

**ANNUAL**

**REVIEW**

**11**



# **FORESIGHT**

ADVISES GOVERNMENT  
ABOUT HOW TO ENSURE  
TODAY'S DECISIONS ARE  
ROBUST TO FUTURE  
UNCERTAINTIES.

# ABOUT FORESIGHT

**Since its creation in 1994 the Foresight Programme has helped the UK Government to think systematically about the future**

Foresight advises government about how to ensure today's decisions are robust to future uncertainties.

By combining the latest science and evidence with futures analysis, we help policy makers tackle complex issues with a better understanding of the potential opportunities and challenges that lie ahead.

We do this in three ways:

- Major Foresight Projects: in-depth two-year studies which build a comprehensive evidence base on major issues looking 20-80 years into the future
- Policy Futures Projects: shorter projects which provide futures and evidence analysis to fill a specific gap in existing policy understanding
- The Foresight Horizon Scanning Centre: training, toolkits and networks to strengthen futures thinking capacity and share best practice within and across government

Our work is used to stimulate and inform the development of more effective strategies, policies and priorities at national and international levels.

Foresight is headed by Professor Sir John Beddington, the Government Chief Scientific Adviser, who reports directly to the Prime Minister and Cabinet. It is a part of the Government Office for Science within the Department for Business, Innovation & Skills.

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## HIGHLIGHTS

## HIGHLIGHTS OF 2011

**JANUARY**

- Launch of Foresight report on *Global Food and Farming Futures*

**FEBRUARY**

- International workshops for the Foresight project on *Migration and Global Environmental Change*
- Dame Clara Furse appointed as Chair to the Lead Expert Group for the Foresight Project on the *Future of Computer Trading in Financial Markets*
- Sir John Beddington's visit to Washington to present on the *Global Food and Farming Futures* project to the World Bank, USAID and the American Association for the Advancement of Science
- *Global Food and Farming Futures* project seminars with the Department for Food and Rural Affairs (Defra) and Department for International Development (DFID)

**MARCH**

- International expert workshop for the Foresight project the *Future of Computer Trading in Financial Markets*
- How can science support food security? Foresight workshop at the Joint Research Centre, Brussels
- Foresight presentation on *Global Food and Farming Futures* to British Chamber of Commerce, Brussels
- Foresight report on *Global Food and Farming Futures* high level policy seminar with the Westminster Food & Nutrition Forum
- Joint workshop on ecosystems services with the Science Innovation Network, Foreign and Commonwealth Office (FCO)

**APRIL**

- How will international climate change affected the UK? *International Dimensions of Climate Change* cross departmental workshop

**JUNE**

- Foresight *Global Food and Farming Futures* project seminar for the Global Food Security Partnership on UK Research funding
- The Foresight *Global Food and Farming Futures* project gave evidence to the Environmental Audit Committee's inquiry on Sustainable Food
- Foresight *Global Food and Farming Futures* project presentations to the Rome based UN Agencies – FAO, IFAD, WFP

**JULY**

- Launch of final report on *International Dimensions of Climate Change*
- *Land Use Futures* report – one-year review of impact published

**SEPTEMBER**

- Working papers on the *Future of Computer Trading in Financial Markets* published
- *Global Food and Farming Futures* presentation to the Joint Research Centre's High-Level conference on Scientific Support for Food Security and Global Governance
- Seminar with Defra Directors on *Global Food and Farming Futures* evidence and follow up activity

**October**

- Launch of *Migration and Global Environmental Change* final project report at the Royal Geographical Society, Parliamentary launch at Portcullis House
- Side event at the Committee for Food Security Annual Conference at the UN FAO on *Global Food and Farming Futures*
- Presentation to UNESCO on *Migration and Global Environmental Change* project findings

**November**

- Launch of the Commission on Sustainable Agriculture and Climate Change summary for policy makers as part of *Global Food and Farming Futures*
- Presentation to the Global Migration Group Principal's Meeting at UNESCO in Paris on *Migration and Global Environmental Change* report
- Roundtable on science and innovation with President Santos, Colombia

**December**

- Presentation on Foresight report on *Migration and Global Environmental Change* at the Joint Research Centre, Brussels
- New Foresight project announced on the *Future of Manufacturing*
- Presentation on *Migration and Global Environmental Change* report at the Global Forum on Migration and Development in Geneva
- US Launch of the Foresight report on *Migration and Global Environmental Change* at the World Bank and United Nations
- Foresight presentation on sustainability metrics on *Global Food and Farming Futures* to British Chamber of Commerce, Brussels

## FOREWORD

# GOVERNMENT CHIEF SCIENTIFIC ADVISER'S FOREWORD

**During 2011 Foresight launched three major new reports: *Global Food and Farming Futures*, *International Dimensions of Climate Change*, and *Migration and Global Environmental Change*, each tackling some of the most significant challenges facing the world today.**



**Professor Sir John Beddington CMG FRS**  
Government Chief Scientific Adviser and  
Head of the Government Office for Science

These reports have each made a substantial contribution to our international knowledge base, delivering a new and improved understanding of the issues and helping policy makers in their decisions.

At the very start of the year, the **Global Food and Farming Futures** report called for urgent action to redesign the food system to address the increasing demands placed on it. The report received significant attention both nationally and internationally. Since the launch we have been working with Defra and DFID, as well as international organisations including the United Nations to inform and support their strategies and programmes in areas such as sustainable agriculture and hunger alleviation.

**International Dimensions of Climate Change** revealed how climate change impacts from abroad could affect the UK more than climate change at home. The report, published in July, highlighted a wide range of risks to the UK in areas including foreign policy, security, resources and infrastructure, as well as potential opportunities for business, finance and global leadership. The report received strong support from its departmental sponsors, DECC and Defra, and once again exemplified how Foresight translates issues of global significance into a UK context.

In October, Foresight launched its report on **Migration and Global Environmental Change**, challenging current views about migration associated with environmental change by highlighting two as yet underestimated groups of people who are particularly vulnerable: those moving into areas of environmental risk, and those trapped in hazardous areas, unable to move. In the few months since the launch the report has been presented and discussed with stakeholders at the World Bank, the UN, the European Commission and of course here in the UK. We are looking forward to further collaboration with national and international organisations to explore how the report's findings can inform policy.

Over the past year we have also tackled two further subjects relating to critical areas of government policy. **The Future of Computer Trading in Financial Markets** is examining how computer trading might evolve over the next ten years, and the effect it is having on a range of areas including financial stability, market efficiency and liquidity. The project is developing a robust evidence base, and has already published three working papers and seventeen driver reviews to support the final project report, which will be published in autumn 2012.

Foresight's role in tackling issues at the forefront of government policy is further exemplified in its latest project, the **Future of Manufacturing**. Sponsored by Secretary of State for Business Innovation and Skills, Vince Cable MP, this project will look at the long-term picture for the manufacturing sector out to 2050, and will call on industry and academic expertise from the UK and abroad to investigate how the UK can identify and act on key opportunities, and mitigate risks.

Coming into my final year as GCSA, I want to thank the many hundreds of experts and stakeholders all over the world who have contributed to Foresight's work over the past four years. Foresight's role is made possible through bringing together the best in science, evidence and expertise, and in an increasingly uncertain world, this work has never been more important.

## FORESIGHT REPORT

# HEAD OF FORESIGHT'S REPORT

## In 2011 Foresight sought to play a pivotal role in helping policy makers to tackle critical and complex issues.

Not only did we publish two of our most ambitious reports to date – **Global Food and Farming Futures**, and **Migration and Global Environmental Change** – but we made substantial progress building and publishing the evidence base for our current work on the **Future of Computer Trading in Financial Markets**, as well as announcing our latest project on the **Future of Manufacturing**.



**Professor Sandy Thomas**  
Head of Foresight,  
Government Office for Science

These projects, combined with publishing the final project report on **International Dimensions of Climate Change** and the continuing work of the **Horizon Scanning Centre**, made 2011 a year where Foresight made a substantial contribution in informing national and international policy making.

**Global Food and Farming Futures** revealed that the global food system is failing and described five broad strategies that can help address this global challenge. In the months following the January launch, Foresight continued to work closely with its sponsor departments, Defra and DFID, to bring the findings of this report centre stage and shape policy both in the UK and internationally.

Foresight's focus for the autumn was on the launch of the **Migration and Global Environmental Change** report in both national and international forums to deliver a new and improved understanding of the links between these two important issues. It was clear from both the stakeholder and media launch events that the report is already starting to change the way migration and global environmental change is debated, in particular by increasing the focus on urbanisation, and trapped populations. Foresight will continue to foster action on the critical issues raised by the report, both in the UK and internationally in 2012.

The Foresight project on the **Future of Computer Trading in Financial Markets** has made substantial progress in building a robust evidence base in

preparation for publishing the final report in autumn 2012. The early working papers and driver reviews published in September 2011 are already sparking significant interest and engagement among policy and industry groups, and we are working to draw in further analysis and evidence over the project's final few months.

Foresight also published its report on **International Dimensions of Climate Change** which examined how climate change impacts in other parts of the world could affect the UK. Commissioned by Defra to inform the Climate Change Risk Assessment, it has stimulated interest across government in the security implications of climate change.

Finally, the Foresight **Horizon Scanning Centre (HSC)** has continued to work with a range of departments to strengthen futures capability across government and improve resilience in planning and decision-making. This included work with the Cabinet Office and FCO to consider future scenarios for the Middle East and North Africa in the context of the Arab Spring, and with DECC to develop scenarios for the fourth Carbon Budget.

I am, as ever, very grateful to the many people around the world who have contributed to Foresight's projects over the past year, and to the staff in Foresight who have shown such dedication.



# COMPLETED PROJECTS

## COMPLETED PROJECTS

# MIGRATION AND GLOBAL ENVIRONMENTAL CHANGE

**Foresight's latest project explored the challenges and opportunities associated with migration in the face of environmental change over the next 50 years.**

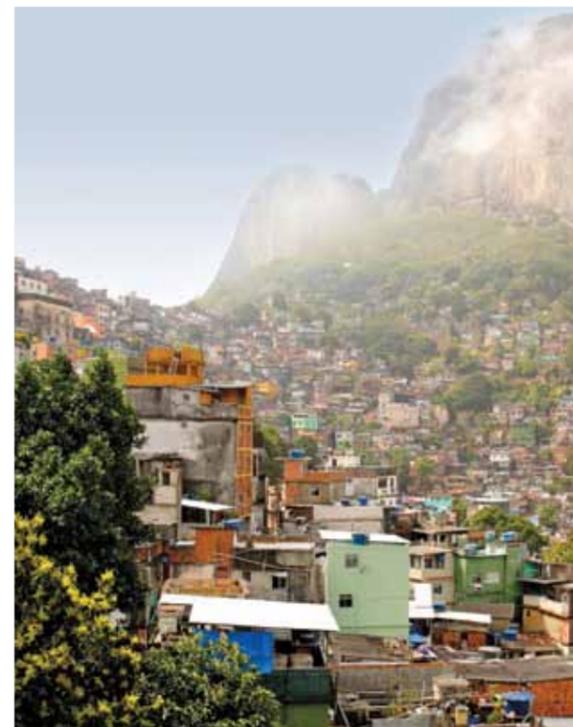
The Foresight report on **Migration and Global Environmental Change** was launched by Sir John Beddington and the project's lead experts on 20 October 2011 at the Royal Geographical Society, London.

International in scope, it examines potential migration patterns over the next 50 years and the possible challenges and opportunities they will present in the future.

#### How we did the project

This report represents the culmination of two years work involving over 350 experts from 30 countries from a diverse range of disciplines. The Lead Expert Group, chaired by Professor Richard Black, University of Sussex, ensured that the project used the best evidence available, with more than 70 papers and other reviews commissioned to inform the analysis. The project was guided by a High Level Stakeholder Group of international experts including representatives from the UN Development Programme, the International Organization for Migration, the OECD, the European Commission and World Bank, as well as UK government departments including DECC, DFID and the FCO. The project also ran international workshops in Nepal, Kathmandu, Johannesburg and Istanbul to inform the analysis.

The Phase 1 driver reviews of the report have been published in the journal *Global Environmental Change*. The work in Phase 2 will be published in *Environment and Planning C*, *Environmental Research Letters* and *Environmental Science and Policy*.



## COMPLETED PROJECTS

### Project conclusions

While recognising the opportunities that human movement will present, 75% of which is internal, the project found that the challenges associated with migration in the face of environmental change have been underestimated.

To date, much of the analysis in this area tends to focus on individuals 'fleeing' from areas with deteriorating environments. The Foresight report highlights two additional issues which have so far received little attention: those who are moving *towards* environmentally risky areas and those who are 'trapped' in difficult situations, unable to move away from growing environmental threats.

The report also concludes however that migration can also be part of the solution to responding to global environmental change, representing a form of adaptation and contributing to long-term resilience. It finds that migration can potentially be a positive force for development, and in certain circumstances can transform people's ability to cope with environmental change.

The report identifies two priority areas for action: first, international adaptation and development funding may be more effective if it takes account of the links between global environmental change and migration, as well as recognising that migration can be part of the solution. Secondly, long-term urban planning can address critical issues such as water availability, more frequent hazards and the well-being of new migrants who are often the most vulnerable.

In summary, the report concludes that environmental change will affect human population movement specifically through its influence on a range of economic, social and political drivers. However, because of the range of factors influencing the decision to migrate, environmental threats will rarely be the sole driver of migration, nor will the policy challenges be limited to people moving away from areas of risk.

### Migration and Global Environmental Change – Key Findings:

The report's main findings are that:

#### 1. Millions will be 'trapped' in vulnerable areas and unable to move, particularly in low-income countries.

Migration is costly, and with environmental conditions such as drought and flooding eroding people's livelihoods, migration – particularly over long distances – may be less possible in many situations. This creates high risk conditions.

#### 2. People will increasingly migrate towards environmentally vulnerable areas.

Rural to urban migration is set to continue, but many cities in the developing world are already failing their citizens with flooding, water shortages and inadequate housing. Preliminary estimates show that up to around 192 million more people will be living in urban coastal floodplains in Africa and Asia by 2060, through both natural population growth and rural-urban migration.

#### 3. However, migration can transform people's ability to cope with environmental change,

opening up new sources of income which help them become stronger and more resilient. For instance, 2009 remittances to low income countries were at \$307 billion, nearly three times the value of overseas development aid. These kinds of income flows may actually make it possible for households, particularly in low income countries, to stay in situ for longer.

#### 4. There are two priority areas for action.

First, international adaptation and development funding may be more effective if it takes account of the links between migration and environmental change. Second, long term urban planning can address critical issues such as resource availability and the well-being of new migrants.

### Media coverage

The project held a press briefing for science, environment and development correspondents at the Science Media Centre and another for international correspondents based in London through the Foreign and Commonwealth Office on Wednesday 19 October 2011. The report received extensive print and broadcast coverage in both the national and international press. The project's findings were also published in an article in Nature magazine on Thursday 20 October.



#### Climate change refugees could end up trapped – Euronews

Hundreds of millions of people fleeing storms, droughts or floods caused by global warming could end up trapped in disaster areas, according to a report from the British government's Foresight Group.

#### Major migration challenge by 2060, experts warn – Telegraph

Climate and other environmental changes will cause "major challenges" for world leaders over the next 50 years as mass migration threatens to create new humanitarian crises, a major new report says.

#### Alert sounded on 'environmental migration' – FT

Tens of millions of people are moving to places that are more vulnerable to environmental disaster, particularly the urban flood plains of Asia and Africa, according to a UK government report.

#### Climate-driven migration challenge underestimated – Reuters

The challenges of human migration due to climate change have been underestimated as millions of people will either move into or be trapped in areas of risk by 2060, rather than migrating away, a British government report showed on Thursday.

#### Climate change migration warning issued through report – BBC

Governments and aid agencies should help the world's poorest to move away from areas likely to be hit by flooding and drought, a UK report says.

#### Millions 'face environment hazards' – PA

Millions of people around the world will be "trapped" in areas at increasing risk from environmental hazards such as flooding, a report into future migration has warned.

#### Climate change could trap hundreds of millions in disaster areas, report claims – Guardian

Report says refugees forced to leave homes by weather caused by global warming may end up in even worse afflicted areas.

#### Millions Will Be Trapped Amid Climate Change, Study Warns – New York Times blog

Millions of people are expected to become trapped in places that are extremely vulnerable to environmental change in the course of this century, according to a British government study released on Thursday.



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## COMPLETED PROJECTS

### Comments on the report

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“Environmental change threatens to have a profound impact on communities around the world – particularly in low income countries. However, this report finds that the nature of the global challenge goes beyond just focusing on those that might try to move away from areas of risk. Millions will migrate into – rather than away from – areas of environmental vulnerability, while an even bigger policy challenge will be the millions who will be ‘trapped’ in dangerous conditions and unable to move to safety.

“The evidence is also clear that under some circumstances migration, particularly in low income countries, can transform a community’s ability to cope with environmental change. The movement of individuals or small groups, even at a local or regional level, may increase the future resilience of large communities. This will reduce the risk of both humanitarian disasters and of potentially destabilising mass migration under high risk conditions.”

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**Professor Sir John Beddington**, Government’s Chief Scientific Adviser

## COMPLETED PROJECTS

# GLOBAL FOOD AND FARMING FUTURES

**The Foresight project Global Food and Farming Futures explores how a future global population of 9 billion people can all be fed healthily and sustainably.**

The report emphasises that we are at a unique moment in history as diverse factors such as changes in the climate, competition for resources and changing consumption patterns present major challenges for sustaining the world's food supply. Whilst the global food system currently delivers for many, it is failing in two critical ways; consuming the world's natural resources at an unsustainable rate; and failing the very poorest, with almost one billion of the least advantaged and most vulnerable people still suffering from hunger and malnutrition.

The report, published in January 2011, argues that urgent action is needed to redesign the food system to feed the world's growing population.

### How we did the project

The two year project commissioned over 80 scientific reviews and involved over 400 leading experts and stakeholders from 35 countries. The project was

guided by international experts from the UN, EU, World Bank, industry and civil society; and draws on other well regarded international reports. Strategic direction for the project was provided by the High Level Stakeholder Group which was co-chaired by **Jim Paice** MP, Minister of State for Agriculture and Food at Defra and **Stephen O'Brien** MP at DFID. The Lead Expert Group, chaired by Professor Charles Godfray, Oxford University, ensured that the project used the best evidence available.

The project's diverse evidence base was published in three peer-reviewed journals including Royal Society Philosophical Transactions B and Journal of Agricultural Science and covered a wide range subjects from food policy to gender issues to inform the project. The papers are also available free of charge on the Foresight website.

### Project conclusions

The Foresight report argues that food system must become sustainable, whilst adapting to climate change and substantially contributing to climate change mitigation. There is also a need to redouble efforts to address hunger, with almost one billion of the least advantaged and most vulnerable people still suffering from hunger and malnutrition. The project has identified and analysed five key challenges for the future (see page 12).

Foresight has worked closely with Defra and DFID to ensure the report's findings and evidence base inform future policies. Visit the 'our impact' section to find out more.



## Global Food and Farming Futures – top five challenges:

### 1. Balancing future demand and supply sustainably – to ensure that food supplies are affordable.

The food system is currently consuming resources faster than are being naturally replenished and renewed, including: consuming 70% of total global water withdrawals from rivers and aquifers and directly contributes 10-12% of greenhouse gas (GHG) emissions. The global food system has to be redesigned to bring sustainability centre stage. Supply must be increased without bringing in substantially new land for agriculture. The report argues that more food can be delivered by using existing knowledge and innovation better to increase production; moderating demand; managing waste; improving governance; and raising the political profile of food.

### 2. Ensuring that there is adequate stability in food supplies and protecting the most vulnerable from the volatility that does occur.

While the amount of volatility in future food prices remains uncertain, price spikes are inevitable. While volatility has been lower over the past 20 years price spikes in 2007/8 had a profound impact, increasing hunger and the risks of political and social instability. Although predicting the future is inherently problematic, there are clear actions that can be taken to manage volatility. They include: creating reliable rules-based liberalised international trade; investigating modern commodity trading; caution on calls for a global system of grain reserves; appropriate insurance for poor farmers; and targeting food reserves and safety nets. As prices in early 2011 exceed the high of 2008, protection of the most vulnerable groups from the worst effects of food price volatility must be given priority.

### 3. Achieving global access to food and ending hunger.

The food system is failing to address hunger. In addition to the 925 million people currently experiencing hunger, another billion are thought to suffer from 'hidden hunger'. In contrast, a billion people are over-consuming. Efforts to end hunger internationally are already stalling, and without

decisive action food prices could rise substantially over the next 40 years making the situation worse. A stronger constituency for hunger reduction needs to be built. The benefits of agriculture to support women and small-holder farming, and improve nutrition and health must be recognised. Efforts must be focused on rebuilding infrastructure; creating better monitoring and evaluation, for example, using hunger maps to target hunger hot-spots; and building anti-hunger momentum so hunger is harder to ignore.

### 4. Managing the contribution of the food system to the mitigation of climate change.

Agriculture, including fertiliser production, directly contributes 10-12% of GHG emissions; this figure rises to 30% or more when land conversion and costs beyond the farm gate are added. Addressing climate change and achieving sustainability in the global food system need to be recognised as dual imperatives. Ambitious, and in some case legally binding, targets for reducing emissions have been set which cannot be achieved without the food system playing an important part. There is a clear case for substantially integrating and improving considerations of agriculture and food production in negotiations on global emissions reductions.

### 5. Maintaining biodiversity and ecosystem services while feeding the world.

Decisions taken now will affect the diversity of plant and animal species for future generations. Food supply will need to increase without the use of substantially more land and with diminishing impact on the environment: sustainable intensification is a necessity. The report argues that policies for food production and maintaining biodiversity and ecosystem services need to be developed and properly connected at both global and national levels.

Foresight is working closely with Defra, DFID and the project's High Level Stakeholder Group to ensure the report's findings and evidence base inform future policies. Visit the 'our impact' section more information on the impact the project has already made.

## Key messages from the report

### • Waste must be minimised in all areas of the food chain:

An amount of food equivalent to about a quarter of today's annual production could potentially be saved by 2050 if the current estimate of global food waste is halved.

### • Focus on sustainability:

The application of existing knowledge and technology could increase average yields two to threefold in many parts of Africa, and twofold in the Russian Federation. Similarly, global productivity in aquaculture could, with limited changes to inputs, be raised by around 40%.

### • Improving governance of the global food system:

It is important to reduce subsidies and trade barriers that disadvantage poor countries. The project's economic modelling shows how trade restrictions can amplify shocks in the food system, raising prices further.

### • Knowledge is power:

Investment in new science and technology to raise the limits of sustainable production and address new threats. No single technology or type of research will be a silver bullet for addressing sustainable production (all can contribute something). There is a need to increase our understanding of animals to improve yields while still increasing water, nutrient and other efficiencies. Research on climate change adaptation and mitigation in the food system also need to be given priority, for example, producing crops that are drought and flood resistant.

## COMPLETED PROJECTS

### Media coverage

The project **Global Food and Farming Futures** held a press briefing for science, environment and farming correspondents at the Science Media Centre and another for international correspondents based in London through the Foreign and Commonwealth Office on Monday 24 January 2011. The report received extensive print and broadcast coverage in both the national and international press. A full list of media impact can be found on the Foresight website.



### 'No easy solution' to global hunger – Today Programme, BBC Radio 4

A detailed analysis of the global food situation has found that a billion people are hungry, another billion malnourished, and that unless action is taken, there will not be enough food for the growing population.

### Report: Urgent action needed to avert global hunger – BBC

A UK government-commissioned study into food security has called for urgent action to avert global hunger.

### Era of low-cost food is over, study warns – FT

The era of cheap food is at an end, with the real prices of key crops set to rise 50-100 per cent during the next 40 years, according to a UK government report.

### Welcome for report on food security – Scotsman

Farming leaders and agricultural scientists yesterday enthusiastically endorsed a report calling for a fundamental change in world food production in order to feed the expected increase in population.

### Global food system must be transformed 'on industrial revolution scale' – Guardian

The existing food system fails half the people on the planet, and needs radical change if world is to feed itself, report warns.

### Farming needs 'sustainable intensification' says report – SciDev

The quest to feed the world's rapidly growing population over the next 40 years needs a frontloaded approach to funding agricultural research, according to a report on food security released today (24 January).

### Agriculture needs 'greenest' revolution to cope with rising prices – Nature

Declining food prices are a thing of the past, and the world must reform its agricultural system to prepare for increasingly volatile prices, the UK government's Foresight Programme said today.

### Food inflation is only going to get worse in future, warn scientists – Independent

The era of cheap food is over, and prices are likely to rise significantly in coming decades, due to the increase in the global population and a worldwide shift towards eating more meat and dairy produce, a major study into the future of farming has concluded.



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## COMPLETED PROJECTS

### Comments on the report

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“We need a global, integrated approach to food security, one that looks beyond the food system to the inseparable goals of reducing poverty, tackling climate change and reducing biodiversity loss – and the UK Government is determined to show the international leadership needed to make that happen. We can unlock an agricultural revolution in the developing world, which would benefit the poorest the most, simply by improving access to knowledge and technology, creating better access to markets and investing in infrastructure. To fuel this revolution, we must open up global markets, boost global trade and make reforms that help the poorest. Trade restrictions must be avoided, especially at times of scarcity. And we must manage price volatility by building trust and cooperation – and in particular by creating greater transparency around the true levels of food stocks.”

**Caroline Spelman**, Environment Secretary

“With one seventh of the world’s population still hungry, this report is a clarion call to arms. The food price crisis in 2008 increased the number of people suffering from hunger by 150 million. Today reports of increasing food prices once again fill the news – and it’s clear from this new study that price volatility is only set to increase in the future making further food price spikes inevitable. Internationally, those with the least spend the largest proportion of their income on food, so food price shocks hit the poorest hardest and can have long term impacts on their health. Britain is already working to tackle malnutrition, improve agriculture, and get new research into the hands of the poorest people. Steps taken now and pushed through over the next few decades to stabilise global markets, reduce volatility and prioritise agriculture will have a disproportionate effect on ensuring food security for a predicted nine billion people by 2050.”

**Andrew Mitchell**, International Development Secretary

## COMPLETED PROJECTS

# INTERNATIONAL DIMENSIONS OF CLIMATE CHANGE

**The Foresight project on International Dimensions of Climate Change finds that climate change impacts from abroad could affect the UK more than climate change at home.**

Jointly funded by the Government Office for Science, Defra and DECC, this one year Foresight project investigated how the UK is likely to be affected by global climate change over the next 30 years and beyond.

#### How we did the project

The project involved over 100 experts and policy makers from across academia, government, think tanks and the private sector, and drew on nine underlying peer-reviewed reports.

Professor Andrew Sentence, professor of Sustainable Business at Warwick Business School and former member of the Bank of England's Monetary Policy Committee, chaired the project's Lead Expert Group. The group comprised leading academics in relevant disciplines and worked closely with the project team to ensure that the project's findings were of the highest technical and scientific standard.



## COMPLETED PROJECTS

### Key findings

The report identified a wide range of risks to the UK from climate change impacts in other parts of the world, which may have implications for:

#### Foreign policy and security

International instability could increase as a consequence of climate change, either directly through extreme weather events and water system stresses, or indirectly as social and political systems in vulnerable parts of the world come under increasing strain. Also, the UK has a moral, political and legal obligation to support certain regions that are particularly at risk from the effects of climate change, such as small island states which include many of the UK Overseas Territories.

#### Resources and infrastructure

Climate change could affect the overseas resources and infrastructure on which the UK depends. The impacts could arise from global temperature change, water stresses, a rise in sea levels and extreme weather events. A wide range of potential threats are identified including disruption to essential infrastructure serving global markets and energy supplies, as well as the potential impact of extreme weather events on communications networks and data centres.

#### Financial sector and business

The report argues that the financial sector and business more generally may fail to properly evaluate and take into account changes in the balance of risks associated with climate change overseas. UK firms managed worldwide assets of £1.2 trillion in 2008, and the failure to make accurate assessments on their level of exposure to climate change effects may result in these assets being insufficiently insured or protected. The UK's financial exposure to overseas climate change impacts may increase if international business and financial policy frameworks do not account for climate change appropriately, leaving institutions exposed to additional risks and uncertainties. Other areas that could be affected by climate change impacts abroad include the health of UK citizens, and the UK's international role.

The report demonstrates how the UK is closely interconnected with the global economy, and that it has an important role in addressing risks internationally. Opportunities in business, finance and global leadership are highlighted.

### Comments on the report

“Our world is getting warmer, and the UK’s extensive international economic, political and cultural ties mean that the UK is at increasing risk from impacts of climate change overseas. The UK must not respond by becoming insular but instead broaden its international reach to tackle climate change. This report is designed to help Government consider how these impacts will be felt here in the UK so we can better prepare and adapt for the future”

**Professor Sir John Beddington**, Government’s Chief Scientific Adviser

“As John Beddington’s report recognises, the effects of climate change extend beyond environmental concerns into geo-political considerations.

“For the international community to deal with these challenges we must adapt together to ensure sustainable economic growth, maintain global stability, and support developing nations and countries particularly vulnerable to the effects of climate change.”

**Caroline Spelman**, Environment Secretary

# CURRENT PROJECTS

## CURRENT PROJECTS

# COMPUTER TRADING IN FINANCIAL MARKETS

**This project is building a robust evidence base on the impact of computer-based trading on financial markets over the next 10 years.**

This project is just over half way through and has so far engaged with over 350 academics and professionals from 30 countries.

These experts have examined the challenges and opportunities presented by technological advances in financial markets worldwide. In recent years the ways in which financial markets operate have been transformed by fast-paced technological progress. Today, over one-third of the UK's equity trading volume is generated through high frequency automated computer trading, while in the US this figure is closer to three-quarters.

The Foresight project **The Future of Computer Trading in Financial Markets**, sponsored by the Financial Secretary to HM Treasury, Mark Hoban

MP, and led by the Government Chief Scientific Adviser, Professor Sir John Beddington, aims to make a significant contribution to the efficiency, integrity and resilience of financial markets by identifying options for policy makers in the UK and internationally. The project has involved lead experts in these fields and continues to explore how computer generated trading in financial markets might evolve in the next ten years or more, and how this will affect:

- Financial stability;
- Integrity of financial markets including price information and liquidity;
- Competition;
- Market efficiency for allocating capital;
- Transaction costs on access to finance; and
- Future role and location of capital markets.

It will also assess policy options and consider how the opportunities offered by advancements in computer technologies could be capitalised upon by the financial sector.

The project is due to publish its final report in autumn 2012.

### Working Papers

In September 2011, the project published three working papers reviewing the emerging evidence

base on the impact of computer trading in financial markets and how this might evolve. The papers provide an expert, independent review of computer trading and its impact on financial stability and market quality, as well as the impact of technology developments. They were commissioned to inform the project's final report, rather than being Foresight's

final findings or conclusions on these issues.

The project has to date peer reviewed and published 17 Driver Reviews as supporting evidence to the working papers and intends to commission and publish further Driver Reviews and Impact Assessments to support the findings of the project final report.



### Comments on the working papers

**“With financial markets evolving at a rapid pace, it is essential we develop a better understanding of the critical issues which affect the health of this sector and the wider economies it serves.**

**“I believe these papers will be valuable to policy makers and regulators wanting to maximise the opportunities from computer-based trading while managing the risks. This kind of evidence-based analysis is vital if a resilient regulatory framework is to be put in place.”**

**Professor Sir John Beddington**, Government's Chief Scientific Adviser

## CURRENT PROJECTS

# THE FUTURE OF MANUFACTURING

**The nature of manufacturing and its role in the UK and global economies is going through a period of change.**

Manufacturing has a key role to play in economic growth and brings a number of other benefits to the UK in terms of societal value and contribution to national resilience. New industries and technologies are emerging and there is increased competition and changing demand for products and services. As with a number of developed economies, the manufacturing share of the UK economy has declined over past decades, from 22% of GDP in 1990 to around 10% today.

The **Future of Manufacturing** project will provide a timely and fresh look at the long-term picture for the manufacturing sector out to 2050. The project is being led by Foresight under the direction of the Government Chief Scientific Adviser, Professor Sir John Beddington, and is sponsored by Secretary of State for Business, Innovation and Skills, Vince Cable MP.

The project will call on industry and academic expertise from the UK and abroad to investigate global trends and drivers of change. It will provide a better understanding of how important trends relating to manufacturing might develop, particularly those involving technology and globalisation. An innovative evidence base and futures analysis will inform policy makers throughout the project and beyond, helping the UK to maximise opportunities in manufacturing, mitigate risks and deal effectively with future uncertainties.

The project is due to publish in winter 2013.



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## CURRENT PROJECTS

### Comments on the report

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“Manufacturing has a key role to play in economic growth, in particular driving exports and productivity. But as industries and technologies evolve, we need to make sure we’re staying ahead of the game. The Government is working with business to support and strengthen the UK’s manufacturing capability, through action to drive up investment, innovation, exports and skills.

“I look forward to this report from the respected Foresight team. It will make a powerful contribution to our work supporting British industry and to making sure that we retain our position as a world-class manufacturing nation at the cutting edge of new products and processes.”

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**Vince Cable**, Business Secretary

“It is essential to develop a better understanding of how key trends relating to manufacturing might develop, particularly those related to technology and globalisation. This work will help the UK position itself to maximise opportunities in manufacturing, mitigate risks and deal effectively with future uncertainties.

“This timely project will have important findings for the UK economy and worldwide. I am delighted that Vince Cable has agreed to be the sponsoring Minister for this project and I look forward to working with him.”

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**Professor Sir John Beddington**, Government Chief Scientific Adviser



# FORESIGHT'S IMPACT

## FORESIGHT'S IMPACT

# GLOBAL FOOD AND FARMING FUTURES

## Foresight's follow-up team have worked both nationally and internationally to catalyse action on Global Food and Farming Futures.

The **Global Food and Farming Futures** report brought together a wide range of multidisciplinary evidence and futures work to analyse the global food system and inform the actions of multiple national and international stakeholders. In particular, the study addressed the food system's consumption of the world's natural resources at an unsustainable rate and its failure to meet the needs of the world's poorest – almost one billion go to bed hungry every night. The report set out the case for urgent action on several fronts and showed that policies on the major global challenges of food security, climate change, economic growth and the eradication of poverty are all inextricably linked.

Over the last year Foresight has worked with the UK government and leading international organisations to achieve impact in a range of areas.

The report has helped shape the Defra Green Food Project. This initiative aims to integrate activities to reduce waste, to link the production of food and energy, and to influence consumer behaviour. By doing so, its goal is to improve production, growth and competitiveness in the farming and food industry, whilst promoting global food security and protecting our natural environment.

DFID has taken forward the report's findings on the global food system in a range of ways. It is funding studies which link agriculture and climate change; strengthening modelling through contributions to the Agricultural Model Intercomparison and Improvement Project; and supporting the Climate Change, Agriculture and Food Security research programme.

Engaging major international institutions such as the UN to meet food and farming challenges on the global stage is essential if progress is to be sustainable and far reaching. To that end, Foresight continues to work with agencies such as the Food and Agriculture Organization, the International Fund for Agricultural Development, and the World Food Programme to inform and support their programmes in areas such as sustainable agriculture and hunger alleviation. Foresight is also working with the African Union in exploring the report's implications for research and policies at all geo-political levels, developing the case for investment in agriculture and promoting economic and social development and trade.

The Commission on Sustainable Agriculture and Climate Change chaired by the UK Government Chief Scientific Adviser, Professor Sir John Beddington, also drew extensively on the principles laid out in the report to identify what policy changes and actions are needed now to help the world achieve sustainable agriculture that contributes to food security and poverty reduction.



## FORESIGHT'S IMPACT

# MIGRATION AND GLOBAL ENVIRONMENTAL CHANGE

**Foresight has worked with Government departments and international organisations to explore the report's implications for policy and strategic thinking.**

The *Migration and Global Environmental Change* report examines how profound changes in environmental conditions such as flooding, drought and rising sea levels will influence and interact with patterns of global human migration over the next 50 years. These patterns of human movement will present major challenges as well as potential opportunities for communities and policy makers at both a national and international level.

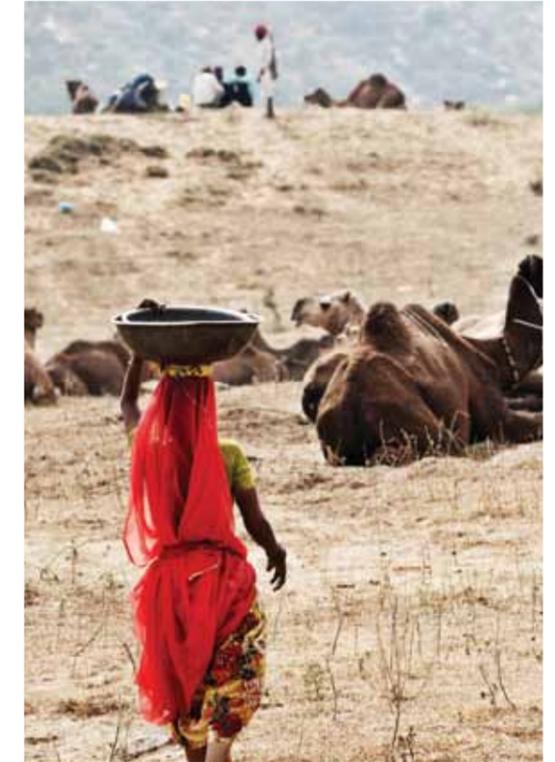
The report reveals that the major challenges associated with migration and environmental change have been underestimated. By focusing solely on those who might leave vulnerable areas, there is a risk that people who are 'trapped' and those who move towards danger are neglected. The report also shows that migration can have a transformative role in helping communities adapt to hazardous conditions. This is a critical finding for policy makers working to avert costly humanitarian disasters in the future.

In the three months following publication, Foresight has conducted an intense period of report dissemination, presenting and discussing the report with UK Government departments such as the Department for International Development and international and regional organisations including the European Commission, the World Bank and the UN. We have also worked directly with national governments including France, the USA, and Switzerland, and collectively through organisations such as the Global Forum on Migration and Development.

These early meetings have yielded a wide range of opportunities which include:

- Collaboration opportunities to turn some of the report's key conclusions into policy and programmes, for example with the World Bank, UNHCR and DFID;
- A facilitating role in helping specific organisations understand how to develop their own policies on migration and environmental change;
- Potential opportunities for partnership with organisations who wish to see some of the report's conclusions embedded in international processes, such as Rio+20.

Foresight is looking forward to building on this firm foundation with a rigorous programme of follow-up activity throughout 2012.



## FORESIGHT'S IMPACT

# LAND USE FUTURES

**Foresight has worked with Government departments and other stakeholders to explore how the evidence base laid out in the report might be used to inform policy and strategic thinking.**

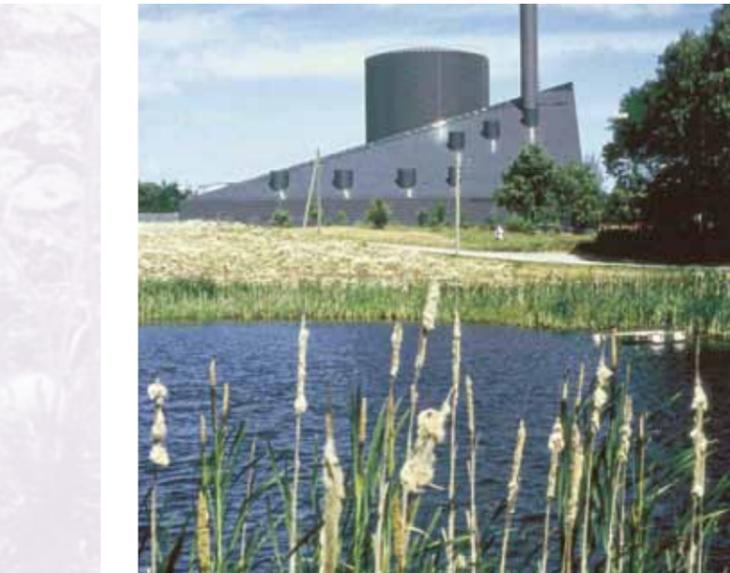
The Foresight report *Land Use Futures: Making the most of land in the 21st century* (2010) demonstrates how, between all of the different uses of land, there are deep-rooted interactions, many of which are not well understood. The report sets out the strong case for improving our knowledge of these relationships and using it to inform the development and implementation of cross-cutting policy. In developing the report, Foresight brought together a wide range of stakeholders and has continued to work with them to influence UK government policy and strategic thinking.

The report was one of the core documents that the Defra used to establish the evidence base of the Natural Environment White Paper, *The Natural Choice: securing the value of nature* (June 2011). The evidence set out in the report was seen as supporting and complementing that in other recent studies, such as the Lawton report, *Making Space for Nature* (2010), *the National Ecosystem Assessment* (2011) and

*The Economics of Ecosystems and Biodiversity study* (2010). Commonality between these pieces of work was particularly evident in the identification of major factors driving change, for example demography, climate change, economic growth, changing societal expectations and in the need to assess the value of land comprehensively, including through innovative forms of economic and non-economic valuation. The report's emphasis on achieving a wider range of sustainable benefits from land, for example, by promoting its multifunctional use and through action at the landscape scale was particularly notable and many of its individual proposals have now been adopted.

For the Department for Communities and Local Government (CLG), the report has provided a valuable baseline on how land is used in England, which has been helpful in deciding planning policy priorities. The report recognises that a strategic approach for land use needs to strike the right balance between national and local powers, and CLG's reforms of the planning system, set out in the Localism Bill, reflect the decentralised framework outlined in the report.

A leading theme of the report is the emphasis it gives to dealing with trade-offs between different land use types. This raises a number of research issues which are being taken forward by research funded by the Natural Environment Research Council and Living with Environmental Change.



## FORESIGHT'S IMPACT

## TACKLING OBESITIES

**The Foresight report continues to provide a valued evidence base for informing government policy on tackling obesity.**

Obesity is a major issue currently facing many countries and is set to become an increasing challenge in the years to come. The Foresight report, *Tackling Obesity: Future Choices* (2007) considers how this challenge might play out over the next 40 years in the UK and explores how Government might effectively respond.

The report has some stark messages if effective and sustainable action is not taken immediately. Modern life ensures that every generation is heavier than the last and the project coined the term 'passive obesity' to refer to the potential outcome of the varied and subtle pressures of living within today's obesogenic environment. The study considers how obesity might develop in the future and the factors which will pay a part in determining this. The project developed an innovative systems mapping approach to identify and expose obesity's many diverse determinants and their complex interrelationships.

This has been one of the most successful of Foresight's reports in achieving enduring impact. Having already been intimately connected with the framing and development of HMG's past initiatives, for example the £372 million *Healthy Weight: Healthy Lives: a cross-government strategy for England*, the Report has again been at the heart of UK government thinking. In 2011 the Department of Health launched *Healthy Lives, Healthy People: A call to action on obesity in England*. This sets out how the new approach to public health will enable effective action on obesity and encourages a wide range of partners to play their part.

*A call to action on obesity in England* states how the Foresight report has been a 'driving force behind efforts to tackle obesity' and, although published almost four years ago, remains a 'robust foundation for future action'. In particular, *A call to action on obesity in England* draws on Foresight's innovative system mapping and other 'key insights which have informed both national and local-level action'.

The Government is determined to bring a new drive to this issue and is setting two new national ambitions to achieve downward trends in the level of excess weight in children by 2020 and in the level of excess weight averaged across all adults by 2020.



## FORESIGHT'S IMPACT

# MENTAL CAPITAL AND WELLBEING

**If we are to prosper and thrive in an increasingly interconnected and competitive world, both our mental and material resources will be vital.**

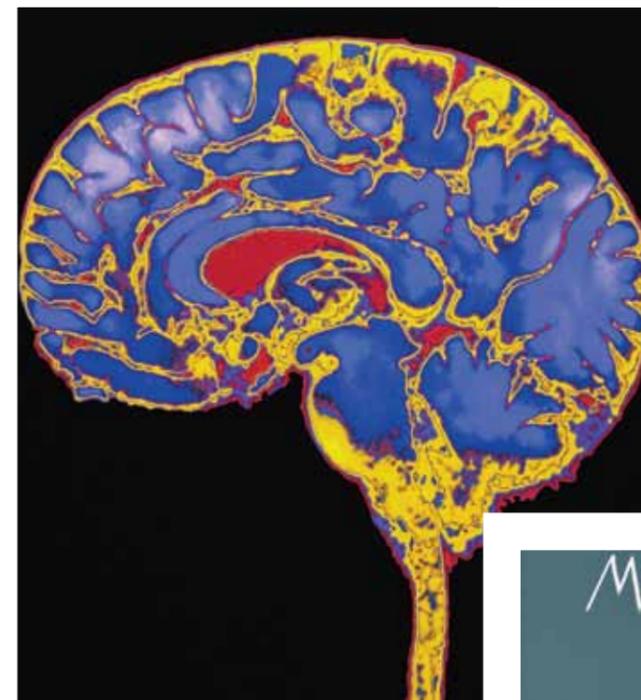
The report *Mental Capital and Wellbeing: Making the most of ourselves in the 21st century* (MCW) (2008) explores what needs to be done to meet the challenges ahead so that individuals can realise their potential and flourish in the future.

The UK Department of Health's new mental health strategy (MHS) *'No health without mental health: a cross-Government mental health strategy for people of all ages'* (2011) sets out an ambition to 'mainstream' mental health, and establish parity of esteem between services for people with mental and physical health problems. The MHS carries forward some of the Foresight study's principal conclusions; in particular, the call for an integrated, cross-government response to future challenges which recognises key social as well as medical determinants and the necessity to align and integrate policies and interventions across the lifecourse from childhood to old age. Also included are the MCW report's *'Five-ways-to-wellbeing'*

(5WTWB) which describe steps that the individual can take to develop and strengthen his or her own mental wellbeing.

The 5WTWB have struck a chord directly with 'grass roots' communities as well as those in policy and research and have been adopted by a wide range of third sector organisations and civil society. For example, Foresight is working with a Community Interest Company to develop a toolkit at the community level to help build a self-organising flourishing neighbourhood, where mental capital connects with social capital. People might then be empowered to use their individual cognitive and emotional resources to create a more connected and nurturing community.

Government policy on national wellbeing also draws on the 5WTWB and their potential to improve the quality of life for citizens. Through new guidance, policymakers from across government are now encouraged to review policy options against their potential capacity to enable people to pursue the 5WTWB and, thereby, enhance their mental capacity and wellbeing.



## FORESIGHT'S IMPACT

# FURTHER IMPACT OF PAST PROJECTS

## Foresight's catalogue of published projects continue to achieve impact with policy makers in the UK and around the world.

### Detection and Identification of Infectious Diseases

The report **Infectious Diseases: Preparing for the future** (2006) takes a broad approach by considering future disease threats to human, animal and plant health, and continues to make inroads into the management of disease risk in Africa.

In particular, the report's Africa strand called for a disease/infection surveillance-based research strategy that is rooted in effective national systems but coordinated through sub-regional clusters and ultimately at the pan-African level. Following on from the successful establishment of the Southern African Centre for Infectious Disease Surveillance which was developed in line with these Foresight principles, the African Union Scientific Technical and Research Commission is now leading an initiative to develop an equivalent centre in Western Africa.

### Flooding and Coastal Defence

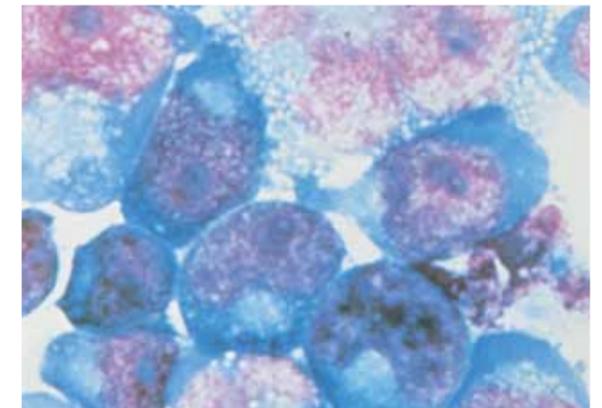
The Foresight **Future Flooding** report (2004) produced a challenging and long-term vision for the future of flood and coastal defence in the UK that takes account of the many uncertainties, is robust, and can be used as a basis to inform policy and its delivery.

Although the report focuses on the UK, its methods, approaches and findings have been used to inform policy and research in several countries and have formed the basis for major studies. For example, in the wake of the widespread flooding in Australia in 2010/11, stakeholders are exploring the report's relevance in the development of a more strategic flood risk planning process in Queensland.

### Sustainable Energy Management and the Built Environment

The Foresight report **Powering Our Lives: Sustainable Energy Management and the Built Environment** (2008) explored how the UK's built environment could evolve to help manage the transition over the next five decades to secure, sustainable, low carbon energy systems that meet the needs of society, the requirements of the economy, and the expectations of individuals.

The report continues to achieve impact in the research community and in February 2011 the University College of London in partnership with the Foreign and Commonwealth Office arranged for UK and US experts to share insights on the report's themes. This enabled discussion in the context of international comparison and explored ways of moving forward on the report's findings. The event also stimulated discussion on an international research agenda around energy and cities and begin to build networks of collaboration.



# HORIZON SCANNING CENTRE

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HORIZON SCANNING CENTRE

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**Foresight's Horizon Scanning Centre (HSC), based within Foresight, helps deliver long-term futures analysis and capability across government. The programme includes working with government departments and GO-Science to deliver futures analysis; building capability, and developing futures networks.**

## **Futures thinking across government**

During 2011, the HSC worked with a range of government departments to develop future scenarios across a range of policies, and to embed greater resilience in planning and decision making. This included work with the Cabinet Office and FCO to consider future scenarios for the Middle East and North Africa in the context of the Arab Spring. We worked with DECC to develop scenarios for the fourth Carbon Budget and with DCMS to consider digital convergence and inform subsequent legislation.

## **Our Future Identity**

The HSC commissioned a review of research on the Future of Identity, led by Professor Nick Bostrum from the University of Oxford, to help government understand the range of innovations that may affect future identity.

## **Understanding the Future Growth Potential of Technology**

The HSC continued to build on its report 'Technology and Innovation Futures: UK Growth Opportunities for the 2020s'. The report provides a forward look at a range of developments that have the potential over the next 20 years to support sustained economic growth in the UK. It identified seven cross-cutting areas that are likely to be particularly important. The report has attracted interest from Ministers and policy makers and informed thinking in this area. Universities and Science Minister, David Willetts, used the report to inform a speech in January 2012 on the UK's high tech future.

## **Scanning the Future**

The Sigma Scan is a searchable database of horizon scanning papers, covering economics, the environment, politics, science and technology and society issues. Designed for government users, it includes over 200 papers to challenge assumptions and spark new ideas. It can be accessed at [www.sigmascan.org](http://www.sigmascan.org)

## **National Security Futures**

The HSC provides support for the security and intelligence community. The Future Security and Intelligence Outlook Network (FUSION) is a closed meeting that promotes collaboration on issues that cut across departments and encourages the use of futures techniques. This group meets four times a year and considers a wide range of areas of interest to the security and intelligence community.

## **Understanding Futures**

Foresight developed its three one-day training courses on strategic futures, available at introductory and intermediate levels. Please contact [horizon.scanning@bis.gsi.gov.uk](mailto:horizon.scanning@bis.gsi.gov.uk) if you would like further details of the courses.

## ANNEXES

## ANNEXES

Many academics, experts and policy makers contribute to Foresight's work. Our Lead Expert Groups bring together specialists from a wide range of scientific and other disciplines to ensure that our work is of the highest technical standard, and relevant to policy. A High-Level Stakeholder Group (HLSG) of relevant organisations in the public sector, research community and business advise Foresight on the strategic direction of projects and the actions that should result from the work. Membership of the Lead Expert Groups and HLSG are published in this section.

#### Advisory Board for Foresight

The Advisory Board for Foresight advises the Government Chief Scientific Adviser on the overall strategic direction of the Foresight Programme. Its members in 2011 were:

- **Sir William Castell** LVO, Chairman of the Wellcome Trust. Previously President and CEO of General Electric Healthcare and Vice-Chairman of the General Electric Company (GE).
- **Professor Brian Collins**, former Chief Scientific Adviser at the Department for Transport and Professor of Information Systems at Cranfield University.
- **Clive Cookson**, Science Editor of the Financial Times since 1991, with a career in journalism covering science, technology and pharmaceuticals.
- **Professor Ian Diamond**, Principal and Vice-Chancellor, University of Aberdeen.
- **Professor Sir David Hendry**, Professor of Economics and a Fellow of Nuffield College Oxford.

- **Dr Mike Howse** OBE FREng, Technical Adviser to Rolls-Royce plc, and previously Director, Engineering and Technology at Rolls-Royce plc. Member of the Defence Scientific Advisory Council. Visiting Professor at Cranfield University.
- **Sir Adrian Smith**, Director General Knowledge and Innovation, Department for Business, Innovation and Skills
- **Professor Sir Chris Snowden**, Vice-Chancellor and Chief Executive, University of Surrey
- **Professor Sir Robert Watson**, Chief Scientific Adviser at the Department for Environment, Food and Rural Affairs (Defra) and chair of Environmental Science and Science Director of the Tyndall Centre at the University of East Anglia. Former Chief Scientist at the World Bank and Chair of the Intergovernmental Panel on Climate Change.

#### High-Level Stakeholder Group for Global Food and Farming Futures

- **Chair** – Jim Paice MP, Minister of State for Agriculture and Food, Department for Environment, Food and Rural Affairs
- **Chair** – Stephen O'Brien MP, Parliamentary Under-Secretary of State for International Development, Department for International Development
- Professor Sir John Beddington, Government Chief Scientific Adviser, Government Office for Science
- Dr Pedro Arcuri, Coordinator, EMBRAPA Labex Europe Empresa Brasileira de Pesquisa Agropecuária
- Dr Tariq Banuri, Director, Division for Sustainable Development, UN

- Dr John Barrett, deputy director policy and research division, DfID
- John Bensted-Smith, Director, Directorate-General for Agriculture, European Commission
- Sam Bickersteth, Head of programme policy team, Oxfam
- Prof. Joachim von Braun, Director General, International Food Policy Research Institute (IFPRI)
- Eckhard Deutscher, represented by Stephen Groff Deputy-Director, Development Co-operation Directorate OECD
- Dr Nina Fedoroff, Special Advisor on Science and Technology to the US Department of State
- Iain Ferguson CBE, Chief Executive, Tate & Lyle PLC
- Anne Guttridge, Supply Chain Manager, Grain and Oilseeds, Europe, Cargill
- Brian Harding, Director, Food and Farming Group, Defra
- Patrick Holden, Director, Soil Association
- Michael Jacobs, Senior Policy Adviser to the Prime Minister
- Prof. Doug Kell, Chief Executive, BBSRC and RCUK
- Peter Kendall, President, NFU
- Laurie Lee, Director, Agricultural Development, Global Development Program, Bill and Melinda Gates Foundation
- Dr Will Martin, Acting Research Manager, Development Research Group, Trade, World Bank
- Dr Jeff McNeely, Chief Scientist, International Union for Conservation of Nature (IUCN)
- Professor Richard Mkandawire, Head of the Comprehensive African Agriculture Development Programme, New Partnership for Africa's Development (NEPAD)
- Alexander Mueller, Assistant Director, General Sustainable Development Department, Food and Agricultural Organisation (FAO)

- Dr Namanga Ngongi, Director, Committee on Agriculture and Rural Development (AGRA)
- Nancy Roman, Head of Public Policy and Communications, World Food Programme (WFP)
- Professor Andrew Rosenberg, Director, Ocean Process Analysis Laboratory, University of New Hampshire
- Dr Harsha Vardhana Singh, Deputy Director-General, World Trade Organisation (WTO)
- Achim Steiner, Executive Director, United Nations Environmental Programme (UNEP)
- Ajay Vashee, President, International Federation of Agricultural Producers
- Jan Kees Vis, Director Sustainable Agriculture, Unilever
- Ross Warburton, President, Food and Drink Federation

#### Lead Expert Group for Global Food and Farming Futures

- **Chair** – Professor Charles Godfray FRS, Hope Professor, Oxford University
- Professor Lawrence Haddad, Director of the Institute of Development Studies, University of Sussex
- Professor Ian Crute, Director of Rothamsted Research
- Professor Jules Pretty, Environment & Society, University of Essex
- Dr David Lawrence, Head of Research and Development, Syngenta
- Dr Camilla Toulmin, Director of International Institute for Environment and Development
- Professor Sherman Robinson, University of Sussex.

#### High-Level Stakeholder Group for Migration and Global Environmental Change

- Mehari Maru, African Conflict Prevention Programme (ACPP)

## ANNEXES

- Richard Edwards, Asian Development Bank (ADB)
- Andy Bearpark, CARE International UK
- Professor Robert Watson, Chief Scientific Adviser, Department for Environment, Food and Rural Affairs
- David Warrilow, Department for Energy and Climate Change
- Alan Winters, Chief Scientific Advisor, Department for International Development
- Paul Boyle, Economic and Social Research Council UK (ESRC)
- Heike Buss, European Commission
- Frank Laczko, International Organization for Migration (IOM)
- Kris Ebi and Chris Field Intergovernmental Panel on Climate Change (IPCC)
- Chris Field Intergovernmental Panel on Climate Change (IPCC)
- Andrew Watkinson, Living with Environmental Change (LWEC)
- Alan Thorpe, Natural Environment Research Council (NERC)
- Steven Wilson, Natural Environment Research Council (NERC)
- Barrie Stevens, OECD
- Goran Svilanovic, Organisation for Security and Co-operation in Europe (OSCE)
- Madeleen Helmer, Red Cross/Red Crescent Climate Centre
- Robin Mearns, The World Bank
- Jeni Klugman, United Nations Development Programme (UNDP)
- Veerle Vandeweerd, United Nations Development Programme (UNDP)
- Diarmid Campbell-Lendrum, World Health Organization (WHO)

### Lead Expert Group for Migration and Global Environmental Change

- **Chair** – Professor Richard Black, Head of the School of Global Studies at the University of Sussex
- Professor Neil Adger, Environmental Economics, School of Environmental Sciences, University of East Anglia and Programme leader Tyndall Centre for Climate Change Research
- Professor Nigel Amell, Director, Walker Institute for Climate System Research, University of Reading
- Professor Stefan Dercon, Developmental Economics, Oxford University
- Professor David Thomas, Head of School of Geography and the Environment, Oxford University and Deputy Leader Tyndall Centre for Climate Change Research
- Professor Andrew Geddes, Department of Politics, Sheffield University

### High Level Stakeholder Group for the Future of Computer Trading in Financial Markets

- Paul Tucker, Deputy Governor, Bank of England
- Martin Wheatley, FSA, Managing Director (Designate), Consumer and Markets Business Unit
- Dr Kay Swinburne, MEP, European Parliament
- Dr Adrian Blundell-Wignall, Deputy Director (Financial & Enterprise Affairs), OECD
- John Bates, Senior Vice President and Chief Technology Officer, Progress Software
- Laurent Useldinger, CEO, ULLink,
- Thomas Secunda, Founding Partner, Bloomberg
- Jon Robson, Thomson Reuters
- John McCarthy, General Counsel, Getco
- Richard Gorelick, CEO, RGM Advisors LLC
- Nicholas Nielsen, Global Head of Trading, Marshall Wace
- Rob McGrath, Global Head of Trading, Schroders

- Scott Cowling, Global Head of Scientific Equity Trading, Blackrock
- Xavier Rolet, CEO, London Stock Exchange
- Dominique Cerutti, President, Deputy CEO and Head of Global Technology, NYSE Euronext
- The Honourable Ronald Arculli, Chairman, Hong Kong Stock Exchange
- Kerim Derhalli, Managing Director and Global Head of Equity Trading and Head of Equities EMEA, Deutsche Bank
- Olivier Osty, Deputy Head of Global Equities & Commodity Derivatives, BNP Paribas
- Andrew Bowley, Managing Director, Head of Electronic Trading Product Management, Nomura
- Mark Northwood, Global Head of Trading, Fidelity
- David Harding, CEO Winton Capital
- Dr Ali Toutounchi, Managing Director (Index Funds), Legal & General Investment Management
- Stephen O'Connor, Chairman, International Swaps & Derivatives Association
- Danny Truell, Chief Investment Officer, Wellcome Trust
- Chris Marsh, Managing Director (Advanced Execution Services), Credit Suisse
- Stijn Claessens, Deputy Director (Research), IMF

### Lead Expert Group for the Future of Computer Trading in Financial Markets

- **Chair** – Dame Clara Furse DBE, former CEO of London Stock Exchange and a non-executive Director of Legal & General Plc, Amadeus IT Holding SA, Nomura Holdings Inc
- Professor Philip Bond – Oxford Centre for Industrial and Applied Mathematics
- Professor Dave Cliff – Professor of Computer Science, University of Bristol
- Professor Charles Goodhart – Professor of Finance, London School of Economics

- Andy Haldane – Executive Director Financial Stability, Bank of England
- Kevin Houston – Chairman, Rapid Addition; co-Chair, Global Technical Committee, FIX Protocol Limited
- Professor Oliver Linton – Professor of Econometrics, London School of Economics
- Dr Jean-Pierre Zigrand – Reader in Finance, London School of Economics

### Lead Expert Group for the Future of Manufacturing

- **Chair** – Sir Richard Laphome CBE, Chairman of Cable and Wireless Communications Plc
- Nicholas Crafts – Professor of Economics and Economic History and Director of the Competitive Advantage in the Global Economy Research Centre, University of Warwick
- Steve Evans – Professor of Life Cycle Engineering and Director of Research in Industrial Sustainability, Institute for Manufacturing, University of Cambridge
- Anne Green – Professorial Fellow, Institute for Employment Research, University of Warwick and UK Commission for Employment and Skills Expert Panel
- Richard Harris – Professor of Applied Economics and Director of the Centre for Public Policy for Regions, University of Glasgow
- Alan Hughes – Margaret Thatcher Professor of Enterprise Studies at the Judge Business School and Director of the Centre for Business Research, University of Cambridge
- Chris Lowe – Professor of Biotechnology and Director of the Institute of Biotechnology, University of Cambridge
- Dr Hamid Mughal – Executive Vice President, Manufacturing Engineering and Technology, Rolls Royce plc
- Professor Michael J H Sterling, Chairman of the Science & Technology Facilities Council



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This publication is also available on our website at <http://www.bis.gov.uk/foresight/publications/annual-reviews>

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