing technology, might reasonably be called the father of the natural gas revolution. Mitchell's improvements to fracking technology have allowed the extraction of natural gas from vast beds of shale rock. Shale gas currently makes up half of the American gas supply, and could make up as much as half of total supplies by 2035.[2] American gas reservoirs can be found abundantly in Ohio, western Pennsylvania, New York State, Texas and North Dakota. The drop in extraction prices spurred on by continuing innovation has driven down break-even costs, contributing to the increase in profitability of natural gas production. The inability to export significant quantities of gas, combined with overwhelming supply, has created a surplus in the U.S. market, resulting in a price drop from 4.5 USD per Million BTU in the summer of 2011 to just over two dollars per mBTU in May of this year.[3]

The short term beneficiary of this drop in prices has been the petrochemical industry, which has switched from oil-derived naphtha, an essential part of petrochemical products, to ethane, a product of gas. This switch has driven down the price of chemicals for fertilizer, and resulted in cheaper raw materials for everything from agriculture to household goods. Use of ethane has driven down demand for oil among manufacturers and mitigated oil-price increases. Natural gas, however, may have the largest effect in transportation, where it serves as a much cheaper, more efficient alternative to petrol. Although the technology for the compression of natural gas for vehicles has yet to be perfected, gas would make a suitable fuel source for garbage trucks, public buses and other maintenance vehicles.

Although President Obama has been dealt a blow by high oil prices, the decrease in natural gas prices has saved the average American household 926$ last year, and he was quick to point to deep gas reserves as a sign of energy stability during his last state of the union address.[4] The low price of gas in the U.S. compared to other regional markets is enough of a comparative advantage to produce a significant manufacturing edge. UBS, a Swiss bank, predicts that this could add 0.5% to U.S. GDP over the next five years.[5] In such a difficult economic climate, the promise of energy stability and a natural gas-driven manufacturing resurgence seems too good to be true.

What is the cost of a golden age of gas?

From an environmental perspective, the expansion of natural gas is not so simple. Although natural gas may have overwhelmingly positive economic benefits, fracking has undergone its fair share of political roadblocks. Governor Andrew Cuomo drew heavy criticism for his proposal to allow fracking in western New York State. Although the state's Department of Environmental Conservation initially supported the plan, outspoken criticism forced the state government to reduce the number of permits for fracking from 75 to 50.[6] Fracking has received the most criticism for the risks it runs of polluting groundwater with Methane

the future

of a golden age of gas

and the mixture of chemicals used to break up shale rock known as "Fracking Fluid." Although gas advocates, like Rex W. Tillerson, the chief executive of ExxonMobil, assert that there have never been any cases of freshwater aquifer contamination by fracking rigs, numerous unpublished reports from the Environmental Protection Agency shown that this is not the case.[7] The documents, obtained by the New York Times, show that EPA officials identified a gas well as the cause of pollution at a site in the Appalachian Basin. According to the report the groundwater had been deemed undrinkable because of high levels of manganese, sodium, and fluoride in the water, and the presence of methane gas.[8] A chilling Youtube video posted last year shows a Pennsylvania man conjuring fireballs from his kitchen faucet by lighting the methane gas in his tap water with a match.

Illustration by Holly Jameson, with permission

Aside from the criticism fracking has received for water pollution, debate continues over how sustainable natural gas extraction is. Shale gas advocates, like Alan Riley, assert that switching to gas would quickly and sharply cut carbon emissions, giving government and industry time to develop sustainable alternatives to hydrocarbons. This is controversial, not only because natural gas is a fossil fuel, but also because a recent study from Cornell University suggested that from production to consumption 7.9% of shale gas is released into the atmosphere.[10] Although EPA research research has put the total at 2.2%, a figure anywhere near the high end of that range would make unconventional natural gas just as dirty as oil or coal. If researchers prove that fracking's carbon footprint is greater than coal or oil, then the future won't be so bright for natural gas.

"If researchers prove that fracking's carbon footprint is greater than coal or oil, then the future won't be so bright for natural gas."

The future of fracking in the U.S.

In the short-term, the future of natural gas in the U.S. will be determined by the price levels of conventional energy sources, and by the fortunes of wells in struggling areas. A significant drop in the price of oil would suppress demand for gas and aggravate the existing surplus, making new capital investments in gas inefficient. If, however, gas continues to be the cheapest raw material for petrochemical manufacturers, then it is hard to foresee a scenario in which consumption of natural gas does not heavily increase.

The position of natural gas in the more distant future will be determined as the environmental effects of the production and use of natural gas are more precisely understood. If water pollution can be prevented and the carbon footprint of natural gas is proven to be less than that of oil or coal, then very little stands in the way of a shale gas oriented energy future for the U.S. Neither of these factors is given, however. The fragile state of our environment and the tolls exacted by the use of earlier forms of energy production necessitates that the cleanliness of natural gas be guaranteed before we go any further.

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China: choking on its own success?

How will China combat its endemic pollution? By Annie Kowalewski

China is a powerful nation. With the world's second largest economy, and fastest growing GDP over the past decade, there is no doubt where China now stands in the international system. Yet to get to its current level of manufacturing and development, China has made many environmental sacrifices; sacrifices that resulted in harmful effects which it is currently trying to counteract.

Today, China is heavily involved in the 'Green movement'. It has signed many international agreements, including agreements on climate change, environmental modification, hazardous wastes, ozone layer protection, and protection of the Antarctic. It is currently the world's largest manufacturer of wind turbines[1]. With its communist government, China is able to pump out policies with assembly line precision and speed. So far, China has implemented many domestic policies in an attempt to increase the environmental health of the country: banning free plastic bags in grocery stores, prohibiting companies from dumping waste into water lines, requiring trash cans on every block of the city. However, most of these policies have failed.

Whilst China has invested in policies and research on environmentally friendly alternatives, the country still has serious problems with pollution, acid rain, and landfills. Pollution alone causes hundreds of thousands of deaths each year, and, according to the standards of the European Union, only 1 per cent of the 560 million people who live in cities breathes 'safe' air[2]. The International Energy Agency has recognised China as the emissions leader of the world[3] , and nearly 500 million people still do not have regular access to safe drinking water[4]. With China taking so many steps to curb the effects of industrialisation, why are there still such extreme problems?

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The foremost reason lies within the foundations of the society. Modern China was built on Deng Xiaoping's idea that "a rich life is a glamorous life, "[5] and that material gains were to be sought after. In the 1980s, people and companies were instructed to disregard environmental concerns and focus only on acquiring or manufacturing material goods and gaining influence, individually and as a nation. Much of the younger generation grew up in smoggy cities with littered pavements. As a result, it does not tend to see much wrong with current conditions. Never having known anything different, young people show no desire to change the environment, or their habits, like throwing litter out of their car windows.

Of course, that is not to say that China will never change. In 2008, when the Olympics were to be held in Beijing, the government strictly prohibited companies from releasing toxins into the air and mass campaigns were implemented to teach people to clean up after themselves. Therefore, China clearly has the capability to improve its environmental conditions; the Communist Party just needs the proper motivation. Unfortunately, there has not yet been sufficient motivation. China may be implementing policies to help protect the environment, and many of these policies may have fallen short, but unlike during the Olympics, the government has made no attempt to force implementation. While reining in manufacturing to improve living conditions seems the logical thing to do, the central government's strength lies in fast growth. Slowing the economy could create social unrest, lessen China's business interest appeal and, as a result, jeopardise the party's iron-fist rule. This is why there has not been any sort of strong follow-up to the policies' effectiveness.

Recently, however, it seems that the Party is getting more motivation to put environmental concerns before economic growth. Rapid industrialisation currently means rapidly burning through China's natural resource pool, and the leadership has started to realise that it cannot sustain this much longer. Also, as China increasingly opens itself to the outside world, its people are being exposed to places with less environmental degradation and are beginning top wonder why they live in such inferior conditions. As a result, demonstrations and protests have happened all over China, with people demanding that the government put a stop to its environmentally unfriendly practices, and calling for a better quality of life. While some of these protests have been ineffective and quickly extinguished by the government, others, such as the recent ones in Qidong, have shown that some people in China are dissatisfied with their environment, and that they will speak out until the government improves conditions[6] . These protests may only represent a little bump the Party has to smooth out before continuing on its road of economic growth; but they may mark the start of China reaching its full potential not only economically, but also environmentally. Whatever happens, if China continues on its current path, it may just choke on its own success.

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The urban farmer

Briana Pegado challenges conventional practices and attitudes toward food.

Wake up. Stretch sore muscles. Get dressed.

This revolution is televised. In recent years, it has become a national concern, thanks to the likes of Jamie Oliver, Michelle Obama and others that have identified the root of the problem. Our bodies are failing us. We are plagued with obesity, diabetes, heart disease, and other preventable food-related health conditions in the United States. Meanwhile, below the equator, we have no access to clean water, suffer from food scarcity, and its related health conditions. We watch our food being shipped to far-flung destinations we can only imagine in our wildest dreams.

'Aha!' moments have inundated the food community, prompting us to reexamine our relationship with food. The grassroots food moment is particularly vibrant in Milwaukee, Wisconsin. Researched and pioneered at the University of Stirling, among others, and used by the likes of *Growing Power and Sweet Water Organics*, innovators have made use of overlooked farming space with indoor and outdoor aquaponic systems that reinvent aquaculture and hydroponics. Many other initiatives have sprung up across the region. The farmer is being reinvented.

The farmer from Kansas, who lives two doors down, waits patiently for you to join him on your morning walk five blocks to the farm nestled within a food desert, an urban farm. Collect your lunch made of fresh fruits and vegetables from your staff market basket. You arrive on-site and start your daily chores.

These visionaries have offered us a way to challenge farming practices that meet an increasing demand for cheap food by a growing population. However, certain barriers and realities exist. Think of them as our chores.

The economics of our food system dictate we must meet an increasing demand for convenient and affordable food. We have an exponentially increasing population and exponentially increasing demand. Basic market forces have adjusted and large corporations have emerged to meet this demand. In the U.S., this system comes in the form of CAFOs (Concentrated Animal Farming Operations), genetically modified produce, increases in demand for wheat and corn, and government subsidies for agribusiness. Historically, the working class was found in rural communities and provided for their families by growing their own food. Increasingly, these households are located in urban centers and can no longer provide for their families nor afford to eat well. Urban farming projects are the exception, not the rule. They are also not the only solution, but part of a larger arsenal of strategies to solve this crisis.

Photograph by Briana Pegado, with permission

Walk through humid greenhouses filled with hanging pots, rows of pea-shoot trays, wooden four feet deep fish tanks filled with North African Tilapia and native Mid-western perch. Greet fellow interns and staff. Soak in the smell of foliage and algae water. Outside of the lab sits your tools—shovels, spades, and hoes—and in the open air one of your compost stations. Fresh fruits and vegetables decompose with their carbon components, woodchips and cardboard. The compost begins to decompose and mix.

The compost of our collective actions is creating one messy batch of soil. Sustainable development is already vaguely defined and even its most passionate supporters have reservations. For these small urban farmers, organizational capacity does not always match technological prowess. These organizations can experience lack of efficiency, meager funds, low worker productivity, and high worker turnover rates, creating an internal instability but more importantly reflecting poorly on the rest of the industry. We must not deny that in politics, image matters. When it comes to our food, we cannot afford to make more mistakes.

You will pull weeds and plant vegetables on your hands and knees with no machinery. Your fingers will bleed and crack right near the fingernail beds no matter what kind of gloves you have on or how much you lotion. You will let chickens angrily peck at your legs as you retrieve their eggs from your chicken coups. Your back will ache as you drag foot after foot of hose across the two acres of the farm. You will get used to feeling dirty, tired, and uncomfortable every second you spend on the farm. But it will be rewarding work. You will realize you are capable of physical tasks you never thought possible.

This will not be an easy task. It will take collaboration between the private and public sector. It will take top down policy as well as bottom up initiatives. It will take a willingness to share skills and information across the board to challenge our food culture holistically rather than partially. It will take innovative solutions such as compost soil production facilities. We will have to prioritize health over convenience, access over exclusion. This revolution is political. This revolution has started and it is taking place on every plate, in every bowl, and in the palm of every hand that feeds. This revolution is not only for the informed and privileged. This revolution does not need to be driven by the socioeconomic elite. On the contrary, this revolution is for the majority and the uninformed. The question is not whose side are you on, but what will you choose to put in your mouth?

The case for energy

Lars Boggild on how organised homeowners can

Within environmental circles, from pundits to policymakers, we often hear about the value of efficiency. Correspondingly, governments around the world have made it an area of priority. In an era of environmental targets and fiscal austerity, this is largely because efficiency is often considered a "no regrets" intervention, one which reduces the material necessary for our lifestyles and increases sustainability. Despite this enthusiasm, we must maintain some scepticism with regards to the delivered environmental benefits of efficiency improvements. Thus far, there is only very limited evidence for "absolute decoupling" of growth in environmental emissions from growth in consumption, which would actually deliver improved environmental outcomes. Instead, as consumption growth has outpaced efficiency improvements, only "relative decoupling" has occurred, leading to the increased environmental emissions we see today despite enormous improvements in efficiency over the last 50 years.[1] Therefore, it should be obvious that efficiency is not the perfect solution for bringing our behaviour within our planet's ecological limits, especially those that we have already surpassed.[2] Nonetheless, the original "no regrets" argument regarding efficiency still holds true, and despite continual changes in our society, we should still pursue maximum efficiency.

The most remarkable thing about efficiency improvements is that, in the absence of market friction, we expect many of them to have already been done. In a famous analysis of the abatement cost of greenhouse gases from different sources, McKinsey and Company (2010) found that many of those yielding the highest "negative cost," which is to say a profit per tonne of abated carbon are within efficiency categories. These included "Lighting Switches", "Electronic Appliances", and "Residential Appliances". Other categories which were lower yielding in monetary terms but higher in abatement potential were "Building Insulation Retrofits" and the "Building Efficiency of New Buildings".[3]

All of these are areas over which individual homeowners have direct control over and capacity to deliver abatement in regards to environmentally damaging emissions while earning positive returns. Unfortunately, this same sector has some of the highest capital requirements to meet its abatement potential. In the same McKinsey

Illustration by Holly Jameson, with permission.

efficiency cooperatives

help deliver a more environmentally sound world

analysis, the "Building Sector," which includes the residential efficiency interventions above, was estimated to require €207 billion investment per year.[4] How do we lower or manage these capital requirements so that there is greater uptake and homeowners can deliver lower emissions while being financially rewarded?

We can learn a lot from the growth in distributed renewable energy, one area where the marketplace seems to be delivering environmental benefits through enormous uptake. As an example, the price of individual solar panels has dropped drastically over the last decade as globally we have moved down the economic "learning curve" and production has seemingly outstripped demand. However, the distributed photovoltaic market has also been catalysed by other innovations which have directly lowered upfront costs. At least in part, solar has taken off due to leasing rather than direct ownership, whereby homeowners pay their utility bills net after the electricity they produce, and pay a fee to a third party owner for the right to use the solar installation. For many, this is economically beneficial from day one, and due to guaranteed price agreements, utility bills can become more constant over time. Meanwhile, for the third party, the capital costs of purchasing and installing the solar arrays can be financed on the basis of the homeowner's fixed payments, shifting risk and upfront costs away from the customer.[5] The takeaway is that uptake in the marketplace will occur faster when the upfront (and therefore more salient) costs are lowered.

A government-led initiative to lower the upfront costs of efficiency can take many forms. Direct "command and control" regulation, phasing in strict efficiency requirements over time, can create relatively guaranteed demand, enabling suppliers and installers and spurring price lowering competition. The UK is doing just this with its "Code for Sustainable Homes," which in combination with the "Zero Carbon Homes" initiative will require all new homes built after 2016 to have no carbon emissions.[6] Publicly led financing innovation can also take place, as in the UK Government's "Green Deal" whereby upfront costs are financed against guaranteed savings (as in the case of most solar leases).[7] In both these instances, the government is leading the way by lowering the upfront costs of homeowners, and thereby guiding markets to deliver better outcomes for the environment and private citizens. But how do we create similar outcomes in countries and areas where the government is not showing leadership?

The upfront price of efficiency interventions can be lowered in other, privately-led ways. For example, One Block Off the Grid is a young company

> "What if private citizens joined together (...) improving the efficiency of their homes?"

using a group-buying model for solar to lower prices through collective bargaining with installers and purchasing discounts. What if private citizens joined together in customer owned enterprises for the purpose of improving the efficiency of their homes? For major installations such home insulation, collective bargaining on behalf of a cooperative's membership (a potentially large, segmented, and engaged customer base) with installers could allow for significant price discounts which would immediately make membership an economically positive proposition against small costs (e.g. a reasonable annual fee). For smaller, self-installed interventions, co-ops could deliver devices such as LED lighting at cost by dealing directly with manufacturers and wholesalers, cutting out middlemen's margins to lower the cost to consumers. Further, if effective at scale, such co-ops could access bulk purchasing discounts unavailable to normal consumers acting alone. The cost of such large purchases by the co-op could be simply met by getting members to pre-pay (on the basis of a quote) on a specified product they would receive later (e.g. a thousand members would each pay the cost of an LED light bulb upfront so that the co-op could pay for the bulk order it makes on its membership's behalf). Perhaps most importantly, membership engages homeowners in a "social community" of fellow co-operative owners who are interested in efficiency. As they begin to see themselves as part of a story of change and see norms around conservation from other members, they may change their decision making to be even more supportive of spending on efficiency in all, because others are seen as also doing this.[8] In this way, energy efficiency co-operatives may have a compounding effect on environmental benefits, as homeowners make friends while improving their finances.

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'Waste' is a

Gill Davies takes an

In nature, the concept of waste does not exist. Everything occurs as part of a bigger process or cycle and at no stage does material become entirely obsolete. Human activity, however, can cause unnaturally high concentrations to build up in a particular part of a previously balanced natural cycle, to the extent that it becomes labelled as 'waste'. Non-biodegradable waste in a landfill site or greenhouse gases emitted through anthropogenic activities are examples of this. When waste is inert its impacts tend to be less severe, though still linked to problems of resource scarcity and waste management. In some cases, however, the build-up of waste as an environmental pollutant risks completely unbalancing stable ecological or geophysical systems.

As people learnt to effectively harness the vast reserves of energy locked up in fossil fuels, newly industrialised countries quickly developed and expanded production. The prevailing 'open system' economic view measured success as the continual increase in throughput of the production system[1] and therefore countries aspired to expanding production. Yet, as highlighted by economist Kennth Boulding in 1966,[2] increasing can only be increased indefinitely if there are "infinite reservoirs from which materials can be obtained and into which effluvia can be deposited". Since this does not apply to the planet, Boulding argued towards a paradigm shift. He described earth as a closed system akin to a spaceship, with finite limits in terms of both extraction and pollution. Man must find his place in that closed system instead of continually pushing towards its limits.

The carbon cycle is one example of a balanced geophysical system. Part of the cycle involves the formation of hydrocarbons from submerged and compressed plants and marine organisms, resulting in large coal, oil and natural gas reserves formed over millions of years. Yet burning fossil fuels now accounts for 80% of global energy supply and this rate is vastly out of sync with the rate at which they formed. The continual excessive release of carbon dioxide (CO2) through anthropogenic activities is leading to unnaturally high concentrations at one particular stage of the cycle. In effect, the atmosphere has become a landfill site for waste CO2. In pre-industrial times the atmospheric CO2 concentration was around 280 parts per million (ppm), but levels have been steadily rising to over 390 ppm, 39% above preindustrial levels, by the end of 2010 (see Figure 1).[3]

> "Man must find his place in that closed system instead of continually pushing towards its limits."

Whilst it is known that natural processes such as volcanic eruptions also cause significant variability in atmospheric greenhouse gas concentrations over time, these are still insignificant by comparison with the rate of anthropogenic release. According to Gerlach (2011), current CO2 emissions from all degassing sub-aerial and submarine volcanoes only equates to about 2% of the world's coal-fired electricity-generating capacity.[4] Even super-eruptions do not come close to anthropogenic CO2 release, which has been calculated as a 1980 Mount St. Helens eruption every 2.5 hours.

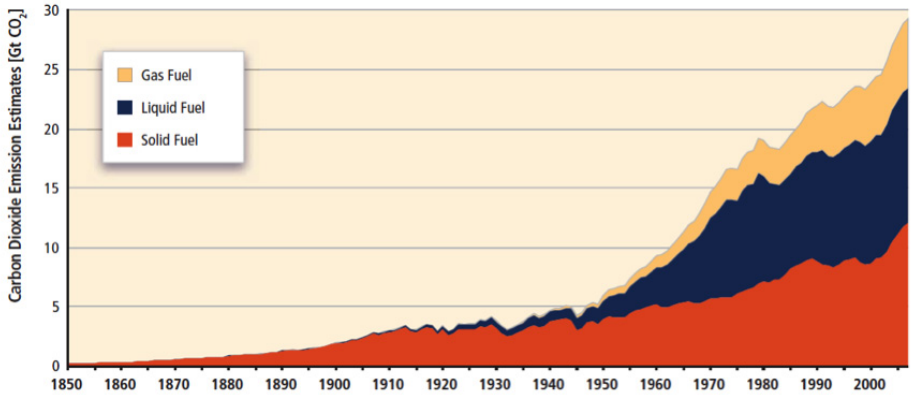

Figure 1. Source: IPCC 2011.

Burning fossil fuels is by no means the only anthropogenic activity that emits greenhouse gases. Methane (CH4) is estimated to have 25 times the global warming potential of CO2 over a 100-year period and its atmospheric concentration is now more than double its pre-industrial value. Activities contributing to this include agricultural processes, natural gas distribution and landfill of solid waste. In its last report, the Intergovernmental Panel on Climate Change (IPCC) summarised that: "Current concentrations of atmospheric CO2 and CH4 far exceed pre-industrial values found in polar ice core records of atmospheric composition dating back 650,000 years. Multiple lines of evidence confirm that the post-industrial rise in these gases does not stem from natural mechanisms."[5]

James Lovelock's Gaia theory,[6] developed since the late 1960s, goes beyond the idea of a set of independent cycles and conceptualised the planet as one single system regulated by homeostasis. He proposed that all biological and physical processes involving both organic and non-organic (inert) compounds are coupled together to maintain the conditions of the planet, including temperature, at levels optimal to living organisms. Lovelock was an early proponent of anthropogenic climate change, suggesting that if humans cause massive disruptions to this natural homeostasis, it could result in one or more negative feedback loops that maintain balance switching to positive forcing responses. For example, warmer temperatures lead to an increase in carbon-fixing algae in the oceans, reducing atmospheric

human concept

interdisciplinary approach to ecology

Figure 2: Solar PV system at Liwaladzi health clinic in Malawi, which previously had no electricity and relied on kerosene lanterns. Photograph by Gill Davies, with permission.

CO2 concentrations and thus contributing to temperature reduction again. Yet the temperature increase that humans could potentially cause could perhaps be beyond the habitable range of those algae, causing their ultimate decline.[7] Lovelock's work received various responses, including criticism that it does not adequately explain the varying interactions within the system or identify trigger points. But

"Industrial ecology suggests modelling socio-economic systems as closed ecological systems, minimising 'waste' production at every stage."

as highlighted by Ogle,[8] the theory helped promote an interdisciplinary approach to climate change research by prompting scientists to explore links between previously unrelated areas of the natural sciences.

While conceptualising earth as one self-regulating geophysical system may be helpful for scientific research, tools are still needed to work out how humans can live within the system's natural limits. Industrial ecology suggests modelling socio-economic systems as closed ecological systems, minimising 'waste' production at every stage. Key themes include increasing resource efficiency and recycling, and reducing reliance on non-renewable energy sources. As described by Erkman and Ramaswamy,[9] "Industrial ecology explores the assumption that industrial activities should not be considered in isolation from the wider world but rather in terms of an industrial ecosystem functioning within the natural ecological system or biosphere."

Within the energy sector, renewable energy systems offer the potential to harness energy without the system-unbalancing risks associated with fossil fuels. Using carbon-rich biomass such as firewood as a fuel source, for example, can be sustainable as long as the removal of biomass is at a managed rate that matches its growth on the other side of the cycle. Technologies such as wind turbines, hydropower, and solar photovoltaics (PV) (Figure 2) also offer potentially sustainable energy solutions, providing local environmental and socio-economic factors are duly considered. However, while they may not produce waste by-products when generating electricity, there is still a risk that waste is created at other stages in the overall production, distribution and disposal processes of renewable energy technologies.

Based on industrial ecology principles, lifecycle assessment (LCA) can help ensure that the full lifecycle of technologies is as near to a closed loop system as possible. Taking PV as an example, the industry does use some toxic gases and corrosive liquids in its production lines. The volumes depend on the type of cells, but the industry is applying increasingly rigorous control methods to minimise associated emissions. Recycling PV modules is now mostly economically viable, with estimates that up to 96% of the material in modules can be recycled – though again depending on the cell type and scale.[10] These areas need to be continually developed to ensure that the positive impacts of zero-pollution energy generation are not covertly negated by the rest of the product lifecycle.

Waste may be a human concept, but when generated at levels as high as those associated with anthropogenic greenhouse gas emissions, it has the potential to interact with balanced geophysical processes that maintain optimal environmental conditions on earth. Interdisciplinary climate change research is continuing to work towards defining limits of the system, but what is clear is that continually increasing production without regard for environmental impacts is not viable. Concepts such as industrial ecology and lifecycle assessment can help model improved production systems that mirror balanced ecological cycles by minimising the waste they generate.

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Figure 1: Global CO2 emissions from fossil fuel burning, 1850 to 2007. Gas fuel includes flaring of natural gas. All emission estimates are expressed in Gt CO2 (Source: IPCC 2011).
Figure 2: Solar PV system at Liwaladzi health clinic in Malawi, which previously had no electricity and relied on kerosene lanterns (Photo: author).

The decline of solar

Maksym Beznosiuk on Europe's dilemma

In the face of economic crisis and the growing cost of 'green' electricity, the countries that are most attractive to the solar energy sector find solutions detrimental to the renewable energy market. This creates significant reduction of feed-in tariffs and limits the amount of solar power produced.

Italy

Not so long ago, Italy confirmed its plans to cut subsidies for solar power plants. The Italian government reduced the stimulus tariff for photovoltaic (PV) generating facilities. Experts believe that Italy will have a severely reduced budget for incentive schemes. The new scheme should result in an additional annual budget of €700 million and will reach its total annual cost of €6.7 billion by the end of its implementation.[2]

The new feed-in tariff scheme could help to add approximately 7.5 gigawatts (GW) of new installations in the next two years, but the figure is likely to be closer to 3 GW.[3] It is also predicted that by the beginning of 2013 the implementation of the feed-in tariff stop in Italy.

In compliance with the last forecast released by IMS Research, we can expect the decline of installations in Italy to less than 3 GW. In the next 3 to 7 years it could undermine Italy's position as one of the leading PV markets in the world. Because of such upcoming budget limitations, Italy's PV industry will have to survive without incentives in the medium-term. Moreover, if the additional budget of €700 million was available, Italy could have kept up with the other top countries that have dynamically developing PV markets.[4]

United Kingdom

Feed-in tariffs, from which households received a guaranteed income through the sale of electricity generated by PV systems, will be reduced starting from 12 December 2012. Half a year ago the tariff, which was paid to homeowners, was reduced from 43.3 pence per kWh (kilowatt hour) of solar electricity to only 21 pence per kWh on the new scheme.[5] But starting from 1 August 2012, the tariff amounts to 16 pence per kWh of solar electricity. Furthermore, it will give those installing solar panels a chance to receive the subsidy for a period of 20 years (instead of the 25-year duration that was available before). This is despite the fact that about 25,000 people across the country may have ended up joining dole queue due to the government's decision to reduce the incentive tariff for solar electricity last December.[6]

For the last 2 years, more than 1 GW of solar capacity has been installed in the UK. But UK authorities will have to make a significant effort with regard to large scale PV installations in order to scale up solar capacity to 22 GW and meet the targets set for the end of 2020.[7]

Spain

Because of the debt crisis and financial problems, the renewable energy sector in Spain has suffered another blow. The government's final decision was to reduce the price of electricity for new solar projects: by 45% for plants on farms, 25% for large photovoltaic systems at offices or factories, and 5% for solar systems at homes (by the end of 2011).[8]

Spain, the world's second largest producer of solar energy, recently had a great arsenal of subsidies in this area. The growing budget deficit led to a sharp restriction of state support for renewable energy. In 2010, the Spanish government allocated €6.5 billion of debt for Spanish utilities to pay for subsidising producers of renewable energy.[9]

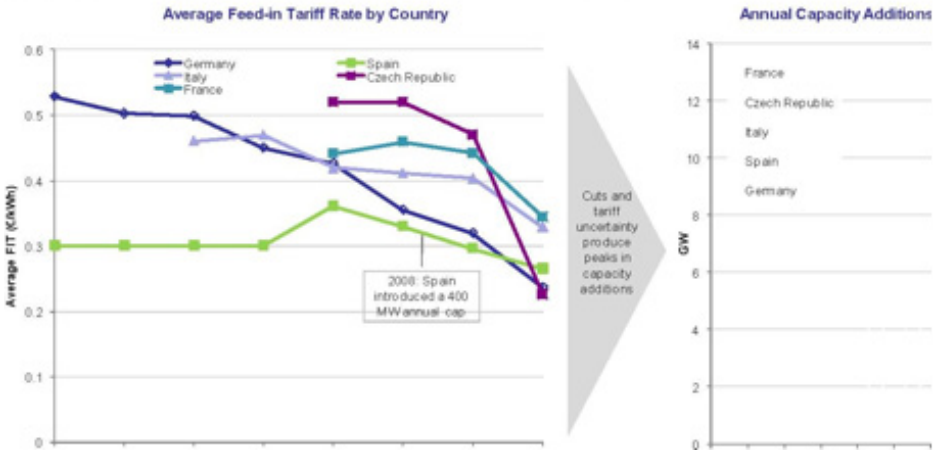
At the beginning of this year, subsidies were cut further. A special tax is being imposed on each kWh produced by renewable energy producers – 19 per cent on the PV industry. Through this drastic action the Spanish government aims to raise approximately €530 million annually.

Germany

Germany, which has the largest solar energy market in the world, plans to limit the increase of new PV facilities to 1 GW per year.[11] This may cause the country to lose its superiority in the field and its position in the global market.

The volume of installations in the German market grew 7.4 GW in 2010 and 7.5 GW in 2011 - the highest rate of solar energy growth in the world(See Figure 4)[12]. German authorities had planned growth rates of 2.5 to 3.5 GW per year.[13]

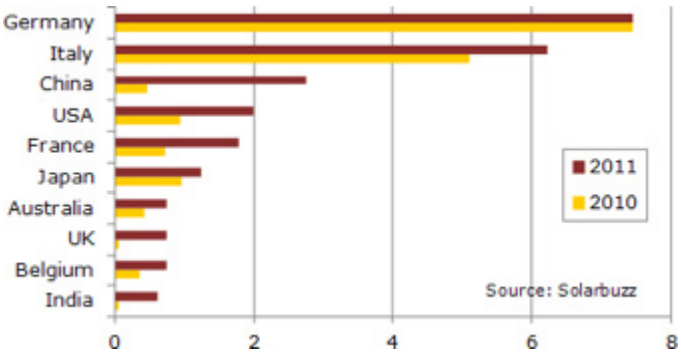
Exhibit 1-1: Europe Solar PV Feed-in Tariff Evolution: 2004–2011



Source: IMS Emerging Energy Research

energy in Europe

regarding the cost of solar power



At the beginning of July 2012, both houses of the German parliament reached an agreement on feed-in tariff amendments. The new feed-in tariff will lead to the reduction of solar installations by approximately 30 per cent, and it includes a new tariff for medium-size PV systems between 10 and 40 kW. The government concluded that it would be appropriate for a new tariff scheme to be implemented after the solar industry reaches a 52 GW capacity (the installed capacity currently amounts to 28 GW).[14]

According to experts, the total capacity of installed PV facilities will amount to approximately 7.3 GW by the end of this year, slightly less than in 2011.[15] The dynamic build-up of PV capacity has been ongoing for the last 6 years. Despite a high chance of a little slide in 2013, some experts agree that annual installations will rise again in 2014.[16]

Ukraine

As a result of the reduced attractiveness of the EU solar energy market, that same sector in Ukraine, which has one of the highest feed-in tariff rates in the world, is attracting more and more business.

The feed-in tariff for ground solar power amounts to 63 cents per kWh.[18] The feed-in tariff will be guaranteed by the state by 2030, however, provided its two-stage reduction.[19] The solar energy market in Ukraine has remarkable potential — it may exceed the capacity of Germany's solar market.

2011 was a breaking point with regard to the installation of solar power stations. Austrian company Activ Solar built two power stations, both of which are among the ten most productive in the world.

Recent positive news for the Ukrainian solar market was the decision of the Council of Ministers of Crimea to allocate 144 hectares of land to 7 companies in 3 regions for the construction of solar power plants. In April 2012 the Council decided to allocate 538.8 hectares of land to 17 companies in several areas of Ukraine for the construction of solar power plants.[20]

According to PV Magazine, "Ukraine is said to be targeting a cumulative installed photovoltaic capacity of one gigawatt (GW) by 2013. Overall, investment in new facilities is expected to reach €2 billion."

New markets such as Ukraine and other CIS (Commonwealth of Independent States) countries could become major centres for solar energy production. However, much will depend not only on the countries giving a 'green' light for the development of the market, but also on the companies themselves: their willingness to invest in emerging markets and active marketing policy.

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Inviting interested editors, graphic designers, illustrators, and writers to contribute to our next issue

The next issue's theme will be 'Justice'. The assurance of justice is usually considered a prerequisite for a good society - when any crime or abuse is committed, we call for justice, both for the offender and for the victim. Some argue that if equality is an important component of justice, governments should practice distributive justice – the fair allocation of goods and wealth among all citizens. Such a theory has been denounced by those who believe that government should have a limited role in the economy.

Justice encompasses a wide range of disciplines, from human rights and the law to religion and ethics, from business and the economy to politics and all-out war.
With definition of the term still hotly contested by legislators, philosophers, and theologians, this broad theme encompasses a myriad of controversial topics.
Most people agree that there is much injustice in the world – where does this injustice lie, in your view? What can or should be done about it?

The deadline for submissions is 24 December, 2012. Email us at leviathanjournal@gmail.com to find out more.

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