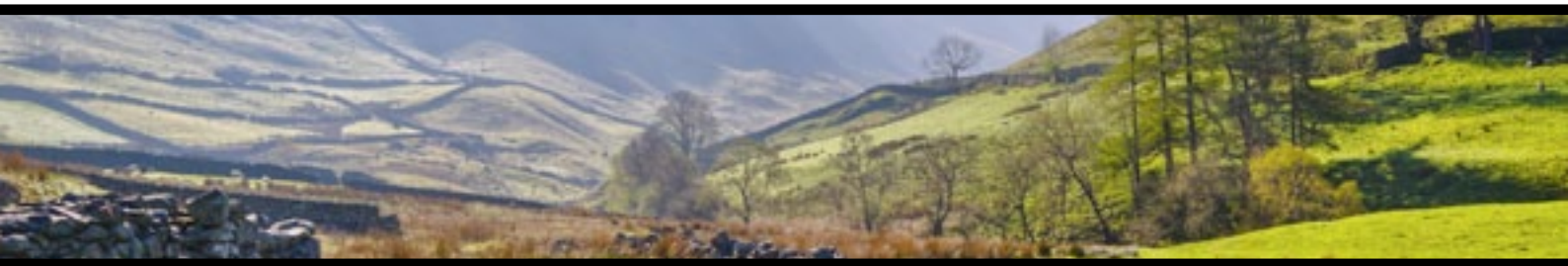
CERF Horizon Scan

Cranfield UNIVERSITY



#31 July 2012

KEY FACTORS

(hover over for links to rest of document)

- Consumer attitudes and behaviour
- Health and well-being
- Science, technology and innovation
- Energy supply and demand
- Natural resources and waste management
- Agriculture and rural communities
- Food production, processing and distribution
- Land use and land management
- Climate, environment and biodiversity
- Oceans, marine life and fisheries
- Economy and industry
- Globalisation, (geo)politics and national security
- Demographics and urbanisation

About CERF

The Centre for Environmental Risks and Futures (CERF) is based within Cranfield University's School of Applied Sciences. Our expertise spans the natural, technological, economic and political domains. Our horizon scanning activity is part of a £1.8m project within the Centre, funded by a partnership of 12 organisations.

Visit www.cranfield.ac.uk/sas/cerf for more details.

We value feedback - tell us what you think!

Send your thoughts and feedback to h.shaw@cranfield.ac.uk or follow us using twitter (@TheRiskExchange), or our blog (https://theriskexchange.wordpress.com).

KEY DEFINITIONS

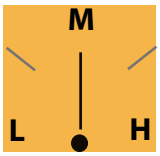
Throughout the document we use a number of key terms to describe the insights we generate. This page provides a quick overview of key factors (what they are and why we conduct our scanning around them), in addition to an explanation of the ratings we use to assess each insight.

What is a key factor?
The key factors are broad drivers or areas of change, and are designed to reflect the most important topic areas shaping the future of our partner organisations. Each quarter, we analyse over 700 scanning resources to identify and highlight the 2 - 4 most important emerging issues under each key factor, based on the level of risk or opportunity and likelihood they are likely to present, in addition to our level of preparedness for it. The partnership includes: Defra, Scottish & Welsh Governments, DECC, Department for Transport, Natural England, Forestry Commission, Environment Agency, Scottish Environmental Protection Agency, Marine Management Organisation, Food Standards Agency and the Natural Environment Research Council (NERC).

What is a horizon?
A horizon is the period of time in which a risk/ opportunity is likely to first occur and have impact. Normally, a technology horizon is very short - meaning things change very quickly. Conversely, ecological horizons can often be very long. We have decided upon three horizons to help decision makers understand the likely timescale of a first impact for each insight.

- Horizon 1: 1-3 years
- Horizon 2: 3-10 years
- Horizon 3: 10+ years

Please note: These horizons should not be used as an indicator of when action is needed. An event likely to occur in 15 years may still require action now to mitigate against it.



What do we mean by importance?
Importance is an indicator of the level of likely risk/ opportunity associated with each insight. Previously, we rated this using a simple "high, medium or low" scale. In this editon, we have expanded our method, and now present a semi-quantitative assessment, with scores ranging from 1 (low risk/ opportunity) to 9 (high risk/ opportunity).

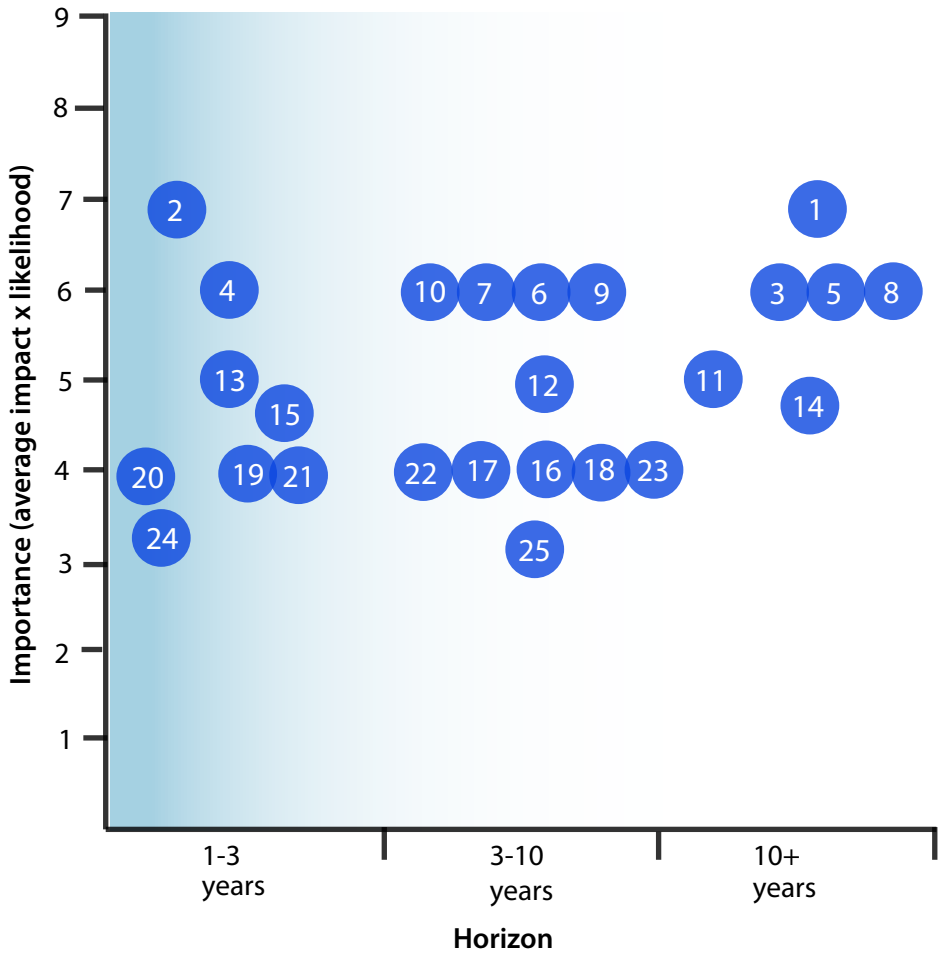
How do you figure that out?

1. We ask the question, "What is the likelihood of this insight affecting the UK?", and assign a score to the answer (i.e. Not likely = 1, Moderately likely = 2, Very likely = 3).
2. We also ask "If this insight does occur, what will the scale of impact be on the environment/ economy/ society? ", and again, score the answers (Low impact = 1, Moderate impact = 2, High impact = 3).
3. The final score is generated by taking an average of environmental, social and economic impacts, and multiplying this by the likelihood of occurrence.

What are the links for?
Click on the white circles to see pages with related articles in this newsletter, or click the grey circles to see related insights from past newsletters. However, we'd suggest that if you'd like to look for common or emerging issues, our website is a good place to look.

TOP RISKS AND OPPORTUNITIES IN THIS ISSUE

The following graph depicts the 25 most important risks or opportunities identified in this quarter's horizon scan. Ratings are approximate, and will almost certainly never be "right", due to the inherent uncertainties involved in horizon scanning assessments. However, these ratings are most certainly indicative of importance, and should help you to guide intervention strategies or future research towards the biggest issues.



1. Earths tipping point? Shift change!
2. Eight major rivers running dry from overuse
3. Soil-free farms reduce land and water pressure
4. Attack of the killer moths
5. Developing a Rio Future
6. Extreme oil
7. Cities will rule the world
8. Effect of digital printing on manufacture is one step closer
9. Urban maths
10. Nanotechnology improves energy storage
11. Wildfires may change peatland management
12. Kerosine jet engines can now run on biofuel
13. Making energy from cheese waste and cow manure
14. New agricultural methods could halve food price inflation
15. Capturing innovation for CCS
16. Water grabbing
17. Marine energy doubles by predicting wave power
18. Smog-eating paint
19. N footprinting
20. Striking a balance: marine conservation versus economic needs
21. Managing disaster better
22. The $60 light bulb
23. Using a dual approach to public engagement
24. Turn it down: noise threshold for marine development
25. Farming on your roof?

Top 5 most important issues:

1. Earths tipping point? Shift change!
2. Eight major rivers running dry from overuse
3. Soil-free farms reduce land and water pressure
4. Attack of the killer moths
5. Developing a Rio Future

Top 3 economic issues:

14. New agricultural methods could halve food price inflation
15. Capturing innovation for CCS
5. Developing a Rio Future

Top 3 environmental issues:

1. Earths tipping point? Shift change!
2. Eight major rivers running dry from overuse
3. Soil-free farms reduce land and water pressure

Top 3 social issues:

18. Smog-eating paint
27. Using a dual approach to public engagement
38. See the world through terminator glasses

Consumer attitudes and behaviour

Will "locovores" come back to bite us?

Horizon: 1

Importance: 2.7

Links:

- Trends across the UK, Australia and the US show that more and more consumers are buying locally produced food. At the extreme, a new hoard of "locavores" will only eat food produced within a 100 mile radius.
- Why? Consumers note that often the foods are fresher, of better quality, support local economies, and are expected to have a lower impact on the environment.
- Whilst many of these points are true, we have to be careful about environmental assumptions.
- Yes, locally grown food will save carbon by reducing transport emissions.. BUT (and it's a big but)... previous research has shown that food grown in the UK often has to be more intensively farmed.
- Take milk as an example. UK cows have to be kept warm indoors through the winter, and eat processed feed when the grass won't grow. The extra heating, food and other factors makes UK cows almost twice as bad for the environment in carbon terms than New Zealand cows - even when you take shipping into account.

The emergence of "locavores" could have genuine impacts on the UK's ability to achieve green food production. Consumers must be educated about the complexities of the environmental impacts associated with food, and turned away from single-issue foci like food miles.
Perhaps we do need a measure of "environmental goodness" on our packaging to inform customers, but it HAS to go beyond carbon or food miles alone. We have to realise that the impacts are never simple, and consider that other factors like water use, impacts on biodiversity or other ecosystem services are as important.

http://tinyurl.com/cu986dx

See the world through "terminator" contact lenses

Horizon: 3

Importance: 1.7

Links: N/A

- Google glasses are the newest innovation pushing for a place on the high-street, but scientists are already working towards the next big thing – terminator contact lenses.
- Users would wear contact lenses which have inbuilt data and power transmitters to process visual information, and allow the user to "see" digital information as they go about their daily lives.
- The innovation is starting small – a single pixel image is being developed which may help alert the hard of hearing to loud noises such as alarms. In the future, you may be able to scan a bar code with your eyes to see instant product reviews, or research its environmental credentials, all without the need for a smart phone.
- Not only that, but scientists think that fluids in the eye may act as reliable indicators of blood glucose levels and more, meaning diabetes patients could constantly monitor their blood glucose without taking blood.

Whilst the technology is unlikely to arise for some time, the innovation has the potential to influence eating habits, buying behaviour and more. Government and industry may wish to think about how to utilise these technologies to influence green behaviour in the future.

http://tinyurl.com/cwc978e

Consumer attitudes and behaviour

Using a dual approach to public engagement: the old and the new

- Two recent campaigns have had a proven effect on consumer behaviour, but they draw on completely different mechanisms.
- The first (an online game) offered points to University students who snapped unique shots of their campus. Results showed that over the competition period, students went well out of their way to grab unique shots and gain points to compete with their peers.
- Tailored to encourage environmental behaviour, future games could allow friends to compete on their cycling: driving mile ratio and could reduce car use overnight.
- The second approach was adopted by General Electric, who used Chinese folklore and characters from an ancient novel to communicate the importance of "working harmoniously with nature".
- General Electric's campaign demonstrated a clear cultural connection and sensitivity which local people could relate to. They hope that their "future folklores" will encourage positive environmental thinking in the future.

The success of these two distinct approaches reminds us that while technology offers many useful communication tools, embedding messages into deeply rooted cultural stories or norms is also a powerful tool which we can use to more effectively engage people with the environmental agenda. Moving forward, a dual approach may have greater effect in encouraging society to adapt behaviour, with positive environmental benefit.

http://tinyurl.com/c8km8rg; http://tinyurl.com/d2zv737

Horizon: 2

Importance: 4

Links:

Health and Well-Being

Smog-eating paint

- A new paint has been created which scientists think could remove 20% of polluting nitrogen in major cities.
- The technology, called Boysen KNOxOUT, reacts with light and water vapour to filter out nitrogen oxides in the air. Each square metre of painted surface is thought to remove as much nitrous oxide as a mature tree.
- The paint is likely to have health benefits in cities with heavy traffic, as nitrogen oxides (often emitted from combustion engines) are known to have adverse respiratory effects, particularly amongst children, the elderly, or those suffering with respiratory problems such as asthma or bronchitis.
- Currently, it is being used to paint creative murals on buildings around Manila, one of the Philippines most polluted cities. By hiring artists, the city is covering 1,000s of square metres with the purifying paint.

Horizon: 2

Importance: 4

Links:

This solution could offer major environmental and health benefits in cities with heavy car use and little space for greenery or trees. Government may wish to consider its use on new buildings, or perhaps promote its use amongst street artists. In doing so, Government could offer cultural, environmental, and health benefits in the UK, particularly in polluted cities such as London.

http://tinyurl.com/82ktq23; http://tinyurl.com/dyj5uus; http://tinyurl.com/caknlfp

Poop in emerging economies: flush it or cook it?

- A major health concern in developing countries is the lack of proper sanitation. 1.4 million children die each year from diseases related to faecal matter.
- However, installing flushable toilets around the world isn't the answer. Western toilets use 3.5 gallons of water for each flush. If everyone on the planet flushed just once, we'd use 24.5 billion gallons a day. Couple that with the challenge of a rapidly increasing population, and we may experience difficulties in sustaining western sewerage systems.
- We need to find news ways of safely disposing of waste – in emerging and existing economies alike. However, the lack of current infrastructure in emerging economies means there is an opportunity to get it right first time, and build infrastructures that can deal with waste safely and responsibly.
- Current options which negate or reduce water pressure might include:
    - microwaves which turn waste into carbon monoxide and hydrogen, which can then be used for energy generation
    - turning waste into bio-charcoal
    - using solar panels to covert the waste into hydrogen for fuel cells

Horizon: 2

Importance: 2

Links: N/A

An international effort is required to continue research into new toilet designs, encourage emerging economies to incorporate the designs into new infrastructure, and for the developed world to begin replacing our unsustainable systems. The issue presents a market opportunity for the UK economy, an opportunity to generate green energy, and the ability to reduce sanitation problems overseas. Failing to do so could lead to UK water shortage and international tensions over water scarcity.

http://tinyurl.com/ca7slks

Health and Well-Being

Can twitter predict food –related outbreaks?

- Sickweather is the first company to attempt to predict outbreaks by tracking symptom and disease mentions on twitter.
- Previous efforts have tracked Google search terms, emergency room visits, and over the counter medication sales to track disease. However, the company founder believes that due to the personal and real-time data offered by twitter, analysts can see trends emerge much quicker and more accurately. For example, analysts can check whether the person tweeting is affected or not e.g. "I have the flu" as opposed to "I went to a talk about flu".
- Currently tracking 24 symptoms, there is still room for the tool to expand the range of outbreaks it can monitor, and develop increasingly accurate reporting for Government.

For health services, the technology may help to anticipate demand for medication and health services. It may also serve as a tool to identify emerging outbreaks (e.g. food-borne illnesses) and to pinpoint the location of the outbreak using the same twitter tools.

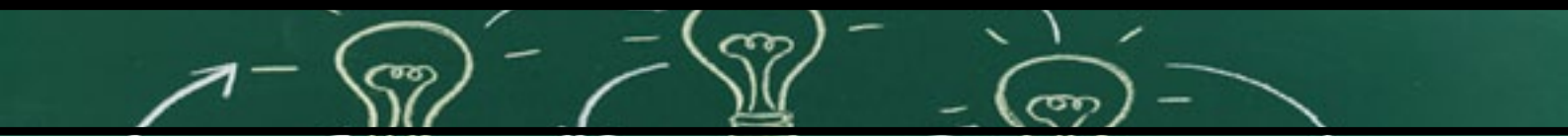
http://tinyurl.com/82kny3l

Horizon: 1

Importance: 2.7

Links: N/A

Science, technology and innovation



Sustainable street lights

- Britain has 7.5 million street lamps costing an estimated £500 million a year to run. Current council budget concerns are driving a streetlight blackout policy to reduce energy costs, however this occurs at an expense to inhabitants, as poor lighting is associated with an increase in fatal accidents and criminality.
- However, the University of Seville may have found a solution. Their new "holonic street lamp" incorporates two solar panels and a vertical axis wind turbine into its design. Power generated by the panels and turbine provides all the energy the light needs to operate, and the power is piped down to underground batteries, allowing them to be used without a connection to the energy grid system.
- The clever thing is that the lights can 'sense' darkness, and power up an array of LED bulbs, providing an output of up to 3,520 lumens.
- Whilst the cost of implementation is likely to be high (current applications will have high overheads for maintenance and reliability issues), as technology progresses over time, it is expected that such issues will be overcome and therefore installation and running costs reduced.

Horizon: 3

Importance: 3.3

Links: N/A

Thus in the future, self-sustainable streetlights could reduce energy cost, simultaneously reduce blackouts and criminal activity, providing a feasible street lighting option for remote councils.

http://tinyurl.com/d42alnl; http://tinyurl.com/776upb8

The metal sponge that captures CO_2

- CO_2 emissions from industry make up 40% of total CO_2 emissions worldwide. Since 1990, improvements in energy intensity have been more than offset by increased total production, such that energy consumption and CO_2 emissions have continued to rise dramatically and it is estimated that by 2050 (relative to 2006 levels), if industrial emissions remain unchecked, total CO_2 emissions will increase by up to 90% compared to 2007.
- The NOTT-202 is a "metal-organic framework" that works like a sponge and has the ability to capture CO_2. Until now, such frameworks have been good primarily at gathering any gas passing through them; those that were selective for CO_2 have proven to have a low capacity for storing the gas. This technology allows the selective storage of a significant amount of CO_2, raising hopes for a better way of trapping and storing the greenhouse gas for long periods of time.
- The findings not only suggest a promising future for the carbon capture and storage (CCS) market, but could also pave the way for a broader range of absorbent materials, each used to capture specific gases during different processes and in different environments.

Horizon: 2

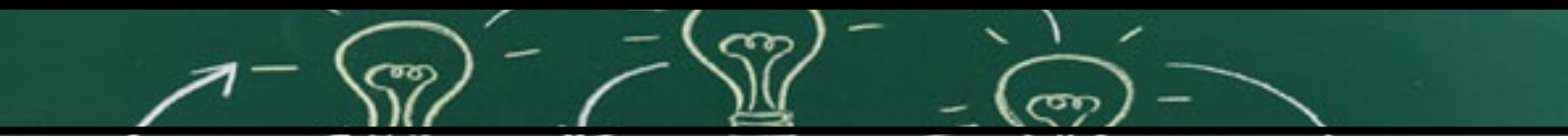
Importance: 2.7

Links:

Before the material can be developed to the point at which it can actually be used to capture greenhouse gases on a large scale, many advances will be required—but all are achievable as long as multiple disciplines within industry and academia continue to work together. This will involve concerns over efficient large-scale production, safe disposal, durable usage, good separation, and low-cost regeneration.

http://tinyurl.com/7pzweqk ; http://tinyurl.com/7ohzu3r ; http://tinyurl.com/co243mu

Science, technology and innovation



The magnetic soap that cleans up oil spills

- Bristol University has developed a soap that could be used to treat oil spills in the future, using a unique magnetic property. The soap (composed of iron rich salts) dissolves in water, and responds to a magnetic field when placed in solution which allows it to be controlled by magnets.
- This test shows that it is much easier to remove magnetic soaps from mixtures of other liquids, suggesting they could be used in response to environmental disasters such as oil spills, where concerns have been raised about the cleaning substances in use. A magnetic soap could easily be collected after cleaning, reducing the environmental impact.
- The potential applications of magnetic surfactants are huge. Their responsiveness to external stimuli allows a range of properties, such as their electrical conductivity, melting point, the size and shape of aggregates and how readily it dissolves in water to be altered by a simple magnetic on and off switch.

Its magnetic properties also make it easier to round up and remove from a system once it has been added, suggesting further applications in environmental clean ups and water treatment.

Horizon: 3

Importance: 4

Links:

http://tinyurl.com/7q43uxe; http://tinyurl.com/72ldj6g; http://tinyurl.com/6plw6qa

Soil biota - what lies beneath?

- Soil biota is a diverse and an often over-looked element of natural ecosystems providing an array of essential ecosystem services.
- Microbes can be useful indicators of environmental or ecosystem change and there is a need to ensure the soil microbe component of a particular system is preserved, particularly at managed sites.
- A technology known as metagenomics was presented by the European Bioinformatics Institute at the recent Cambridge Conservation Forum. The innovative methodology allows DNA identification of organisms present in a soil sample with the potential to detect species both past and present at a site.
- The use of genetic barcodes to detect soil microbes is becoming more widely available and allows changes (for better or worse) in soil microbe communities to be mapped. This is a valuable tool for determining if soil diversity at a site is being lost or if particular practices are, in fact, beneficial for microbial communities.

Soil health has been overlooked in the past and so considering its importance in ecosystem health is relatively new and tools such as metagenomics make the issue more approachable. Weight needs to be given to the function of microscopic organisms, especially those in the soil. These often play a crucial role in the maintenance of ecosystems, productivity of agricultural systems, and the existence of particular species which are the target of conservation efforts.

Horizon: 1

Importance: 4

Links: N/A

http://tinyurl.com/cj4ruqr

Energy supply and demand

Nano-technology improves energy storage

- The nanocable, produced with techniques pioneered in the nascent graphene research field, could be used to build next-generation energy-storage systems.
- A recent study reports that the capacity of the nanocable is at least 10 times greater than what would be predicted with classical electrostatics and improves on previous results from micro-capacitors.
- It may be possible to build a large-scale energy-storage device by arranging millions of the tiny nanocables side by side in large arrays.
- Energy systems are more efficient when coupled with effective operating reserves, providing the link between production and demand peaks whenever these are not in sync. This discovery may provide the basis for developing effective energy storage systems which can improve the UK's capacity to deliver energy more efficiently, reducing costs and energy loses.
- Improving the capacity to store and deliver energy may impact the current energy framework in two particular areas: 1) The baseload plants (coal and nuclear plants) produce the bulk of energy to meet demand. However, these are limited in their capacity to increase or decrease output in response to daily variation in demand. Currently, to meet demand variability relies on smaller, more responsive but less efficient, units. The use of efficient storage devises allows for smoothing out energy production spikes, allowing for a more efficient use of resource and reducing energy costs. 2) In renewable energy the maximum penetration of power is limited by the intermittent nature of the energy input. Fluctuations in power production also make it difficult for renewable energy plants to compete in electricity markets. Energy storage devices with the ability to store large amounts of energy could provide the necessary flexibility for smoothing power spikes.

Improvement of mass storage capacity may ease the management of energy sources in the UK, creating an opportunity to improve integration of renewable energy into the grid system.

http://tinyurl.com/c7bsbqv; http://tinyurl.com/7mceey8;

Horizon: 3

Importance: 6

Links:

Energy supply and demand

Kerosine jet engines can now run on biofuel

- Increased in oil prices have provided new incentives to develop alternative fuel sources for jet engines. Whilst the use of biofuels in jet engines is not new, recent technological advances have meant that biofuel blends can be used without any modification to current engines.
- Biofuel blends using Jatropha plants, wood chips, and algae have all been tested, and testing by General Electric suggests that airline, aircraft manufacturers, and military clients can switch to biofuels without any modification to, or investment in current engines.

Horizon: 2

Importance: 5

Links:

If successful, this technology may provide a platform for alternative energy use in air travel. Whilst this may be seen to be 'greener', Governments will need to carefully consider whether biofuel production is sustainable, and possibly incentivise industry investment in sustainable biofuel sources.

http://tinyurl.com/d4t7dn5

Good vibrations: turning sound into energy

- Materials scientists at the University of Wisconsin-Madison have developed a technology that harnesses noise or random vibrations in the atmosphere, and uses them to transform water into energy.
- The vibrations flex two nanocrystals (zinc oxide and barium titanate) placed in water, which catalyses a chemical reaction and splits water into hydrogen and oxygen. The resultant hydrogen fuel is far more stable than electricity, meaning it can be stored more effectively.
- Applications may include powering devices that require small energy inputs, e.g. mobile phones and streetlights, making them completely self-sufficient.
- This method (termed peizoelectro-chemistry) requires a small amount of power, yet extracts an impressive 18% efficiency with the nanocrystals, higher than most experimental energy sources.

Horizon: 3

Importance: 1.7

Links: N/A

The technology might prove a simple, efficient method to recycle waste energy. Whilst the technology is most likely to be applied in smaller technologies, the cumulative energy savings globally could be large. However, predictions for overall energy savings are currently undefined.

http://tinyurl.com/8a5r2hp; http://tinyurl.com/7ee2tk8

Natural resources and waste management

N footprinting – new tool shows importance of Nitrogen losses to the environment

Horizon: 1

Importance: 4

Links:

- A new tool has been developed to enable individuals to calculate their overall nitrogen footprint. This draws attention to the amount of reactive nitrogen (Nr) lost to the environment through food production and fossil fuel combustion, which can be an important contributor to greenhouse gas emissions.
- The calculator uses average per capita data for a country and is then scaled by the individual's answers about resource consumption in the following areas: food consumption, housing transportation and, goods and services.
- While the use of other "footprints" as a measure of the single or collective environmental burdens from a particular source is well known, such as the carbon, water or ecological footprint, the authors of the tool felt it was appropriate to draw attention to the negative impacts of nitrogen loss to help consumers and policymakers minimise their impact on the nitrogen cycle. Along the principles of other life-cycle based indicators, the N-calculator provides an integrated approach that includes up-stream processes that release Nr.
- Different food products demand different amounts of nitrogen to create the consumable food product. There are substantial differences both between plant and animal products and within plant (e.g. vegetable vs. cereals) and animal (e.g. milk vs. beef) products. In that regard, both vegetable products and animal products start with the same procedure to calculate the Nr released as a result of growing a crop, but the animal product calculations extend through the production process of the actual

The introduction of new indicators can be used to draw the attention of both public and policy makers to the environmental impacts of a product, service or activity. The report observes that the ranking of food products, for example, in terms of their N footprint is not necessarily consistent with the ranking of their carbon footprint and highlights the need for indicators to be used jointly, not independently.

Furthermore there is a distinct need for careful management of such indicators. The use of an overarching sustainability indicator may be dangerous in that they can over-simplify highly complex systems, are subject to bias, and can lead to a loss of awareness of the actual impacts of a product or service. The introduction of a new indicator warrants careful guidance and explanation if it is to be used properly and not get lost within the wider spectrum of footprints and tools.

http://tinyurl.com/cew35az

Natural resources and waste management

Eight major rivers running dry from overuse – a future source of conflict?

- Eight of the world's greatest rivers have no net outflow due to the scale of human interventions upstream. Rivers, such as the Colorado, the Indus in Pakistan and the Yellow River in China, are so heavily abstracted for agriculture, industry and municipal uses that they rarely reach river deltas.
- This has detrimental impacts on delta ecosystems and fertile land for rice paddies and fisheries. Water scarcity in some regions is leading to riots and political tensions between countries that share river resources.
- Rio20+ has paved the way for discussions on a more sustainable energy-water-food nexus, with 45 CEOs committing to sustainable water use, and proposals for new goals on water use and sanitation. The results of the event are likely to hold benefits in the very long-term future, but are unlikely to resolve local water shortages and conflict over water in the short to medium term.

Horizon: 1

Importance: 7

Links:

Whilst the UK is not directly affected, the indirect impacts could be large due to our reliance on global trade and imports of commodities produced in these regions. The article draws attention to the increase in conflicts over the world's water resources and the need to manage these at a global scale, using systemic approaches which consider local and global priorities for food, energy, water and health.

http://tinyurl.com/6wdgbmw

Making energy from cheese waste and cow manure

- New research has shown that a mix of whey (a by-product of the cheese-making process) and liquid cow manure may be the ideal combination for high quality biogas. Cheese whey is only a problem for really large dairies, but isn't usable in anaerobic digesters as it acidifies too quickly. It is often applied as fertiliser or can be used as other animal feed, however by mixing whey with cow manure, researchers in Italy found that they could achieve the perfect pH.
- Storage of farmyard manure (FYM) and slurry is a significant source of greenhouse gas emissions and poor storage or leakages can lead to pollution of local water bodies.
- The research found that the cheese whey-manure combination was equivalent to corn in terms of energy generation.
- Some dairies are already using cheese whey in biodigesters, such as some in Quebec, where cheese whey is mixed with wash water from the dairy parlour to produce biogas, which is then used to heat water tanks to pasteurise the milk.

Horizon: 1

Importance: 5

Links:

While in the UK whey is often used as pig feed, this is not always a solution, and Government should be aware of other potential uses, particularly in terms of on-farm energy generation, reducing reliance on fossil fuels and external energy sources.

http://tinyurl.com/c8ws4cu

Agriculture and rural communities

Broadband funding shortfall

- The UK is likely to fall short of its broadband targets for 2015 due to a £1.1bn gap in funding that will need to be met by private investors.
- Government targets are to provide 100% access to fast broadband and 90% access to superfast broadband. A report by the London School of Economics (LSE) suggests that the target of 100% coverage by basic broadband by 2015 is likely to be met, but that it was unclear when the fast and superfast targets would be able to be met. The LSE defines "basic" broadband as services offering speeds of up to 2Mbps. "Fast" broadband ranges from 2Mbps to 24Mbps, and "superfast" exceeds 24Mbps.
- Given the economic benefits of faster broadband, one of the report's authors suggested that this year's budget allocation for broadband seemed disproportionate in comparison to other infrastructure such as transport.

Horizon: 1

Importance: 3.3

Links: N/A

While the UK investment in broadband is more than in some other European countries, failure to meet targets is likely to be felt most in rural communities, which could see economic benefits from the rollout of faster broadband and provide important support to local businesses, farmers and rural home-workers.

http://tinyurl.com/7uwldyu

Pesticide resistance - a new development

- That bugs become resistant to pesticides over time is well known, however, while this resistance develops over multiple generations, bacteria can go through several generations in one day. New research has shown that some bacteria have evolved to be able to digest the toxins in insecticides, but also have the ability to live inside the gut of insects, providing them with resistance.
- The phenomenon requires several factors to coincide:
- The pesticide observed was one of the most commonly used organophosphorus insecticides in the world (fenitrothion), which has been so widely deployed that bacteria have evolved to use it as a feed source.
- Many of these bacteria inhabit the soil where the pesticide is used, simply cutting down the level of insecticide present. One particular species however, Burkholderia, also has the ability to inhabit the gut of insects.
- Within the experiment, a pot of soil treated with fenitrothion was found to boost the bacterial population and that 80 per cent of the bacteria grown were able to digest the toxin. When plants were grown in both sets of soil and an agricultural pest introduced, those that were on the insecticide treated soil ended up with bacteria in their mid-gut that could digest the pesticide. This also appeared to provide the bugs with protection from surface exposure to the insecticide.

Horizon: 1

Importance: 3.3

Links: N/A

The research is important in that it shows that where previously it was thought that pests selected for resistance over multiple generations, the presence of bacteria in their gut means this can happen in the space of a day. However, the researchers found that in this case, where fenitrotion was used sparingly, the resistance doesn't seem to occur because if the bacteria can't guarantee its presence, they won't evolve the ability to digest it. Future research may be needed to test the effects of smaller applications, and up skill the farming community to help them to tackle pesticide resistance.

http://tinyurl.com/dxr9vex

Agriculture and rural communities

New agriculture methods could halve food price inflation

- New research by The International Food Policy Research Institute has found that resource conservation technologies could halve increases in food prices.
- If drought resistant varieties for rain-fed crops are fully adopted over the next 30 years this could increase maize, wheat and rice outputs by 27%, 30% and 10% by 2050, respectively. Integrated soil fertility management and nitrogen use efficiency could bring yet further increases.
- Under current climate change scenarios, prices are predicted to rise by between 65% for rice and 90% for maize. The new report suggests that these increases could almost be halved if measures are fully implemented.
- Contrary to the expectation that infrastructure development would accelerate land disturbance, IFPRI researchers also found areas with highly dense roads also had a lower rate of land degradation and deforestation, this was due to strong regulation by institutions managing forests and natural resources in these areas.

The research draws attention to the enormous potential for yield and efficiency gains with implications for both quantity of food production and providing affordable food. However, these benefits will require new techniques and crop varieties to be fully implemented for the greatest improvements to be achieved.

http://tinyurl.com/camrv9f

Horizon: 3

Importance: 4.7

Links:

Food production, processing and distribution

Farming on your roof?

- Designers of a self-contained rooftop aquaponics dome known as the Globe (hedron) are hoping that their concept may help to address food security and are seeking funding to develop a prototype.
- Aquaponics is a combination of aquaculture and hydroponics. If effluents from fish and their food that accumulate in water are channelled to plants, they can be consumed as nutrients, purifying the water for the fish in the process.
- Designers suggest that a rooftop dome could feed a family of four year-round, providing it with sufficient fish, vegetables and herbs.
- Other rooftop agriculture solutions are taking off across the US and elsewhere, utilising otherwise useless land areas and heat that would otherwise be absorbed by dark rooftops and radiated back into the environment, increasing urban temperatures.

Horizon: 2

Importance: 3.3

Links: N/A

Government should be aware of the development of the techniques and their potential to contribute to food security, however adoption of individual systems across households would bring implications such as the need for regulation to ensure food safety control of diseases etc.

http://tinyurl.com/cv8gg3w

Cattle welfare campaign is first to use new European Citizen's Initiative

- A new campaign to drive welfare legislation for dairy cows is the first to use new a new EU initiative to propose new legislation.
- Supporting Better Dairy aims to create new legislation that will make it mandatory for farmers to achieve a certain level of welfare, similar to the Welfare of Laying Hens Directive which came into force in January.
- The campaign will be the first to use the European Citizen's Initiative (ECI), which allows EU citizens to propose new legislation. The initiative requires 1 million signatures from across the EU, from a minimum of 7 EU member states.
- Standards of cattle welfare vary widely across the EU as they are not governed by rules such as the Laying Hens Directive, or the Pig Welfare directive to be brought into force in December.
- UK cows enjoy relatively high welfare standards, with the vast majority covered by the Red Tractor Farm Assurance Scheme. However, there are 23 million dairy cows across Europe, and all are still susceptible to conditions such as lameness, mastitis and infertility, that can be brought about by cramped conditions and poor housing.

Horizon: 1

Importance: 3.3

Links:

Similar to the Pig Welfare Directive, the UK already has generally higher welfare standards than some other European countries, which may give UK dairy production a competitive advantage, provided there is a premium for maintaining high welfare standards in dairy. If higher welfare standards are introduced, the UK should be well placed to deal with these, and legislation should level the playing field and prevent UK farmers being out-priced by competitors with lower welfare standards.

http://tinyurl.com/cy44ssy ; http://tinyurl.com/c3svlcj

Land use and land management

Soil-free farms reduce land and water pressure

- The Waseda University in Japan has developed an alternative technology which allows farmers to grow crops without soil. Not only does this offer the potential to reduce land use pressure (by negating the need for nutrient-rich soil), it also offers other environmental benefits.
- The technique uses a plastic "hydrogel" membrane resembling Saran Wrap. The transparent membrane uses one-tenth of the water and a fraction of the fertiliser to grow the same produce as conventional agriculture.
- The plants are generally free of pathogens, pesticides, and pollutants such as oil or heavy metals because the membrane is selective - water drawn up by the plant's roots pass through it, but other compounds are left behind.
- Dubai-based Agricel show tomatoes and other plants thriving on a film-like material directly atop the desert sand instead of soil and allows farmers to use 90 percent less water.
- According to the research scientist Yuichi Mori "any surface will work anywhere from concrete floors to contaminated ground left behind by the 2011 tsunami in Japan. All that's needed to start a film farm is space, sun, and nutrient-rich water".
- The technology is in its early stages of commercialisation. Thus, there is still much uncertainty regarding the positive and negative impacts created by film farming, as well as how to optimize its use (with regards where and when to use film farms). Nonetheless, the reports suggest it is able to increase the potential for food production from land with little agricultural value.

Depending on its success, the technology could alleviate land, water, and fertiliser-related pressures in the UK and abroad, and increase the amount of space viable for crop growth. There may be potential for the UK to explore new crop markets and relocate cropping to traditional livestock areas in the northwest. Therefore, major effects would be land-use based.

Horizon: 2

Importance: 6

Links:

http://tinyurl.com/bntlgcm http://tinyurl.com/d2blj6z ; http://tinyurl.com/bt5etdp

Land use and land management

Wildfires may change peatland management

- Drying of northern wetlands has led to much more severe peatland wildfires and nine times as much carbon released into the atmosphere.
- A long term experiment in peat drainage, set up in Canada, in 1983 which was interrupted by a wild fire, encouraged scientists to investigate the effect of wildfires in drained and pristine peat. The study revealed that drained peat releases 8.5 more carbon per square meter than pristine peat.
- As wildfires tend to affect the same area of peatland once every 120 years in this region of Canada, the drained peat would not accumulate carbon fast enough to replenish the carbon content of the soil before the next wild fire struck. As a result, the effects of climate change are likely to turn many areas of boreal peat into carbon sources in future.

Horizon: 3

Importance: 5

Links: N/A

The results were surprising and may affect the way peat land is managed. Long-term drainage actually increased tree productivity and carbon storage in the soils. However, a lower water table changed wildfire conditions, and losses of soil carbon to burning in the drained areas increased nine-fold. The study could have implications for peatland management in the UK to prevent the loss of carbon from fire or other events.

http://tinyurl.com/d78aoq6; http://tinyurl.com/6kpqmvt

Water grabs

- Land grabbing is a well-known problem. According to the World Bank, about ten million hectares were acquired from governments or local authorities between 2004 and 2009 in five African countries alone.
- At the genesis of this are a number of laws from colonial times, stating Government's entitlement to all unclaimed land, which includes up to 90% of sub-Saharan Africa's land and most of its water resources. This allows government to sell customarily held land, leaving farmers or the public without grounds for disputing dispossession or reduced accessibility to water resource.
- Recently there has been an increase in leases and acquisitions of water rights and land use to international investors. This process has been unplanned, haphazard and unchecked, creating problems for local communities which are dispossessed of their land and left with less access to secure water.
- The level of foreign investment observed in Africa may lead to a degradation of the quality of life for the population, reduce control of their resources, create barriers to rural development, to the countries self sustainability and incentivise the concentration of people in precarious conditions slums in urban centers.

Horizon: 2

Importance: 4

Links:

As well as the well known implications for food security, the UK may also see the knock-on effects of water grabs via international conflict over water.

http://tinyurl.com/7je5bm4; http://tinyurl.com/c9omd86

Climate, environment and biodiversity

Attack of the killer moths.....

- The giant moth was once thought confined to the world of science fiction. Researchers in Scotland are finding out that the giant moth, though smaller than its cinematic cousin, may wreak a similar level of damage to the coniferous forests of the north. Three inches in length with a wing span the size of a human hand this creature is imposing, but it is the larva that causes the greatest damage stripping the foliage from large areas of pine woodland.
- Originating from continental Europe, Russia and Asia, the moth has established a breeding population in Scotland since 2008. Outbreaks of the moth generally last for 8 years and climate change, which may lead to drier conditions, makes for favourable moth breeding conditions.
- Strict control measures are in place to limit the spread of the moth, however changing climatic conditions will be difficult to overcome. Lessons can be learned from other parts of the world, in particular Canada where the mountain pine beetle continues to decimate forests, a result of warmer than normal winters, also believed to be a result of climate change.

Horizon: 1

Importance: 6

Links: N/A

Instances such as these serve as a warning of the tortuous pathways climatic impacts may take before affecting society. Climate induced drier conditions lead to invasive moths, which in turn decimate an industry that sustains a particular population.

http://tinyurl.com/c8r4k9e

Earths tipping point? Shift change!

- According to a number of respected biologists the earth is rapidly approaching a critical threshold that will lead to a new and highly uncertain future. It is well established that global biological systems undergo rapid wholesale shifts and these shifts have largely been responsible for past mass extinctions. The authors suggest that once an ecological area experiences 50% disturbance it is inevitable the remaining 50% will undergo similar change. Approximately 43% of the Earth's land has been converted for agricultural or urban use with 50% of land disturbed predicted to occur in 2025.
- The effect of environmental change may already be observed. Scientists studying the wetlands of Yellowstone National Park, the US's largest protected watershed, have observed a massive decline in both wetland area and amphibians. The cause of loss is not internal and therefore can only be due to external environmental forces. This may be a 'real-time' example of a tipping point being reached.

Horizon: 3

Importance: 7

Links: N/A

For wealthy countries catastrophic environmental shifts are masked using short-term fixes however many countries are not equipped with the flexibility to deal with these issues. The conundrum for policy makers is developing intergovernmental structures with the flexibility to manage environmental change. Scientists call for improved understanding of impacts and better prediction of environmental shifts.

http://tinyurl.com/d55derh

Climate, environment and biodiversity

Climate mayhem

Horizon: 3

Importance: 2

Links: N/A

- London Geologist Bill McGuire argues that global warming may trigger geological events such as volcanic eruptions, earthquakes and resultant tsunamis. The link between these subterranean events and climate change is supported by evidence of catastrophic geological events of the past. For example, as the Earth shifted out of the ice age, stresses and strains induced by melting ice sheets and rising sea levels were suspected of triggering volcanic eruptions with the number of eruptions increasing 50-fold.
- Recent changes to the Earth's surface may once again destabilise hidden faults within the crust triggering earthquakes. McGuire suggested melting glaciers in New Zealand may trigger an earthquake and though this prediction was accurate (i.e. Christchurch quake) the reason for the earthquake is unknown.

Understanding the complexity of climate change is challenging. It is not simply a case of measuring temperature and sea-levels. It is about understanding the inevitable impacts of climate change and developing plans for dealing with impacts we can no longer mitigate.

http://tinyurl.com/ce5e7vb

Oceans, marine life and fisheries

Marine energy doubled by predicting wave power

Horizon: 2

Importance: 4

Links:

- New methods for predicting wave power could double the energy generated from oceans, according to new research led by the University of Exeter, which could potentially make marine renewables more viable.
- The research team devised a method for accurately predicting the power of the next wave, to make technology more efficient and extract far more energy than currently possible.
- The UK has a huge potential capacity for marine energy to supply electricity, however current technologies are not as developed as those capturing wind and solar energy, are not yet efficient at extracting wave energy and are susceptible to damage from the hostile marine environment. The new research addresses this by enabling the response of the point absorbers (commonly used floating devices with components that move in response to waves) to closely match the force of the wave, making them much more efficient.
- The system devised enables the device to extract the maximum amount of energy by predicting the incoming wave and controlling the response of the device, which minimises damage and avoids the current need to switch off systems in stormy conditions.

This development could bring significant advances in wave technology and mean that wave energy could potentially play a much greater role in the UK energy supply.

http://tinyurl.com/cfw8ky6

Striking a balance: marine conservation versus economic needs

Horizon: 1

Importance: 4

Links:

- Britain's Lyme Bay Marine Protected Area was created with the intention of balancing conservation with the economic needs of fishermen by zoning the park to allow particular types of harvesting in designated parts of the protected area. A similar model exists in Australia's Great Barrier Reef Marine Park with zones such as general use, scientific research and preservation.
- However it seems that in Lyme Bay, conservation may be losing out with closed areas resulting in double the fishing pressure using certain techniques in the restricted parts of the bay.
- Economic impacts are also being felt with declining fish stocks in areas adjacent to the park, threatening the livelihood of fishermen from nearby ports.
- It is hoped that a collaborative working group composed of groups such as fishermen, scientists and regulators will result in more sustainable fishing practices being adopted to achieve the balance that the marine protected area was created to achieve.

The unexpected negative affects seen in the Lyme Bay Marine Protected Area may prove useful in guiding future marine conservation planning and consultation of affected parties to enable broader thinking about how to overcome the conflict between conservation and meeting economic needs in the marine environment

http://tinyurl.com/ccogt2v; http://tinyurl.com/dx77yhh

Oceans, marine life and fisheries

Turn it down: noise threshold for marine development

Horizon: 1

Importance: 5

Links:

- Marine development for energy generation is on the rise which means an increase in construction of seabed infrastructure and pile driving to anchor energy generating systems such as turbines.
- Pile driving large hollow steel pipes into the sea floor creates loud booms underwater that rapidly change water pressure which can be harmful to marine life, causing irreversible damage. It was previously assumed that limiting combined sound during construction minimised the risk to fish, but new research has revealed that the sound level of individual blows is a key factor in the extent of damage to fish.
- Injuries, including damage to the swim bladder and rapid changes to oxygen concentrations in fish blood, were more detrimental when the fish were exposed to one strike of 177 decibels (db) or more, than with multiple strikes at lower db levels.

This research has provided evidence to suggest that a decibel threshold should be adhered to in future when constructing seabed infrastructure and highlights the importance of targeted studies to guide meaningful regulation to ensure marine life is not harmed by increasing underwater development.

http://tinyurl.com/78pdac3

Osmotic power generation one step closer to viability

Horizon: 3

Importance: 2

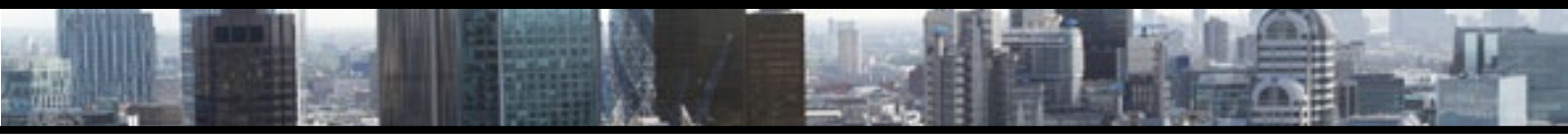
Links: N/A

- Osmotic power generation is a renewable energy source with no emissions to atmosphere and minimal emissions to sea.
- The global energy generating potential of osmotic generation is estimated at 1,650 TWh, approximately 12 times Norway's annual energy production and is more predictable than other renewable sources such as wind, wave, tidal and solar power.
- The principle of osmotic power generation is the release of so-called "mixing energy" when fresh water is mixed with salt water. An osmotic generating station uses a semi-permeable membrane to extract the energy generated when sea water and fresh water meet on either side of the membrane and the pressure is greater on the seawater side. Freshwater then permeates through the membrane to the sea water side, causing an increase in pressure here, driving a turbine and generating electrical energy.
- The process is not without several challenges:
    - The membrane must allow water to pass through whilst keeping out salt
    - It must also be durable and effective enough to operate over a long time period
    - To produce power equivalent to other power plants such as hydroelectric, the size of the osmotic power station would currently need to be larger than any of the desalination plants so far constructed.
- Researchers in Norway suggest that to achieve the required energy efficiency, as much as five million square metres of membrane will be needed to operate an osmotic generating plant with a production output of 25 MW.
- However, this can be achieved by packing membranes into special modules, each containing 1000 square metres of membrane within a cubic metre, making it possible to construct more compact generating plants that make efficient use of the area.

The new methods of "packing" membranes into efficient modules makes this new technology all the more attractive. Given the plant size required to operate the technology is now realistic, further research will focus on furthering the technical performance of the membranes.

http://tinyurl.com/d8b4e84

Economy and industry



Effect of digital printing on manufacture and supply is one step closer

- True to its name, the digital revolution is having a 'revolutionary' effect on manufacturing and supply chains.
- 3D printing technologies now allow companies to download increasingly complex designs and print high technology products on location. The technology is impressive – allowing 10 different materials to be printed into one product alone.
- The implications could be widespread, allowing consumers and businesses to print everything from plates and iPhone covers to body parts or medical devices.
- Not only does the technology help to reduce waste by printing exactly what is required, it could also cut transport costs, emissions and fuel use. As the location of manufacturing shifts and "home printing" of products becomes more accessible to consumers and businesses, there may be less need for distribution networks. The Boston Consulting Group predicts that 10-30% of goods imported from China to the U.S. could be manufactured at home by 2020.
- Whilst the importance of low-wage manufacturing locations will inevitably be weighed against the benefits of proximity to consumers and designers, technologies like this are likely to be disruptive.

Horizon: 3

Importance: 6

Links: N/A

The UK could potentially see a rise in domestic manufacturing as labour costs become less of an issue and companies seek to capitalise on British design expertise. Challenges for government are in providing a highly skilled work force through better education and setting policy that is equitable for all from SMEs to multi nationals. Additionally, home-based manufacture may lead to new waste products, in addition to new regulatory requirements to prevent the home manufacture of counterfeit or dangerous goods.

http://tinyurl.com/cngmuup

Cities will rule the world

- Cities are the major attraction of the 21st century through mass migration, particularly in countries like China and India; people are attracted by the prospects of an increased standard of living through better employment prospects.
- Research points to strong evidence that the influence of cities and all that they encompass will continue to grow resulting in mega cities that attract most of the available talent from which economic and social progress derives. It has been suggested that the global geopolitical future will not be controlled by the "G2" nations of China and the U.S. but rather 10-20 strategic urban networks. London serves as anecdotal evidence of such strategic positioning as over the past 20 years with the growth in its financial services sector, it provides three pronged link between the Americas, Europe and the Far East.

Horizon: 2

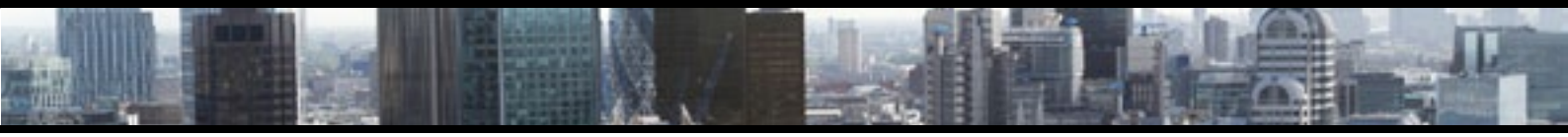
Importance: 6

Links: N/A

Can a city like London remain competitive amongst the power houses of Asia, the Middle East and Latin America let alone those on the doorstep of Europe? The economic benefits are undoubtedly enticing but the environmental and social costs of such a shift in urbanisation and economic power must be assessed in designing policy that either propagates or negates such a move. Governments must also consider the governance issues associated with effecting change through cities operating in concert, as opposed to though national governments.

http://tinyurl.com/d6ftwp6

Economy and industry



Extreme oil!

- Demand for oil has grown concurrently with global GDP over the past 20 years and the consequences of such exploitation and consumption are well documented.
- Despite the hazards and disasters of the past, a new potential risk of "extreme oil practice" is emerging, where companies and governments that are taking greater risks to satisfy stakeholder and consumer demand.
- Whether it's from the challenging and naturally sensitive arctic seas, the extraction of tight oil by controversial fracking in the U.S. or the polluting and inefficient oil sands of Canada, environmental risks are being taken to ensure that global demand is met. The price of oil has afforded companies like Petrobras the capability to push the geographical and technical boundaries of extraction.
- For the UK, extreme oil brings environmental and economic risks - the likes of which have already been seen in the Gulf of Mexico and the Deepwater Horizon Spill. Whilst there are many benefits, these need to be weighed carefully against the costs.

Horizon: 2

Importance: 6

Links:

The need to mitigate the risks associated with oil extraction are substantial and should be met with a global push for more environmentally sustainable methods of energy production, particularly within oil utilising industries such as transport and material production.

http://tinyurl.com/corvhsj

The $60 light bulb

- A light bulb that recently won a competition for $10 million has been made available to purchase in American stores. The light bulb boasts a 20-year lifespan whilst providing a natural, pleasing light. The main issue however, is the price tag of $60 per bulb (or $50 online). It dwarfs the price of previous versions and once again highlights the main issue of adopting new eco-friendly technologies that are too expensive, take too long to enter the main stream and often need government-backed subsidies.
- However, a study has found that over a 10 year period, one Philips light bulb (and the electricity it uses) would set you back $83. Using the regular incandescent light bulbs, you would need to replace it 30 times, and deal with the higher energy use, which amounts to a cost of $228.
- Organisations could make use of economics and psychology principles to communicate the long-term savings to consumers ("Buy now for $50 online, save $145 per bulb over the next 10 years!")
- Additionally, whilst the environmental impact of future technologies will be positive, the contest for the grant is also recognised as an innovative way to solve environmental problems.

Horizon: 2

Importance: 1.3

Links: N/A

The prize was won by technology firm Phillips and the same process could be adopted to solve domestic issues within the UK, where we could capitalize on home-grown design talent in solving domestic and international problems that would bring economic benefits through trade and increased efficiency, environmental and social benefits through decreased resource use and increase welfare as a result of the aforementioned factors.

http://tinyurl.com/c2c2brs

Globalisation, (geo)politics and national security

Capturing innovation for CCS

- The UK energy system will not decarbonise in the immediate future and within energy circles it is quite obvious that carbon capture and storage (CCS) technology is needed to ensure the UK meets looming emission targets.
- However, in the UK a large scale demonstration of CCS technology has not happened. A recent report funded by the UK Energy Research Centre has charted a path for CCS demonstration using examples of innovation stimulation from past large scale energy technologies.
- The UK would seem a logical location for demonstration given the wealth of oil and gas, offshore and engineering expertise, not to mention a number of depleted oil and gas fields.
- So what is preventing innovation? Some suggest cost, others suggest public perception. Closer to the root of the problem may be the approach government takes in managing the energy sector, which is through 'arms length regulation'.

Horizon: 1

Importance: 4.7

Links: N/A

This approach has proven ineffective at stimulating innovation and therefore a change in tactic is necessary. Researchers suggest government work closer with industry to better explore options, discover costs and set strategic goals. This is not to say government loses its autonomy, but rather takes an active approach in stimulating innovation.

http://tinyurl.com/cr3ut9g

Managing disaster better

- A recent report by the Chatham House suggests that policy makers and big business still have a lot to learn about resilience and preparation in the face of high impact low probability events.
- Though considerable efforts are made to improve scientific understanding and reform risk management approaches, further work is necessary. A suggestion is to reconsider risk management strategies, possibly adopting crisis decision-making frameworks based on risk matrixes that categorise risks by common consequences.
- This approach would lead to more targeted, proportionate responses. Other suggestions include improved cooperation between sectors, greater emergency plans transparency, more robust communication strategies and development of a multi-disciplinary reference library quantifying the consequence of world disasters.

Horizon: 1

Importance: 4

Links: ○

Developing mitigation and management frameworks is often only part of the battle for dealing with high impact low probability events. The greatest challenge may be in communicating the Government's rationale behind decision processes with the wider public. An effort that may lead to more socially inclusive efforts to mitigate and manage high impact, low probability events.

http://tinyurl.com/cju6kx7

Building a Rio future

Horizon: 1

Importance: 4.7

Links:

- While the outcomes of Rio+20 are were deemed to be disappointing by much of the press, a way forward for has Rio+40 emerged that uses economic policy and market forces to drive sustainability (e.g. metrics for including environmental goods and services into national accounting systems)
- In most cases natural capital goes widely unnoticed in economic reporting. By internalising environmental externalities it is hoped resources will be viewed as an investment rather than a cost.
- Though commitments towards moving to a green economy failed, the green economy as a tool was deemed very important.
- The outcomes document mostly comprises statements that "note" or "recognize" the major challenges highlighted at the summit. However, there is a lack of strong commitment to set targets or action plans to tackle these challenges. The cost of implementing these changes was cited as the main reason for the weak outcome of the summit.
- Some suggest that the strongest initiatives were made outside the negotiating halls, where significant agreements have been struck on investing in public transport, commitments made to green accounting by corporations and strategies agreed by cities and judicial bodies on reducing environmental impacts.
- Gro Harlem Brundtland, chair of the commission that produced the 1987 "Our common future" report cautioned that Rio+20 had largely failed to acknowledge planetary

While the summit has been argued to lack substance in the context of big commitments, the overarching ideas were promising. It was agreed that nations would consider ways to place higher value on natural capital including ways to measure social and environmental factors as an alternative to GDP as a measure of wealth, payments for environmental services and valuing our impact on natural resources and ecosystems.

http://tinyurl.com/cc2zwms

Demographics and urbanisation

China's age gap paves the way for economic downturn

Horizon: 3

Importance: 3.3

Links:

- Like many countries, China faces a rapidly aging population. Over the past 30 years, the average number of children each woman has, declined from 2.6 to 1.56. That's set to dip again to 1.51 by around 2015. Couple that with the fact that people are living longer, and you see that China's median age will jump from 22 in 1980, to 49 by 2050.
- The impacts are considered to be so huge over time that China is said to be in demographic crises, with potential global economic consequences.
- First, fewer workers will be available. By 2050, the number of people coming towards the end of their working lives will have risen by more than 10%, yet the number joining the workforce will have halved, reducing capacity for economic growth. Additionally, far more individuals will be reliant on the state for pensions.
- Second, China may need to increase immigration (skilled labour), in the absence of long-standing immigration policy or routines. This may lead to a rise in UK citizens seeking work in China to fulfil demand.
- In an age of rapidly expanding populations, disproportionate reductions in birth rates may not be the answer. Doing so only creates an imbalance between the proportion of young and economically productive, and the old and economically dependant.

Government may wish to continue to invest in new, accurate ways of monitoring population demographics, to ensure Governments are able to take action and maintain a balance which is amenable to economic growth. This is by no means an easy feat, and will be highly debated. Incentives/tax breaks may encourage higher fertility rates, but matched with longer life, this is unsustainable. Reduced economic dependency of the elderly may help, but means are not currently in place for this to be viable.

http://tinyurl.com/bra759p

Urban Maths

Horizon: 3

Importance: 6

Links:

- Geoffrey West, a physicist at the Santa Fe Institute says that every doubling in the size of a city brings a 15-20% increase in wages, patent output, the employment of "supercreative" people, the efficiency of transport systems and many other good things associated with cities.
- The story appears to hold some truth in London. Recent research shows that the average Londoner's contribution to the UK's economy shifted from 1.5 times that of the average Brit in 1997, to 1.75 in 2010. This suggests that the workforce is increasingly productive, with greater input to the UK economy thanks to supersized cities.
- Maybe concentrating population rise in cities is economically desirable, but of course, there is a tipping point, and such rises are parallel to rises in crime and pollution.
- In particular, it is worthwhile considering whether the same effect would occur if rural populations were to double, or whether the rise of productivity truly adds to overall economic growth in the UK rather than simply "shifting" productivity from rural areas with the same overall impact.
- Either way, managing the dispersal of populations and economic growth correctly could have major economic, environmental and societal impacts.

Studies may be necessary to better model these impact of both highly concentrated and dispersed population growth in the UK. In order to achieve a sustainable demography, government may wish to consider a full suite of indicators to facilitate particular population growth patterns in the UK.

http://tinyurl.com/d43ssuk