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ADJACENT GOVERNMENT

November 2014

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Cover inspired by arctech HELSINKI SHIPYARD

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Reinventing the City Building on Creativity

Creativity, innovation and a strong focus on social and cultural aspects of sustainability are at the very heart of developing the City of Varberg to become the Swedish West Coast's Creative Hot Spot by 2025.

In our vision for the future, the City of Varberg has unique opportunities. Our goal is clear, and we are acting on it. We are building a community converging around means of public transportation in a rapidly expanding region. The railroad, which has long created a barrier between the seaside and the city centre, will now be relocated into a tunnel underneath the city. To expand on this opportunity we are moving the harbour in order to further free up land for letting the city reclaim its position as a seaside town. In total, the project will result in more than 500,000m² of land for development of our future city front. For people living, working or visiting the city of Varberg, the change will dramatically increase the freedom to experience the coastline. Places of residency, places for eating and meeting, places to shop and work, etc. – comes as a bonus.

Come to Varberg. Share our vision.

Read more on pages 24 and 25.

The City of Varberg

www.varberg.se

Foreword

Viviane Reding
Former Vice-President of the European Commission, Member of the European Parliament (MEP)

Europe's growth and prosperity will largely depend on innovation and excellent infrastructure. A sector with the highest expectations is the digital economy. That's why the newly elected President of the European Commission, Jean-Claude Juncker, made the development of the digital single market a priority right of the beginning of his mandate. In his speech at the European Parliament in July 2014 he said: "We must make better use of the opportunities of the digital technology which knows no borders. We must break down national silos in telecommunication regulations, in copyright and in data protection standards. We have to break down national silos as far as the management of radio waves is concerned. We must knock down these barriers, these hurdles to growth. Roaming charges in Europe have to and will disappear. If we are successful in implementing a real digital single market, we can generate €250bn of additional growth in Europe." The goal is to create new job opportunities, especially for young job-seekers, and to ensure the transition of Europe to vibrant knowledge-based society.

Juncker even charged one of the new Vice-Presidents, Andrus Ansip, with the horizontal competence for the digital single market and Commissioner Günther Oettinger in particular with the digital economy and society. They will have the task to make Europe a world leader in information and communication technology, with all the instruments to compete successfully in the global digital economy and to participate in an interlinked global digital society.
I am proud that I personally could contribute to put the cornerstones to this ground-breaking project for Europe's future. The first cornerstone was eliminating the initial borders blocking the free flow of information, the legislation to cap roaming charges. The second cornerstone is a simple, concise and clear legal framework for data protection, thus bringing back "trust".

Data is at the centre of the digital world. It is the currency of this new market. Already in 2011, European data was worth €315bn. By 2020, European data will be worth €1tn. But like any currency, it relies on trust. Yet citizens' trust in the way in which data is used in the economy is low. Even before the surveillance revelations, 92% of Europeans were concerned about the way their data is used without their consent. Therefore we need to engage to restore trust in the digital economy. That means: personal data needs to be protected by a strong European regulation.

European citizens want strong data protection rules and companies need a simple, clear and enforceable legal framework for doing business in the EU's internal market. Those are the 2 objectives of the European Data Protection Reform. It is conceived as a win-win deal for citizens and businesses alike.

For citizens, the goal is to secure that administrations and businesses do not collect and use more personal data than they need. Further, individuals should be back in control by updating their rights. The right to be forgotten, the right to data portability and the right to be informed of personal data breaches are key features. They will help close the growing rift between citizens and the companies with which they share their data.

For businesses, the reform will stimulate growth by establishing a true Digital Single Market. At the moment, a firm operating in all 28 Member States has to deal with a different legislation, as well as with different data protection authority in each country. The European Union wants to replace this complex and multilayer legal situation by one concise law that and valid in all of Europe: One continent, one law!

The proposal has been agreed by the European Parliament and is still under deliberation in the Council. I hope that strong and credible EU data protection rules can be approved as soon as possible, thereby setting a global standard for data protection. ■

Viviane Reding
Former Vice-President of the European Commission, Member of the European Parliament (MEP)

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Introduction

It's all change for Europe this month with the new President of the European Commission Jean-Claude Junker starting his 5-year term with his chosen Commissioners.

On November 1st the new Commissioners and Vice-presidents took to their new roles with some recognisable faces amongst the new line up, as both Günther Oettinger, and Johannes Hahn continue as Commissioners, but with new responsibilities.

A regular contributor to Adjacent Government, Hahn is now the Commissioner in charge of European Neighbourhood Policy & Enlargement Negotiations. Oettinger will follow on from Neelie Kroes, in his new role as Commissioner for Digital Economy & Society.

In this winter edition of Adjacent Government we give you a rundown of the new Commissioners and Vice-presidents, including their nationalities. We wish all the new Commissioners good luck in their role, and look forward to working with them on future articles.

We kick start this edition with a foreword from a former Vice-president of the European Commission and MEP Vivienne Reding. Ms Reding discusses the changes afoot, as well as the importance of Europe being digitally successful in the future, in order for businesses to achieve growth.

In line with Ms Reding's foreword we have a number of articles that look at the digital agenda. On a local level, Sunderland City Council describes how the city is embracing and becoming more flexible in regards to digitalisation. We also feature an article from Tom Saunders at Nesta, who highlights the impact digital technologies can have on our cities.

A major focus this month is given to the agriculture sector. Agriculture is a key part of the economy and environment. Reflecting this, we examine the important role soil plays within our lives in articles from Moujahed Achouri, FAO Land and Water Division of the Global Soil Partnership, and the Scottish Environmental Protection Association (SEPA).

Other areas of discussion within the publication include: the new UK state pension; change management; the urban agenda; healthcare innovation; and the new UK curriculum.

The health and social care section of the publication delves into the world of non-communicable diseases. With the Ebola epidemic hitting West Africa, Adjacent Government asks the World Health Organization (WHO) to detail prevention methods that could be carried out throughout Europe to help prevent the further spread of the disease that has already killed around 5,000 and affected people in the USA and Spain.

As always I hope you find this edition thought provoking and useful, and welcome any feedback and feature ideas you may have.

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The European Commission
2014-2019

On 1st November 2014 a new College of European Commissioners took up their roles aside the new President – Jean Claude Junker. Here, Adjacent Government outline who the new Commissioners are, their nationalities, along with new and old roles....

President – Jean-Claude Junker (Luxembourgish nationality)

2004-2013 President of the Euro Group
1995-2013 Prime Minister of Luxembourg
2009-2013 Prime Minister, Minister of State, Minister for the Treasury

http://ec.europa.eu/commission/2014-2019/president_en

Vice Presidents

First Vice-President – Frans Timmermans (Dutch nationality)

2014 First Vice-President of the EU Commission in charge of Better Regulation, Inter-Institutional Relations, the Rule of Law and the Charter of Fundermental Rights.

2012-2014 Minister of Foreign Affairs.

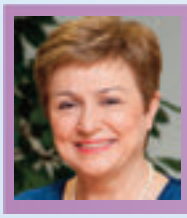
http://ec.europa.eu/commission/2014-2019/timmermans_en

Vice President – Federica Mogherini (Italian nationality)

High Representative of the Union for Foreign Affairs and Security Policy

Feb-Oct 2014 Italian Minister for Foreign Affairs and International Cooperation. Member of the Italian Democratic Party and Progressive Alliance of Socialists and Democrats.

http://ec.europa.eu/commission/2014-2019/mogherini_en

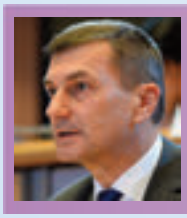


Vice-President – Krisalina Georgieva (Belgian nationality)

Responsible for Budget and Human Resources

2010-2014 European Commissioner for International Cooperation, Humanitarian Aid and Crisis Response.

http://ec.europa.eu/commission/2014-2019/georgieva_en



Vice-President – Andris Ansip (Estonian nationality)

Responsible for Digital Single Market

2014 Member of the European Parliament, Vice-President for the ALDE group.

2005-2014 Prime Minister of Estonia.

http://ec.europa.eu/commission/2014-2019/ansip_en

Vice-President – Maroš Šefčovič (Slovak nationality)

Responsible for Energy Union

2014 Elected as a Member of the European Parliament.

2010-2014 EU Commissioner & Vice-President for Inter-Institutional Relations and Administration.

http://ec.europa.eu/commission/2014-2019/sefcovic_en

Vice-President – Valdis Dombrovskis (Latvian nationality)

Responsible for Euro & Social Dialogue

2014 Member of the European Parliament.

2014 Member of the Latvian Parliament.

http://ec.europa.eu/commission/2014-2019/dombrovskis_en

Vice-President – Jyrki Katainen (Finnish nationality)

Responsible for Jobs, Growth, Investment and Competitiveness

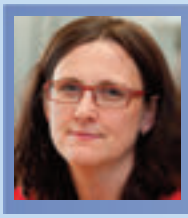
2011-2014 Prime Minister of Finland.

http://ec.europa.eu/commission/2014-2019/katainen_en

Commissioners

Gunther Oettinger (German nationality)
2014 – European Commissioner for Digital Economy & Society.
Previously the Commissioner for Energy, Oettinger has been a member of the European Commission since 2010. Prior to this he was Minister-President of Baden – Wurttember, Germany.
http://ec.europa.eu/commission/2014-2019/oettinger_en

Johannes Hahn (Austrian nationality)
2014 – European Commissioner for European Neighbourhood Policy & Enlargement Negotiations.
Previously the Commissioner for Regional Policy, Hahn has been a member of the European Commission since 2010. Prior to this, he was the Federal Minister for Science and Research in Austria.
http://ec.europa.eu/commission/2014-2019/hahn_en

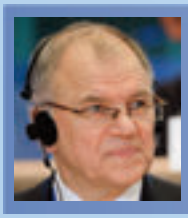


Cecilia Malmström (Swedish nationality)
2014 – European Commissioner for Trade.
2010-2014 – European Commissioner for Home Affairs.
2006-2010 – Minister for EU Affairs, Sweden.
http://ec.europa.eu/commission/2014-2019/malmstrom_en

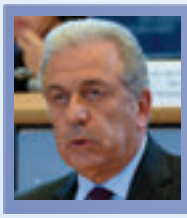
Neven Mimca (Croatian nationality)
2014 – European Commissioner for International Cooperation & Development.
Mimca is a Croatian politician who was previously selected as a Deputy Prime Minister of the Croatian government in 2011, responsible for Internal, Foreign and European Policy.
http://ec.europa.eu/commission/2014-2019/mimica_en

Miguel Arias Cañete (Spanish nationality)
2014 – European Commissioner for Climate Action & Energy.
2014 – Member of European Parliament.
2011-2014 – Minister for Agriculture, Food and Environment, Spain.
http://ec.europa.eu/commission/2014-2019/arias-canete_en

Karmenu Vella (Maltese nationality)
2014 – European Commissioner for Environment, Maritime Affairs and Fisheries.
2013-2014 – Minister for Tourism and Aviation.
2010-2013 – Chairman of the Orange Travel Group.
http://ec.europa.eu/commission/2014-2019/vella_en



Vytenis Andriukaitis (Lithuanian nationality)
2014 – European Commissioner for Health & Food Safety.
2014 – Vice-President of the World Health Assembly.
2012-2014 – Minister for Health, Lithuania.
http://ec.europa.eu/commission/2014-2019/andriukaitis_en

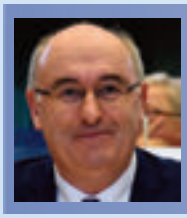


Dimitris Avramopoulos (Greek nationality)
2014 – European Commissioner for Migration, Home Affairs and Citizenship.
2013-2014 – Minister of National Defence.
2012-2013 – Foreign Minister.
http://ec.europa.eu/commission/2014-2019/avramopoulos_en

Marianne Thyssen (Belgium nationality)
2014 – European Commissioner for Employment, Social Affairs, Skills and Labour Mobility.
2008-2010 – Party leader of CD&V (Flemish Christian – Democratic party).
2004-2009 – First Vice-President of the EPP Group in the European Parliament.
http://ec.europa.eu/commission/2014-2019/thyssen_en

Pierre Moscovici (French nationality)
2014 – European Commissioner for Economic and Financial Affairs, Taxation and Customs.
2014 – Member of the French National Assembly, 4th constituency in the Doubs.
2012-2014 – Minister for Economy and Finance.
http://ec.europa.eu/commission/2014-2019/moscovici_en

Christos Stylianides (Greek nationality)
2014 – European Commissioner for Humanitarian Aid & Crisis Management.
2013-2014 – Government spokesperson of the Republic of Cyprus.
2006-2013 – Member of the Committee on Industry, Research and Energy.
http://ec.europa.eu/commission/2014-2019/stylianides_en

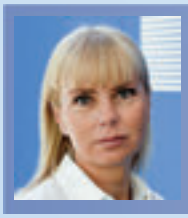


Phil Hogan (Irish nationality)
2014 – European Commissioner for Agriculture & Rural Development.
2011-2014 – Minister for Environment, Community and Local Government in Ireland.
2013 – President of the Council of EU Environment Ministers.
http://ec.europa.eu/commission/2014-2019/hogan_en

Jonathan Hill (British nationality)
2014 – European Commissioner for Financial Stability, Financial Services and Capital Markets Union.
2013-2014 – Leader of the House of Lords and Chancellor of the Duchy of Lancaster.
2010-2013 – Under-secretary of State for Education.
http://ec.europa.eu/commission/2014-2019/hill_en

Violeta Bulc (Slovenia nationality)
2014 – European Commissioner for Transport.
2014 – Minister without Portfolio responsible for Development, Strategic Projects and Cohesion.
http://ec.europa.eu/commission/2014-2019/bulc_en

Commissioners continued

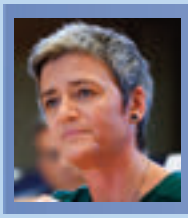


Elżbieta Bieńkowska (Polish nationality)
2014 – European Commissioner for Internal Market, Industry, Entrepreneuship and SMEs.
2013-2014 – Deputy Prime Minister and Minister of Infrastructure and Development.
2007-2013 – Minister of Regional Development.
http://ec.europa.eu/commission/2014-2019/bienkowska_en

Věra Jourová (Czech nationality)
2014 – European Commissioner for Justice, Consumers and Gender Equality.
2014 – Minister for Regional Development.
2013-2014 – Trainee solicitor, Bezdek & Partners law firm.
http://ec.europa.eu/commission/2014-2019/jourova_en

Tibor Navracsics (Hungarian nationality)
2014 – European Commissioner for Education, Culture, Youth and Sport.
2014 – Minister for Foreign Affairs and Trade.
2010-2014 – Deputy Prime Minister & Minister of Public Administration and Justice.
http://ec.europa.eu/commission/2014-2019/navracsics_en

Corina Crețu (Romanian nationality)
2014 – European Commissioner for Regional Policy.
2011 – Present Vice-president of Partidul Social Democrat (Social Democratic Party).
2014 – Vice-president, European Parliament.
http://ec.europa.eu/commission/2014-2019/cretu_en



Margrethe Vestager (Danish nationality)
2014 – European Commissioner for Competition.
2001-2014 – Member of Parliament.
http://ec.europa.eu/commission/2014-2019/vestager_en

Carlos Moedas (Portuguese nationality)
2014 – European Commissioner for Research, Science and Innovation.
2011-2014 – Secretary of State to the Prime Minister of Portugal.
2011 – Member of the Portuguese Parliament.
http://ec.europa.eu/commission/2014-2019/moedas_en

For more information regarding the President, Vice-President or Commissioners visit:
http://ec.europa.eu/commission/2014-2019_en

Cohesion Policy – key investment policy to achieve Europe 2020 goals

In order to achieve Europe 2020 goals, Cohesion Policy is a key tool. Iskra Mihaylova, Chair of the Regional Development Committee at the European Parliament highlights this...

Nowadays Cohesion Policy is the main instrument of the EU aimed at investment for Europe's regions, cities and the real economy to reduce the economic and social disparities across European regions, boosting their competiveness, tackling climate change and energy dependence, and achieving the Europe 2020 goals. With a total budget of around €352bn for the 2014-2020 period, the reformed Cohesion Policy becomes a real strategic investment policy contributing to the achievement of sustainable, long-term growth.

Ms Iskra Mihaylova
Chair

During recent years Cohesion Policy has become even more important due to the economic and financial crisis, because it has remained a vital source of public investment across the EU. Getting the maximum out of the limited available resources became of the utmost importance in our efforts to return to growth. In the whole of the EU, public investment declined by 20% in real terms since 2008. In countries such as Slovakia, Lithuania, Hungary, Bulgaria, Latvia, Portugal and Estonia, Cohesion funding now represents more than 60% of the investment budget. Cohesion Policy has prevented a total collapse of public investment in many Member States during the crisis and has played a crucial role in supporting the capacity of Member States to carry out growth and job enhancing investments.

The reformed Cohesion Policy aims at concentrating all resources available to make efficient investments that will steer Europe back onto the path of recovery and growth. It aims at concentrating resources on key growth sectors in line with the Europe 2020 strategy and firmly linking the policy to the European semester and the multilevel economic governance procedures. It also aims at increasing its effectiveness through greater result orientation and by putting in place appropriate framework conditions for investment.

Need for sustainable and integrated urban development

During recent years urban areas have gained recognition as the engines of economic growth and innovation for Europe. Cities can provide the opportunities and infrastructure necessary for economic growth and job creation but at the same time they have suffered more during the crisis than other regions in terms of employment losses, migration, environmental, climate and energy challenges. That's why we have to work to strengthen the investments in cities through the Structural and Investment Funds. Integrated sustainable urban development is a key aspect of Cohesion Policy for 2014-2020, and we expect more than half of ERDF to be spent in cities. An integrated approach towards urban development will help to achieve the Europe 2020 strategy's goal of 'smart, sustainable and inclusive

growth'. It combines various sectoral planning approaches for a city in a unified concept and aims to sustainably improve all dimensions of urban life. Only an integrated approach to urban development can enable cities to respond to the challenges represented by globalisation, as well as to all issues that have been aggravated by the recent economic crisis.

An urban agenda will promote the integrated approach to policy development, better coordination and greater consistency. It could help us to bring together the efforts of different levels of governance: EU, national, regional and local because I believe that all governance levels need to be involved and work together to strengthen efforts to improve urban policy making.

Bulgarian example for integrated approach in urban development

An example of good practice in urban development in Bulgaria is the elaboration of integrated plans for urban regeneration and development (IPURDs), which are to serve as the basis for the implementation of sustainable urban development actions during 2014-2020 period through different financial resources – ESIF, national and municipal budget, public-private partnerships, etc. They are focused on establishing and ensuring attractive public spaces, high standard of living environment, modernising infrastructure networks and improving energy efficiency to ensure high quality of life of residents and attractiveness of the city. The IPURDs in Bulgaria demonstrate a place-based and result-oriented approach, determining intervention zones within cities, including a system of interrelated actions aimed at lasting improvement of the economic, physical, social and ecological situation of a given territory. They encompass various elements of the urban environment like demography, infrastructure and public facilities in its interrelation and complexity, as well as different sectors of economy and public policies on local level in their integrity. A key feature of IPURDs is the broad public participation – they were developed with the widest public participation.

Priorities of the Committee on Regional Development

The Committee on Regional Development (REGI Committee) controls the efficient implementation of the legislative framework for regional development in close partnership with the Council, the European Commission, the Committee of the Regions, European Economic and Social Committee (EESC), interregional cooperation organisations, local and regional authorities and other institutions and bodies. As a Chair of REGI Committee, I would like to highlight the importance of focusing our attention on the implementation and overall impact of Cohesion Policy investment. There is in the 2014-2020 financial perspective also a clearly marked position for the cities in the Cohesion Policy, as vehicles for growth and jobs. This requires a clear involvement of the EU level in urban policy making. Increased synergy and complimentarily between EU regional policy and other community policies is necessary to ensure optimal investment and increase its efficiency. The main priorities of our work also include better coordination between the Structural and Investment Funds with EU economic governance, encouraging transnational and trans regional cooperation, greater recognition of cities, thus reinforcing the link between climate, energy and the environment, with a high degree of social cohesion, socially inclusive housing and developed social services. ■

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Chair
Organisation Committee on Regional Development – European Parliament
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iskra.mihaylova@europarl.europa.eu

Creating an urban Europe

Adjacent Government details the work that former Commissioner for Regional Policy, Johannes Hahn achieved before passing the baton to Corina Cretu, and why an Urban Agenda is so crucial to Europe...

Former Commissioner for Regional Policy, Johannes Hahn made some great strides in creating a more structured urban agenda throughout Europe. Committed to urging Europeans to shape a future Urban Agenda. During his term as the regional policy commissioner, Hahn called for engagement from citizens in order to share their views. Speaking in Rome in October, Hahn said: "I have championed a stronger role of cities in our policies: in my own portfolio cohesion policy, but also in other areas of EU policy for which depend heavily on you for their success.

"I am at the end of my 5 year term as Commissioner responsible for regional and urban policy; and I can proudly say that we have made considerable progress together during these five years.

"We have a cohesion policy with a strong urban dimension, and we have a directorate general within the Commission responsible for regional and urban policy. My final plea as the outgoing Commissioner responsible for the EU urban agenda is that you help us keep that momentum in this process that we set off in February with our CITIES forum.[1]

Hahn believes that the Urban Agenda process needs to be kept alive and pushed forward by the Commission, but it's up to the new Commissioner responsible for Regional Policy, Corina Creţu to define her priorities in the area of urban development.

From the 1st November, the Commissioner for Regional Policy, Corina Creţu took over where Commissioner Hahn left off. Although he is no long the Commissioner responsible for this area, Hahn urged cities of Europe to continue the dialogue.

Former Commissioner for Regional Policy Johannes Hahn

"The urban agenda needs to be kept alive and pushed forward by the Commission, but also by you. You, as capital cities have a particularly important role to play in that you are the most important urban actor in your country."

In her first speech as Commissioner for Regional Policy, Creţu expressed the need also in order to strengthen the basis for economic competitiveness and job creation.

She said: "We live in critical time. Europe is seeking to get into a path of sustainable growth, and to over-come its investment and financing gap. The recent reforms establishes regional policy as a key pillar for investments in the real economy." ■

[1] http://europa.eu/rapid/press-release_SPEECH-14-651_en.htm

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FoodRoof Rio: How Favela Residents Grow Their Own Food

Imagine living in Cantagalo since you were born. The daily routine of playing games, or trying to find your parents, if still alive, hoping to stay away from drugs trafficking, but also attracted to the excitement and its golden promise. At the end of the day you're feeling hungry so you try to find a snack, some chips and lemonade to feed you. Or you try your first booze, and get dependent on 'others', whoever they may be, as they have some kind of power over you. These people provide a safety net of sorts. But, you're still stuck with old food traditions, such as alcohol, pre-wrapped cakes and candy.

Now imagine the house where you were born stands in Hardenberg, where the cows graze around your village. From day one your parents feed you with the best milk products, fresh vegetables and meat. When you start your study in Velp you're interested in making the world a bit more sustainable, but the main thing you want is to build something nice. A roof garden – or something else fancy. But lately, you're more into fast food and having a beer with your friends. Not the most healthy diet, but who cares? That is something to worry about later.

These worlds came together in Rio de Janeiro, where Bart and Marc, from Velp in the Netherlands met Asunçao, born in Cantagalo, Brazil, and where they built the first FoodRoof in the world.

A FoodRoof?

Professor Rob Roggema at VHL University of Applied Sciences invented the FoodRoof, which supports residents of the favelas in Brazil to grow their own food. A FoodRoof is a completely closed aquaponic system, producing fish, vegetables, fruit and herbs, it is lightweight, easy to construct and fits on a (small) roof. With more than 50% of the world population living in the city, and roughly another 50% living with limited access to a healthy diet, the question is no longer if we can produce enough to feed the world, but how and where we must grow food to feed everyone. The answer could well be that we shouldn't become more efficient, large-scale and more productive, but we need to reach the places where people suffering from eating unhealthy food live. Instead of asking people to eat healthy food, teach them to grow it themselves. In order to do this, we need to go deep into these communities and create productive pieces of city-landscape. That's what we did in Cantagalo favela.

Cantagalo

Standing on Ipanema beach you can be unaware of Cantagalo favela (Figure 1), hiding behind the tall luxury buildings along the coast. But the heart of the favela is only a 10 minute stroll away. Up the hill the seemingly randomly placed houses follow the pattern of the slope.

Figure 1. Google map image of Cantagalo favela

The houses in the favela were built with whatever material was available or could be obtained for nothing, but they're mostly extremely well constructed. The main incentive for constructing strong buildings is so the owners can rent additional floors, simply to earn extra money. This has led to a diverse housing stock, with one characteristic in common: flat roofs, or the opportunity to create one. Due to overcrowding in the favela, roofs offer the only productive spaces.

To support the residents of the favelas food needs to be grown in the vicinity where it is consumed. It requires a system that fits in the urban environment, provides fresh and healthy food, must be simple and safe to operate, and is easy to construct and cheap. Aquaponic systems are lightweight and sustainable with closed cycles of nutrients, water and energy, and consist of fish breeding, water storage and the growth of fresh vegetables and fruit.

We have identified 3 success factors for designing, planning and realising a FoodRoof:

1. **Work with the strengths within the community.** They need to be the owners of the project. When the local residents are made co-creators of the project they become committed, are open for collaboration and support and feel more responsible for maintenance.

2. **Use local food potentials.** In the case of favelas there is not much space, but the roofs are flat and strong enough. There is no soil, so an artificial system is preferential. To design the roofs, the micro-climate, natural shade, humidity, but also the place where rain water can be caught and stored, determine the design.

3. **Support start-ups first** and then accelerate to extend the project beyond the initial pilot to the entire favela.

In order to help residents construct a FoodRoof by themselves, 2 students from VHL University of Applied Sciences have developed a manual, giving explicit, visual and clear directions on how to construct the roof step-by-step. This bilingual manual contains easy to understand 'IKEA-like' information with images of tools and materials needed for the construction (Figure 2).

Building the FoodRoof

The theoretical background and even the shopping list of required materials may be complete and ready, this doesn't mean the construction of the FoodRoof is easy.

Figure 2. The 'IKEA' manual, with required tools and materials

We set ourselves a target of 'one-week one-roof'. Within a week materials needed to be purchased, tools needed to become available, the materials needed to be transported to the house and on to the roof and the system needed to be constructed.

Without the help from local architect Marcelo, we wouldn't have been able to achieve the result. When the only available drill wasn't suitable, Marcelo brought his own, when the fish needed to be bought from outside the city Marcelo arranged the purchase and transport. When we were short on clay balls, Marcelo knew the flower stall where they provided us with 700 litres. Meanwhile, Bart and Marc constructed the system on the roof. The manual proved to be an excellent help explaining to the installer, local residents and shop owners what was needed and how things should be constructed. When the system was nearly ready, there was no water available in the favela to fill the tanks. Luckily the next morning the water supply was functioning again. On day 5 the system was in operation and ready to show to a delegation of the Dutch Consulate, the other favela residents, the State Government of Public Works and colleagues and friends. The first FoodRoof in the world was realised.

What can 'we' do?

This first example FoodRoof houses the aquaponic system, a system which is well known in many western countries. The application of this technique in a new context, in challenging spatial and social conditions, that benefits local residents who have no access to healthy food is truly innovative.

When we talk about 'we', the Western countries, could learn 2 things from this. First, bringing a fixed solution, no matter how sustainable it is, to a new country does not make sense. Secondly, to reach the people you really want to reach, you need to be able to adapt, genuinely be interested in the people you want to reach and be creative and flexible. Western countries should learn that it is not enough to develop the solution only. This must be done first, in a controlled and safe environment.

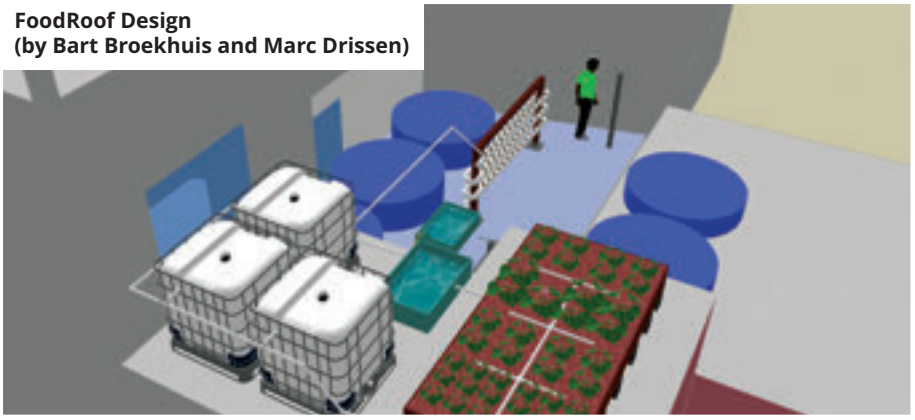
When the solution is tested and ready for implementation, the real innovation starts: be modest enough to allow modifications where necessary to the technique in order to make it work in its new environment. Many aid oriented organisations and regular businesses are not readily equipped to step in the latter role. But when the technique is sound, exported to a new context, and implemented with modesty, as the FoodRoof example illustrates, the benefits are there for the people that need it.

Therefore, Western countries need to enter deep into the community to reach the people's needs. This outreach must be executed in a genuine way, and not for profit, because otherwise the reception by the residents will be a "thanks, but no thanks", and no real change will occur.

Also, sending money only is not enough to make a change, as money can go missing due to corruption. Set clear goals and ambitions, but realise these through bridging cultures in an empathetic way. People with real interest and curiosity are sought and they don't come in hordes. Westerners often tend to be blinkered, pushing their knowledge and therefore their solutions, forgetting about the new context they enter.

The building process

FoodRoof Design
(by Bart Broekhuis and Marc Drissen)



How does the FoodRoof work?

The Aquaponic System of the FoodRooof consists of 5 elements:

1. Fish-tanks

There are 3 fish tanks on the roof (each tank has a group of fish of different size (small/baby-fish, medium growing fish, and large, ready for consumption fish). Each tank has an overflow from where the water flows to one central pipe and is led to the horizontal grow-bed. The fish produces waste in the form of ammonia. Residents eat vegetables and fish (as soon as the fish is big enough and ready for consumption) from the system. The fish eat the food waste. The fish food contains a lot of proteins, which are found in the waste from food such as bread, grain, fish waste, maggots or worms.

2. Horizontal grow-bed

The grow-bed is located next to the fish-tanks. It is a horizontal vegetable plant system, consisting mainly of clay-balls. The water is irrigated through the bed in which the crops are planted. When the water reaches a certain maximum level it leaves the bed through a siphon to the feeder tank. Water with ammonia is led through pipes to the grow bed for plants. Plants require water, light, CO_2 and nitrates. The bacteria which attach to the clay balls in the grow bed break the ammonia down to nitrates, which the plants subsequently use. The plants extract nitrates from the water and filtrate the water after passing the grow beds.

3. Feeder tank

This is a storage tank for water overflowing from the horizontal grow-bed. Using a pipe on the bottom of the tank, the water continuously flows to the vertical grow-bed. From the feeder tank the water is pumped up to the upper tube in the vertical grow system.

4. Vertical grow system

The second grow system consists of tubes through which water flows. The tubes have holes in which the fruit and herb crops are planted in small substrate cups. The roots of the plants must continuously be in the water. The water flows through the tubes into the pump-tank.

5. Pump tank

A pump tank is placed at the end of the vertical grow system, from here the water is pumped to the fish tanks. The pump gets power from a 12V battery, which is connected to a small solar panel. A solar pump is needed to circulate the water through the entire system and return water to the fish-tanks.

This system creates a closed cycle. Every month the system loses 10-15% of water due to evaporation. When water is added to the system it should not be taken from chlorinated city water, but instead, rainwater should be used.

A good idea might be to involve students to connect creating a productive city with learning. Students are generally flexible and curious, and this could add value to their career portfolio. This is similar to elite sportsmen, who are very well equipped to lead businesses, because they have learnt the lessons of losing and winning in their sports, and overcoming setbacks. When students are placed in the context of creating FoodRoofs they will need their practical skills, but they also gain other experiences and become human beings with empathy and creativity who can solve unprecedented problems quickly.

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Next issue: *Rethink, Reborn and Return of energy and food supply in the Fukushima region.*

FoodRoofRio

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Malmö: Green Policies transform an industrial city

The City of Malmö in Sweden is transforming itself into a sustainable city of culture. Here, Ilmar Reepalu, former Mayor of Malmö, and Göran Rosberg Senior Adviser at the City Planning Office discuss the transformation and how it benefits Malmö residents...

Malmö is the third largest city in Sweden, with 310 000 residents. It is rapidly changing and, has undergone a profound transition from the classic smokestack city in decline to a successful city of culture and knowledge. It is recognised for providing a sustainable future for generations to come, being awarded the UN Habitat Scroll of Honour in October 2009.

By the year 2020, Malmö has committed itself to be climate neutral – which means that buildings owned and managed by the city are to be powered by renewable energy – and, by 2030, the whole city is to run on 100% renewable energy. This will be accomplished by further decreasing energy consumption, by at least 20% per person by 2020, and a further 20% by 2030. At the same time, solar, wind, water and biogas will be phased in and fossil fuels phased out through measures such as further development of rail traffic and, green electricity driven public transport.

The long journey

In January 1995 the Municipal Executive Board set out a clear, long-term vision for the future (Project Malmö 2015), elaborating the steps toward remaking Malmö a competitive city in the Öresund Region by becoming a knowledge society. This decision was taken in the context of an agreement between Sweden and Denmark to establish the Öresund Link. Malmö's future was thus understood as part of a transnational, integrated region at a time when cities and regions were becoming the key driving force of European development. Emerging as the most important economic actors were regions comprising a polycentric, often transnational, network of cities and towns. A partnership between the cities and towns in the region was initiated with the aim of defining, developing and marketing the region as a whole, while respecting those aspects in which they remained in competition.

The investment in the regional infrastructure, in the context of globalisation, has generated new patterns in the way people live and work in a region. The borders between local and regional identities is erode as one no longer has to live, study and work in the same town. The development of an extensive commuter network allows people to choose where to live on the basis of their interests and the opportunities that area offers, and then commute to centres of learning, work, cultural facilities, recreation, and entertainment. The growth in IT has affected the way people work: it has made us more flexible, but it places greater demands on the quality of face-to-face encounters, and this, in turn, has generated greater demands for a high quality urban life in those locations where we do meet.

It is now 20 years since that important moment in Malmö's journey from declining industrial town to a culture and knowledge-based city marked by the adoption of the new plan in 1995, and almost 15 years since the completion of the Öresund fixed link in the year 2000. These brought a new dimension to the changes at the local level change that had begun at the end of the 1970s, following upon the demolitions that had taken place during the previous 20 years, to fill the "bomb holes" that had thus been created in the central parts of the city.

With the regional integration brought by the Öresund link and complementary infrastructure investments, the city's vision for the future took on both a regional and local perspective.

The regional perspective starts from Malmö's geographic position at the other end of the bridge from Copenhagen. Rather than in competition with the capital city, its development complements it. A railway system centered in Malmo was developed and expanded so that the fixed link connected Malmö and the region into the European transport grid. This in turn was integrated with a highly expanded system of local and regional public transport. The crucial decision to engage in an ultimately fruitful dialogue with Copenhagen's administrators was difficult but unavoidable. Copenhagen today is only 30 km from Malmö, while Sweden's seat of government, Stockholm, is 640km away.

The local vision is based on the simple idea that Malmö continues to grow as an attractive city to live and work. The key added dimension this vision brings is an environmental one, of long term development as a compact and mixed city through the promotion of an environmentally adapted traffic system, by limiting the exploitation of valuable natural resources and by strengthening biological diversity.

To maintain Malmö as a compact city entails planning new construction to take place in centrally located areas within the outer ring road that are unused or where renovations can expand land utilisation. This places the focus on the older harbour and industrial areas, along with several other centrally located areas where renovation of dwellings and businesses can result in a denser, mixed urban environment and lifestyle, with easy access to public transport facilities. The resulting compact and mixed city reduces transport cost, links citizens with urban services and their providers, and intensifies city life.

The Future

The environment is at the centre of Malmo's future plans, with 2020 as the date by which the City of Malmö is to be climate neutral and 2030 the date the entire municipality will run on 100% renewable energy. This ambitious goal is to be achieved by combining:

More efficient energy consumption. Energy consumption in Malmö will decrease by at least 20% per person by 2020, and by a further 20% by 2030.

"By the year 2020, Malmö has committed itself to be climate neutral – which means that buildings owned and managed by the city are to be powered by renewable energy by 2020 – and, by 2030, the whole city is to run on 100% renewable energy."

More renewable energy. Solar, wind, water and biogas will be phased in and fossil fuels phased out. The proportion of renewable energy will be 100% in the City of Malmö by 2020, with as large a proportion of this energy as possible produced locally.

Reduction of emissions. Greenhouse gas emissions will decrease by at least 40% from 1990 levels.

Green Transportation. There will be significant development of rail traffic and other electrically powered forms of transport for people and goods, as well as extension of the network of cycle lanes.

Adaptation to climate change. Malmö will take steps to adapt to temperature changes, rising sea levels, and increased precipitation. ■

Original article published in 2010 by authors Ilmar Reepalu, and Göran Rosberg.

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Reinventing the City Building on Creativity

Creativity, innovation and a strong focus on sustainable and attractive growth are at the very heart of the vision for the City of Varberg to become the Swedish West Coast's Creative Hot Spot by 2025. The municipality is growing quickly and has a population of more than 60,000 residents, mainly due to its location between two expanding regions – Göteborg (the West Sweden region) and Malmö (the Öresund region). Varberg is a stronghold for culture and tourism, and is especially renowned for its 13th Century fortress, long stretches of beautiful beaches and inland deciduous woodland with plenty of small lakes. It is also well known among surfers from all across northern Europe as one of the best places in Scandinavia for all kinds of surfing.

The City of Varberg is focusing strongly on sustainable development and has been acknowledged for its success in bridging the gap between public service and the diverse interests of various partners in society (e.g. commerce, business, industry, development, conservation, culture, etc.). The municipality has a sharp focus on the way ahead, and a portfolio full of solid strategies. In our vision for the future, the City of Varberg has unique opportunities and we are acting on them. We are building a city converging around means of public transportation in a rapidly expanding region. The railroad, which has long created a barrier between the seaside and the city centre, will now be relocated into a tunnel underneath the city. To expand on this opportunity we are moving the harbour in order to further free up land for letting the city reclaim its position as a seaside town. In total, the project will result in more than 500,000 m^2 of land for development of our future city front. For people living, working or visiting the city of Varberg, the change will dramatically increase the freedom to experience the coastline. More places of residency, places for eating and meeting, places to shop and work, etc. – comes as a bonus.

In our vision for Varberg 2025 we are striving to be at the forefront of supporting social and cultural aspects of sustainability. The municipality is localised in the middle of a strong academic region. The University of Göteborg and Chalmers University of Technology, the University of Lund and Malmö, the University of Borås and the University of Halmstad are all located well within

comfortable commuting distance from Varberg. This is of great importance for our local business climate and for our young. We are focused on consolidating the relationship with our academic allies even stronger, strengthening the position of our own Campus Varberg. The same is true for cultural institutions. For our growth it is key to attract enterprises and institutions that share our idea of building a more sustainable future, in the heart of a progressive region. This means that we are especially on the lookout for academic and cultural institutions, and enterprises with profiles that fit our idea of a modern sustainable city and trying to attract them into investing in Varberg.

It is often stated that the place, and the people and lifestyle associated with it, is everything. If this is true, then the City of Varberg has everything to offer.

Come to Varberg. Share our vision.

The City of Varberg

www.varberg.se

Supporting and understanding innovation in our cities

Damian Walne, Director of socio-economics at Lancaster University's Work Foundation details how their Cities 2020 programme looked at some of the challenges of understanding innovation in cities...

"Cities" and "Innovation" – two words buzzing together in current policy debate. In recent months, we have heard the Chancellor of the Exchequer talking up England's northern cities as a powerhouse for the UK economy, and we have seen government initiatives of City Deals and Growth Deals with ambitions to promote "innovation". The European Commission has put smart cities at the core of its regional development funds, and there is a new Future Cities Catapult to promote urban innovation.

It becomes difficult to keep up, so what does it all really mean? Beyond the buzzwords, are we really seeing the types of policies that support innovation in our cities? We must separate what is informed evidence-based economics about the relationships between cities and innovation, from what is, let's say, a little fluffy. Otherwise, in the pursuit of innovation, national and local policy-makers might prioritise the wrong things.

Here at Lancaster University's The Work Foundation, we aim to be at the forefront in evidence-based thinking about cities and innovation. Our "Cities 2020" programme of research looked at high growth firms in cities; explored the challenges of the 'eco-system' for innovation; the role of anchor institutions such as universities; and the demand for graduate skills. We continue to work with local government, for example with our current work in understanding the creative economy.

We know some of what makes this a tricky topic. And so here we look at some of the challenges in

understanding innovation in cities; and consider what the evidence really tells us about how policy-makers can support it.

The challenges of understanding innovation

The first challenge: What is "innovation"? The word is well used. But there is ambiguity about its meaning. The language of "innovation" is a positive way of framing discussion of economic change. This contrasts with language of "growth", "development", "restructuring", "disruption", and so on, each of which imply economic change has some consequences. We look to define innovation as "doing things differently" to create and apply new knowledge. This is not simply growth through doing more of the same, but by combining people, machines, and premises in ways to create new and better goods or services (product innovation), or to do things better (process innovation).

The second challenge: Even if we can define innovation, it is not clear if and how we can measure it. Some obvious things analysts look at are metrics such as the registration of patents for new products, or how much firms spend on research & development. But these may tell us very little. It also misleads us into thinking about innovation in terms of industry and manufactured goods, rather than new services or methods of doing things. Good measures of innovation must also draw from data such as survival rates of enterprises, or surveys of business managers on their new products and processes. But none of these are perfect.

The third challenge: There is no single framework for understanding what drives innovation. There is some agreement around the importance of the "innovation eco-system". This is the argument that innovation emerges from a web of technologists, scientists, businesses, banks, consumers, universities, workers, and public bodies that interact in multiple different ways. But there is no unified theory. The dominant arguments point to ideas such as:

- Creative destruction with competition between enterprises within and across sectors, as better and newer products and processes out-compete older approaches;
- Learning by doing as the development of people's skills, knowledge, and experience lead to better ways of doing things;
- Dynamic gains from trade as products and processes flow across countries, with ideas exported, copied, adapted, and imported back;
- The rules of the game, highlighting how institutions and systems of governance shape incentives and behaviours.

Understanding innovation in cities

The interest in cities takes us to questions about how innovation relates to geography. "Place" plays a role in that all innovation happens somewhere. For example, an enterprise that aims to make profits will choose a location with benefits (revenues through proximity to customers, or reduced prices through proximity to suppliers) against the costs (the price of accommodation or the wages of workers). This explains the clustering of activity, and the formation of cities.

The advantage of innovation in cities is largely one of economic mass – that is simply the proximity of many able people, jobs, and enterprises within short travel times. This proximity widens considerably the scope for innovative activity – this is people meeting and sharing ideas, buying and selling off one another, and introducing new products to consumers.

The challenge is that this relationship between cities and innovation is not straightforward. For example:

- The place may not matter. It is enterprises that innovate, not the cities they are in. An innovative employer may be within a city, but have little relationship with other parts of the local economy. Or local units of a large enterprise may introduce new products or process but this will be driven by interactions within the enterprise, not within the city;
- Where place may matter, the effects are not clear. The most important effect may be workers moving jobs between different firms – and taking ideas with them. Urban labour markets allow workers and their skills to better match with employers.

How to support innovation in cities

So what should local policy makers, across local authorities or local enterprise partnerships, do to support innovation in their areas? There are never easy answers. But here are 3 key arguments:

1. Do not over-state what local policy-makers can do. Local policy must operate in a context of wider patterns of economic growth and trade, and within a policy environment of tight public funding and limited local powers. So this means a reality-check on what is feasible; not everywhere can be a hub for favoured industries like biotechnology, ICT, or advanced engineering. It also means better understanding of how the rules, taxes, and spending of national government may run against objectives to support cities and innovation. Take an obvious example: England's housing market. If high house prices, especially in growing cities, deter people from moving there, it does not help innovation. National policies on land-use planning and taxation may deter the building of homes that growing innovative cities need.

2. Learn what works. This means that whatever interventions local policy makers try, they must invest in building up robust evidence, ideally using experimental controlled trials that we can really learn from. It is somewhat disappointing, that from all the public money over many years that has funded initiatives to support business innovation or local growth, so little effort has gone towards rigorous economic evaluation.

3. See where the evidence we have actually takes us. Firstly, many of those interventions that local economic strategies tend to frame in terms of innovation, are less than compelling. See examples such as Enterprise Zones, cluster development, broadband, and culture-led regeneration. Each are interventions where the evidence contests their effectiveness or value for money.

Secondly, there is mixed evidence on the role of offering support to small and growing enterprises through business advice around management, training, and exports and so on; or facilitating access to finance and venture capital. What is less clear is the extent to which this is a role for local policy-makers or is more effective through institutions such as banks, universities, or national business support agencies.

Thirdly, so much innovation in cities is about people. So that should mean local policy-makers prioritising those interventions that enable residents and workers and visitors to succeed in cities. That should include:

- Housing that enables people to move to the cities where job opportunities are;
- Urban public transport that enables people to move around cities and between jobs; and
- Helping people overcome the barriers they face, such as in careers advice, social care, and childcare, that prevent them from going into productive employment.

"The advantage of innovation in cities is largely one of economic mass – that is simply the proximity of many able people, jobs, and enterprises within short travel times."

Interestingly, the case is rarely made for how new housing, public transport, or locally provided services support innovation and local growth. Perhaps that is because housing tenants, bus passengers, young unemployed people, and busy parents, are not so effective at coordinating business cases around how the services they use support innovation. In recent years these services have often been very vulnerable to cuts in public spending.

"Cities" and "innovation" are both great things. If we emphasise that cities are about people, and innovation is about enabling people to do stuff, then perhaps we will achieve a goal of more innovative cities. ■

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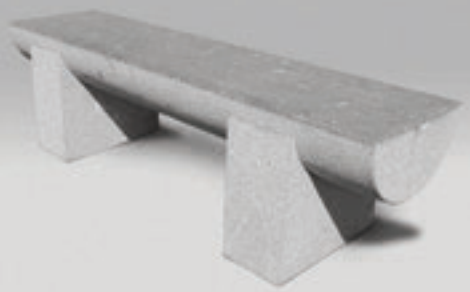

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Managing the carbon footprint

David Fatscher Head of Market Development for Sustainability at BSI explains how a new standard for measuring greenhouse gas emissions at city level, is helping London manage its carbon footprint...

With an estimated 50% of the planet's population becoming urban citizens by 2030, making cities more sustainable has become one of the most important challenges of the 21st Century. Cities play a key role in tackling climate change and how they respond to this depends in part on access to quality data on greenhouse gas (GHG) emissions.

Any city inevitably gives rise to the production of GHG emissions both within and beyond its boundaries and yet GHG accounting methodologies vary considerably, covering different scopes and making comparisons difficult. Credible reporting and meaningful benchmarking of data requires greater consistency and research in 2009[1] estimated London's consumption-based GHG emissions, whilst highlighting the need to include a wider range of emission sources in the inventory. As a result, the Mayor of London made a commitment to conducting a more complete GHG emission assessment[2].

PAS 2070, BSI's specification for the assessment of city GHG emissions, is a response to this challenge. It specifies requirements for identifying the assessment boundaries, the sources of GHG emissions, the data requirements for carrying out the analysis, and the calculation of the results to develop a city-scale GHG inventory. It also captures both direct GHG emissions (from sources within the city boundary) as well as indirect GHG emissions (from goods and services that are produced outside the city boundary for consumption and/or use within the city boundary). In PAS 2070, these are termed: direct plus supply chain (DPSC) methodology and a consumption-based methodology (CB).

The DPSC methodology captures territorial GHG emissions and those associated with the largest supply chains. It covers direct GHG emissions from activities within the city boundary and indirect GHG emissions from the consumption of, for example, grid-supplied electricity and district heating, travel

and the supply chains of key goods and services produced outside the city boundary (e.g. water, food, building materials). Meanwhile, the CB methodology captures direct and life cycle GHG emissions for all goods and services consumed by city residents, so emissions are allocated to the final consumers rather than the original producers.

Although the Greater London Authority (GLA) commissioned the development of the standard, PAS 2070 is intended for widespread use and is the result of expert input from a truly international group of stakeholders, including the City of New York, Stockholm Environment Institute, University of Toronto, as well as Thames Water, Transport for London and the C40 Cities Climate Leadership Group.

The GLA had always intended that the PAS would enable it to carry out a more complete assessment throughout Greater London and has recently published a case study[3], demonstrating how to apply the standard's methodology. Among the many findings, the PAS 2070 study highlights that using the DPSC methodology:

- London emitted 81 million tonnes of CO_2e[4] in 2010 (or 10.05 tonnes CO_2e per person);
- Energy use in buildings is the largest source of GHG emissions in London accounting for 50% of emissions;
- Transport is the second biggest, accounting for 31% of London's GHG Emissions;
- The consumption of food and drink accounts for 13% of GHG emissions.

Meanwhile, applying the CB methodology:

- London emitted 114 million tonnes of CO_2e in 2010 (or 14.15 tonnes CO_2e per person);
- Utility services is the largest sources of GHG emissions (18.1%), followed by transport services (17.0%);
- 75% of the emissions relate to household consumption.

In 2008, the world's first product carbon footprint specification was published, PAS 2050 and its 2011 revision introduced a framework that enabled BSI to work with individual industries to develop sector and product group-specific requirements. This year has also seen the revision to PAS 2060, the specification for demonstration of carbon neutrality. PAS 2070 also relates to, and informs, the development of a series of standards around smart cities and sustainable communities.[5]

As with other GHG assessment standards, PAS 2070 seeks to provide a robust and transparent method for consistent, comparable and relevant quantification, attribution and reporting of GHG emissions, enabling city leaders to measure more holistically and effectively, to assess their risks and opportunities, create a strategy to reduce emissions, and ensure that progress towards a low-carbon environment/ economy can be reliably monitored. ■

[1] Capital Consumption. London Sustainable Development Commission and Bioregional, 2009. Web published at: www.londonsdc.org/documents/research/Capital%20Consumption.pdf

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[3] Application of PAS 2070 – London, United Kingdom; An assessment of greenhouse gas emissions of a city

[4] All GHG emissions data are reported as metric tonnes of CO_2 equivalent (CO_2e). CO_2e is a universal unit of measurement that allows the global warming potential (GWP) of different GHGs to be compared. Individual GHGs are converted into CO_2e by multiplying the 100-year GWP coefficients in the IPPC Guidelines

[5] For further information on related standards, see 'Related standards' section of www.bsigroup.com/PAS2070.

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BIM Level 2: Mapping the road to success

The UK construction industry is making a good start in embracing BIM, providing the opportunity for reform and economic success as global leaders. Peter Hansford, Government Chief Construction Adviser details the value of BIM for the UK...

Technology is moving fast – including in construction. We are moving quickly towards a digital economy which is starting to have profound implications for our built environment. We must act now to ensure UK construction is, and remains, at the vanguard of smart construction and digital design, and have made a good start in embracing this through the BIM programme. Indeed, the UK BIM standards and processes are working as a world-wide acknowledged benchmark for industry digitisation.

For the public sector, BIM offers HM Government the opportunity to industrialise and reform its built environment through a digitally enabled procurement process. Indeed, the level 2 BIM programme is already helping cement significant savings: early adopters such as the Ministry of Justice (MoJ) are reducing cost and improving quality through their BIM library concept, where they have standardised and digitised many of their assemblies. This process has also helped them drive down area requirements and determine solutions which will make it easier to ultimately economically dispose of their assets – such as courthouses – by formulating standard grid solutions compared to traditional non-standard layouts.

Our present goal is that all centrally-funded public procurement projects be delivered using Level 2 BIM by 2016, and the government's commitment to this

Peter Hansford
Government Chief Construction Adviser
Department for Business Innovation and Skills

target – set out in the Government Construction Strategy – remains firm. It provides a strong drive towards digitising our industry and, I am glad to report, one that is going well with significant progress and appetite from the departments to adopt BIM within standard procurement practices and operations. We are on track with our plan for getting BIM Level 2 production ready, which will position the departments perfectly for increasing the rollout of BIM across projects and making it business as usual.

With around 2.9 million people employed within our industry, the biggest challenge is not within the government departments, but raising awareness, building capacity and capability within the supply chain. Our whole sector approach to BIM is making organisations challenge preconceived ideas, and encourages techniques and incentives to standardise ways of working in which 3D geometry and data is stored throughout the lifecycle of buildings and infrastructure.

Key to this is the creation of Level 2 BIM maturity by the BIM Task Group who, along with BSI, have developed a number of standards, documents and guides to explain clearly how BIM should be applied. This is the big challenge for the supply chain: better controls and definitions of both data deliveries and data classification. The Level 2 BIM programme is a key enabling strategy for the UK developing both these processes, and open data definitions. Creating a capable, informed work force will cement the UK as the recognised leader in vision, policy, capability and results for Digital Construction World Wide.

Creating and managing digital data sets for transactions and queries is undoubtedly a step change for industry. Within the supply chain we are seeing early adopters offering levels of efficiency, reduced costs, faster delivery and ultimately, delivering buildings and infrastructure that are 'right first time', and offerings consistent with sectors that have made a switch to digital working and process automation. Communities such as the BIM4 working groups are helping articulate the business case for BIM, and help demystify what needs to be done within their relevant populations to make level 2 BIM happen. The fact that they can build in beta digitally and debug before executing flawlessly on site makes it all worthwhile.

The Industrial Strategy for Construction – Construction 2025 – set out a vision of "an industry that is efficient and technologically advanced". It is therefore essential that we are prepared for a sector switch from analogue to digital given the size of the prize. Economists have estimated that the UK market for BIM-related services will be an annual £30bn by 2020. In a global context, UK-based firms already export £7bn of architectural and engineering services. Pursuing a global leadership position in developing BIM capabilities will provide strong potential for further export growth, and enable our industry to deliver higher quality and a more sustainably built environment for future generations. ■

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BIM and the SMEs: Opportunity is knocking

SMEs are key to the UK's BIM journey, so their uptake is vital to ensure our BIM leadership. David Philp, Head of BIM at Mace and the UK BIM Task Group explains their importance...

In 2013, there were 4.9 million businesses in the UK, with over 99% categorised as small or medium sized businesses (SMEs) i.e. employing between 0-249 people. Of this populace the SME community's share of construction turnover in the UK private sector was 72.4%.

Given that SMEs are the backbone of our sector, we must ensure that they have sufficient digital capacity and capability to ensure that the UK remains at the forefront of BIM leadership across the globe. But why should they care? Why should they consider investing in change?

The reality is they have to compete on a new basis with fierce international competition for the provision of skills and products and ever tight project affordability constraints. It is self-evident, therefore, that to flourish with the backdrop of these challenges they must reform and unlock more efficient ways of working.

BIM really offers SMEs the opportunity to raise their game and contend in the heavy weight classes. Despite often being resource constrained, the SMEs are a motor of innovation with inherent change characteristics often not found in bigger organisations, coupled with faster decision making processes. It is essential, however, that SMEs build adequate knowledge capital in the BIM space to improve their value creation processes to:

- Sell or export this knowledge to another organisation as part of their offering; and,

David Philp MSc BSc FRICS FCIOB FGBC
Head of BIM at Mace and
Head of UK BIM Task Group

- Improve their offering, such as manufacturers who can liberate the data associated with their products to increase exports, create new markets or simply get specified earlier in the construction process.

There is much evidence to support the hypothesis that digital enabled workflows benefit the SME in the built environment. Organisations such as David Miller Architects (DMA) have seen both direct and indirect benefits through their BIM implementation; growing from a small to medium size practice through the efficiencies they are achieving, but also how they are being perceived differently by clients and through meritocracy competing for larger and more prestigious commissions.

Additionally, the tier 2 and 3 communities play an important part in enabling the larger tier 1 organisations. It is therefore essential there is a symbiosis between these parties to help each other up-skill and exchange digital data.

So where should an SME start their journey? Firstly start with the free stuff.

1. Perhaps I am a tad biased on this but visit the BIM Task Group website www.bimtaskgroup.org . This is a treasure trove of great resources on the BIM standards and processes. Be sure and visit the labs space and read the fortnightly newsletters.

2. Read PAS1192-2:2013 and PAS1192-3:2014 which looks at information management for the capital and operational phases of construction projects using BIM. These can be downloaded free of charge from the BSI website. They can be also be accessed via the BIM task group website.

3. Build a network – trust me, BIM is about open innovation and collaboration. Join the dots with your local Regional BIM Hub http://www.bimtaskgroup.org/cic-bim-regional-hubs/ and the BIM4SME working group http://www.bim4sme.org/ who are doing great work to raise the awareness and value proposition of BIM for smaller organisations.

4. Capability. You are probably already doing some BIM efforts but perhaps you don't even realise it. Have a review of how you create or manage your digital data. Do you use a common data environment? Work out where you are on your point of departure and determine what up-skilling is necessary to close the gaps. Consider both: knowledge of processes as well as skills on digital toolsets.

5. Have a play about. Most technology vendors offer free viewing, or indeed in some cases, free clash detection tools. Often viewing and reviewing models will be all you need and you can do it for free.

Do your duty. Ensuring the UK construction sector builds on its rich heritage and makes a big step into the digital frontier will be massively driven by the uptake of the SME community, so remember you can't hit a home run unless you step up to the plate.

Our digital universe is growing exponentially as are the opportunities. Big data, and the increasing value of the internet of things will all create new exciting prospects for the SME players in our fast changing built environment. ■

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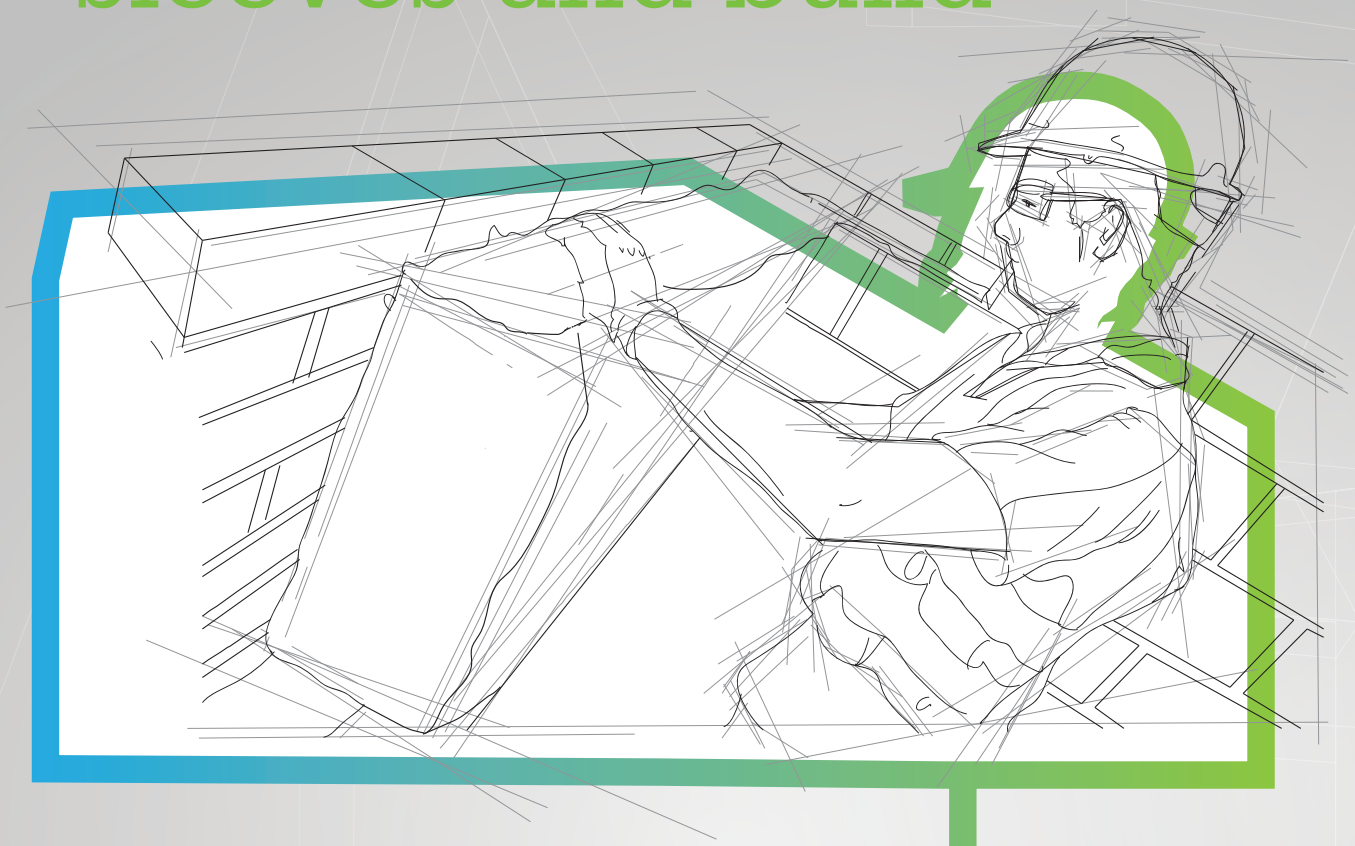
It's time to roll up your sleeves and build



Become a qualified Passive House builder

It's all very well having well-trained, knowledgeable and certified building designers, as long as somebody can build to their designed standard. And, let's be clear, we're not talking about sweeping, aesthetically pleasing curves, we're talking about the details that remain out of sight, details that make the building comfortable, details that keep the running costs in line.

With this in mind, Saint-Gobain has partnered with the Passive House Academy to offer, from the Saint-Gobain Technical Academy in Erith and the CITB in Glasgow, the UK's first Passivhaus Institut certified hands-on tradesperson course.

This type of hands-on training is essential, not just for achieving Passivhaus standards, but for the UK, if it is to realise its zero carbon build standards.

The training is five days long and is a combination of classroom lectures and presentations but with a significant amount of hands-on, practical work. There are also a number of demonstrations in different fields of Passivhaus, including airtightness and mechanical ventilation heat recovery.

The foundation of the training is the understanding of what Passivhaus is and what principles should be followed when designing and constructing a Passivhaus building. Whilst most tradespeople would be unlikely to design a Passivhaus, if they understand the thought process and principles followed, they will be in a stronger position to ensure the performance standards are delivered on-site. Also covered is:

Passivhaus Institut

PHA Passive House Academy

citb National Construction College

Passivhaus Trust PATRON The UK Passive House Organisation

an overview on how to calculate U-values for opaque building elements; and appreciating the impact of thermal bridging.

Different construction types are covered, and instruction is given as to the correct positioning of the airtightness and vapour barrier layer in relation to the insulation and structural layers. Time is spent looking at how the insulation should be handled and how the thermal performance is affected when it's badly installed or damaged. Insulation can be damaged during installation or by a following trade. The course encourages all trades to consider those that have gone before, and those that are following – if trades don't work together and understand the implications of their installations then they're unlikely to deliver a building that performs to its highest potential.

The requirement to work together supportively is nowhere more evident that when it comes to air-tightness. The most conscientious installation can be unwittingly undermined by a rogue fixing or over-zealous slip of the knife. The training covers not only the correct airtightness treatment at door and window openings, service penetrations, joints vertically and horizontally, corners and where the wall meets other constructional elements, but also demonstrates how an air-tightness test is carried out.

Using full-size construction models, built specifically for the tradesperson training, attendees will familiarise themselves with the installation techniques required for Passivhaus standard windows and doors, as well as ducting detailing for ventilation outlets. The sizing and commissioning of mechanical ventilation heat recovery systems is also covered.

They will also learn to identify and accurately interpret data from the PHPP files to determine construction details.

On successfully passing the Passivhaus Institut exam, participants will receive international accreditation from the Passivhaus Institut as a Certified Passivhaus Tradesperson. It's a theory examination but, due to the inclusion of the hands-on practical training for course participants, the Passivhaus Institut will also make note on their qualification of the hours of hands-on training undergone during the course.

The Passivhaus Tradesperson Course runs over 5 days (Mon-Fri, 9am to 5pm) and costs £825+VAT. CITB grants are available and Passivhaus Trust members in the UK also get a 10% discount.

For more information and to book onto a course visit www.passivehouseacademy.com/saint-gobain

SAINT-GOBAIN

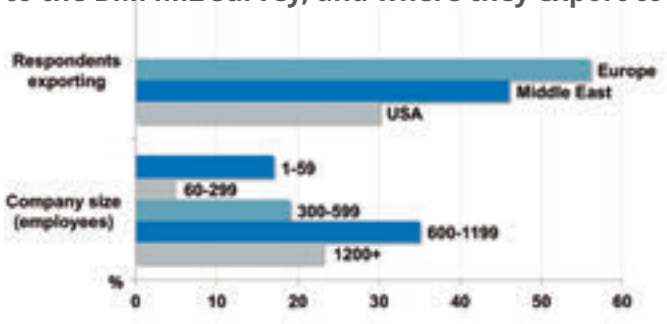
Manufacturing for BIM

Addressing the challenges faced by manufacturers in the BIM process requires that digital product information can be exchanged with supply chain partners. Steve Thompson, Chair of BIM4M2 discusses the support and advice available...

Even before the UK government announced its intention to require collaborative 3D BIM on its projects by 2016, the construction industry had been busy readying itself for the change to a digital world. Whilst it is clear that the creation, exchange and use of product data is crucial to the BIM process, a common understanding of the type of information that product manufacturers should provide to support BIM has been missing. In March of this year BIM4M2 was formed, with the purpose to support product manufacturers through the transition to a BIM-ready industry, and to provide a forum to share their knowledge.

For me, one of the most exciting aspects of BIM is the willingness of organisations and individuals across the industry to collaborate and work together to address the challenge. Manufacturers have been using digital information and processes for over half a century, but exchanging digital information with supply chain partners is a very different proposition, and one that the sector is eager to tackle. From the preliminary results of the survey of manufacturers that our Promotions Working Group are undertaking, 93% of those responding said they plan to invest in the process (41% already have, and 52% will have by 2016). So, for many the question is less about whether to develop their BIM capabilities, but more about how, in what format and on which platforms? This is where the real challenges lie for the manufacturer, and the answers can be different for every organisation depending on their product types, supply chain routes, markets, regions and scale. However, the basic principles remain the same, to provide structured digital product information that can be exchanged with supply chain partners.

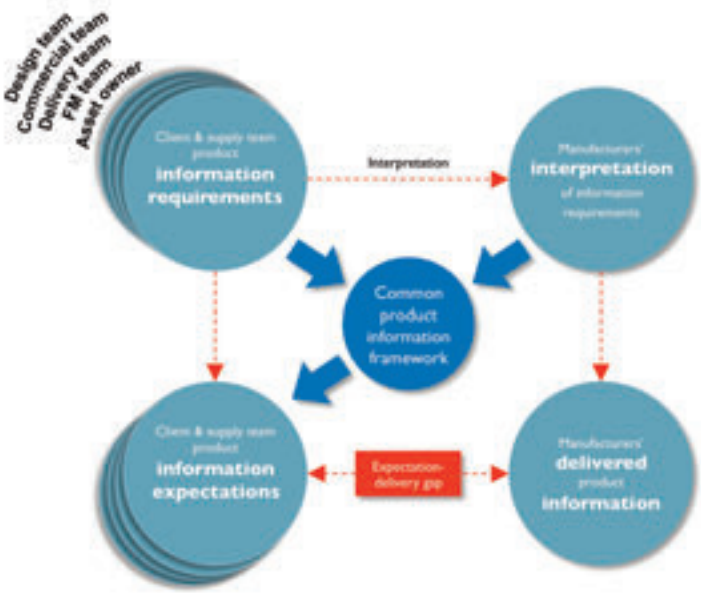
Mix of manufacturer organisation size responding to the BIM4M2 survey, and where they export to



Adding to the complexity is the different information requirements of members of the client and supply chain team on any given project. To find a way through the complexity, we need to work together as an industry and develop an agreed way of describing products and their attributes, both for the UK and internationally. Certainly BS1192:4 (COBie) forms part of the solution as the mandated exchange format for Level 2 in the UK, and the broader Industry Foundation Classes (IFC) are also crucial; but these need to be supported by further definition of what information supply chain partners need and how this can be presented consistently by product suppliers. I'll illustrate this using a customer satisfaction approach.

As we know, on any construction project the client has a set of requirements that need to be met through the delivery of the project, and to support their delivery is a set of information requirements. In the BIM process these are the Employer's Information Requirements (EIR). Added to this, members of the supply chain also need information to deliver the project effectively, and to share with others. In the BIM process these are described in the BIM Execution Plan (BEP).

The expectation-delivery gap



Steve Thompson RIBA, Chair BIM4M2

Without close engagement and accurate definition of what information is required and the level of granularity (element, system, product), there is real potential for a gap between the supply team's expectations on what information a manufacturer provides and what will be delivered: the expectation-delivery gap. With a common framework for product information, supply teams will know what to expect, manufacturers will know what to provide as a minimum, and the gap between expectation and delivery is reduced.

With the development of COBie, the Digital Plan of Work and BS 8541 parts 1-6 in the UK, the gap will certainly begin to close where they are applied. To reduce the gap further the BIM4M2 Data Templates Working Group are working closely with other BIM4 Community groups, clients, professional institutes, trade associations and content providers to develop and refine product data templates to enable suppliers to provide information in a consistent format. There should, and will always be the potential to go further, but the templates will look to set the baseline to support the requirements of a Level 2 BIM maturity.

For those supplying products internationally, a common concern is that in developing structured information or objects for the UK, they will need to create different information for use in every region they operate in. The good news is that with the development of an ISO standard for the BIM process, there is the potential to reduce the differences that exist, and by structuring our information in a common digital format, it makes exchange of information across regions much more straightforward.

Furthermore, the BIM4M2 Education Working Group is developing guidance for product manufacturers on the implications of BIM, and how to develop and deliver a BIM strategy that is fit for their business.

If you would like further information on the group, or to get involved please contact us through our website or on the details provided. ■

BIM4M2

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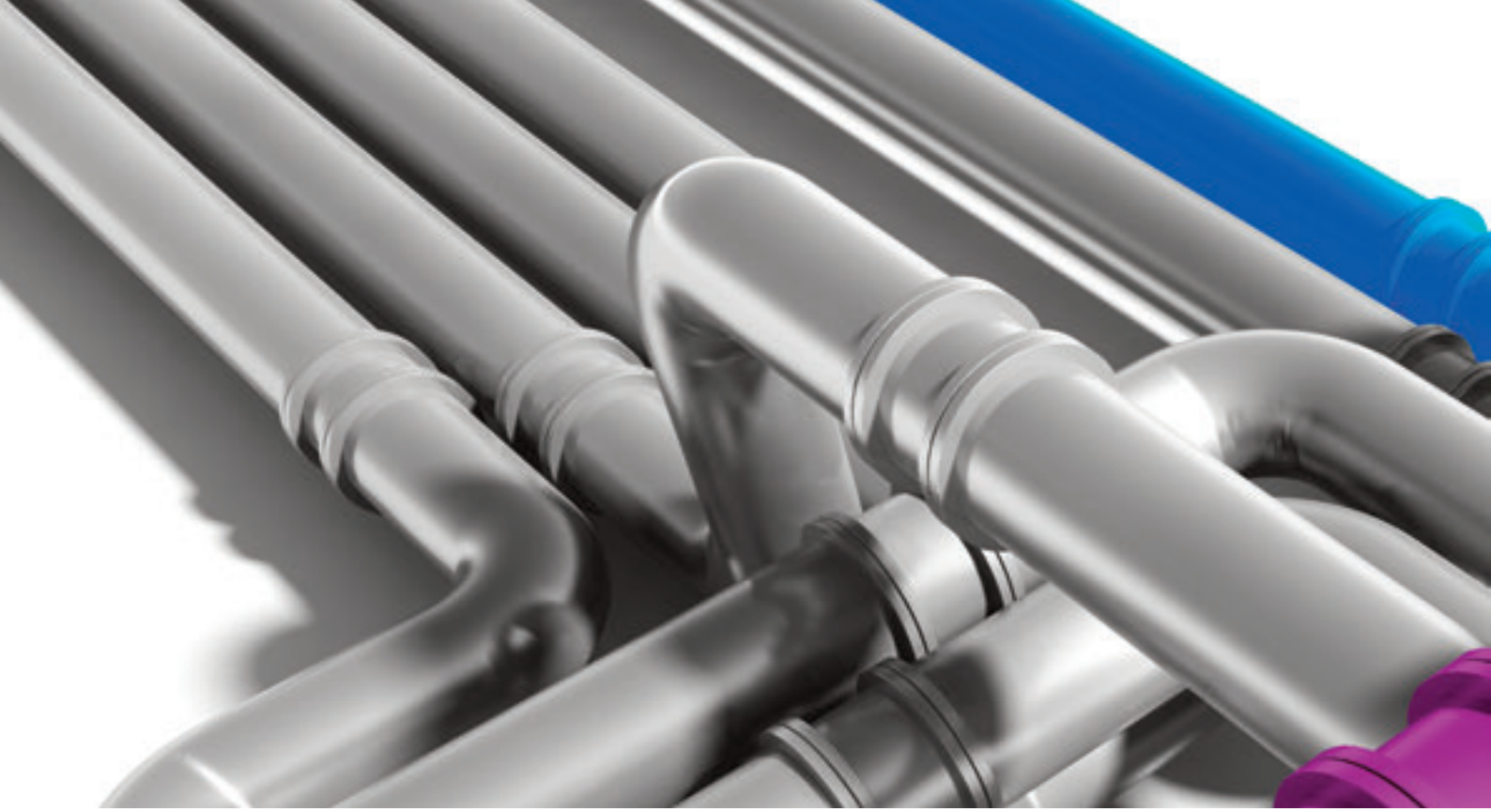


BIM for FM – are we there yet?

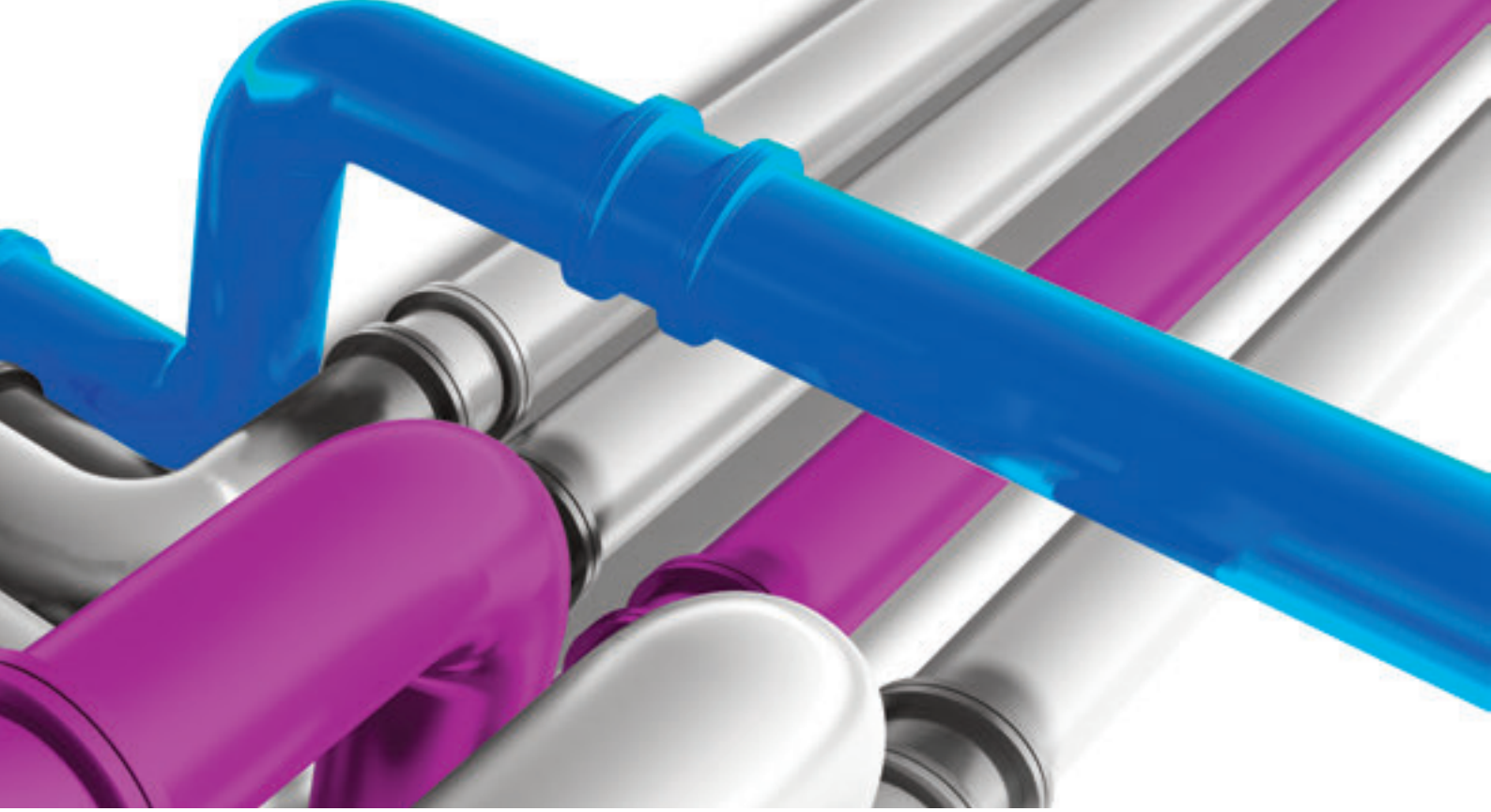
Being involved at the beginning of a new project, and then maintaining this involvement through to eventual handover and post occupancy is key for FM in the BIM process. M J Packham, BIM/Soft Landings Champion at BIFM sheds light on the current situation...

BIM for FM has a certain ring to it and I have to confess that it is very easy to get carried away by the groundswell of enthusiasm that the topic generally seems to engender – particularly amongst our designer/construction colleagues. However, before we get swept away by the BIM tide, it is perhaps appropriate to take a step back to give serious consideration to the potential benefits for FM and, more importantly, how we go about ensuring that these are realised.

Certainly I think that we will all recognise the operational benefits to be derived from BIM in terms of a co-ordinated structure and services installations design. Like me, I suspect that many FMs will have experienced problems with access and general maintenance activities as a result of the structure having "got there first" and the services installations having to be modified on an almost ad hoc basis as a result.

This scenario brings to the fore what I see as being one of the key benefits of BIM, i.e. it provides a mechanism for ensuring collaboration between the respective members of the design/construction supply chain. From a FM perspective we need to ensure that this collaborative ethos also extends to include the operational phase of the built environment that is being created.

This in turn brings into play consideration of the related, but entirely separate, Soft Landings initiative (otherwise known as Government Soft Landings – GSL – in the Public Sector). For those unfamiliar with it; "Soft Landings is the process for the graduated handover of a new building or refurbishment..." So essentially it is about FM getting involved up front in the genesis of a new project and then maintaining this involvement through the various stages of development of design and construction, through to eventual handover and post occupancy evaluation.



The idea being that, in this way, the operational/ occupational phase of the building life cycle – which is by far and away the most significant in cost terms – is always kept under review.

I have wandered somewhat off theme so to return to BIM, one of the other key benefits that I see it bringing to FM relates to the information that gets provided at handover. Again I think that most practising facilities managers will be familiar with the scenario whereby the information they are provided with on taking over new premises is less than perfect – with the net result that they are effectively "flying blind" until the gaps are closed. With BIM this should be a thing of the past. Thus on completion we will – in theory at least – be taking ownership of a fully populated building model that provides all of the asset and service run information required to operate the building at optimum efficiency. Of course all of this lovely information will be in the BIM system and not the CAFM system (or equivalent) which is probably where we really want it. So one of the issues we need to address is how do we get the two to talk to each other in a way that does not involve an undue amount of data manipulation (and hence time/cost). Equally we need to give thought to how frequently we are going to need to refer to the BIM model; once an asset register etc is up and running, I suspect that this will not be as often as some of the BIM protagonists would have us believe.

M J Packham
BIM/Soft Landings Champion

I could go on but I suspect that by now you are starting to understand where I am coming from on BIM. Yes there are a lot of positives for us in FM, but we need to be a bit cautious and not get too excited as there are a number of hurdles we need to navigate before we can expect to fully realise the benefits that it potentially brings. ■

BIFM
ADVANCING OUR PROFESSION

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A New Model for Affordable Housing

How has a collaborative student-designed project become one of the first of its kind designed to some of the world's most stringent design codes? Stacey Temprell, New Build Sector Director for Saint-Gobain, tells us how the world leader in sustainable habitat paired up with The University of Nottingham on the project.

Stacey Temprell
Residential Sector Director

"The project is the result of an extraordinary journey that provides an exemplar 'zero carbon' solution that is a viable, repeatable family home suitable for the UK housing market of the future."

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Nottingham H.O.U.S.E (Home Optimising the Use of Solar Energy) is a full-scale, fully functioning family home that complies with the future Fabric Energy Efficiency Standard (FEES), likely to be the requirement for the 2016 Zero Carbon Homes performance requirement.

The house has been designed to perform at a very low level of energy usage by optimizing both the building's fabric and services to meet the Zero Carbon Hub's FEES and the Government's agenda for reduction of impacts on climate change and fuel poverty.

FEES is the proposed maximum space heating and cooling energy demand for zero carbon homes.

This is the amount of energy which would normally be needed to maintain comfortable internal temperatures. In a dwelling, this can be influenced by a number of factors, including building fabric U-values, thermal bridging, air permeability, thermal mass, external heat gain (solar) and internal heat gains such as metabolic activity or as a by-product of services.

FEES should ensure that a good minimum standard of building fabric (the longest-lasting part of a home) will be embedded in all new homes. It is measured in kWh/m^2/year and is therefore not affected by carbon emission factors for different fuel types. For the majority of homes, levels of 39 and 46kWh/m^2/year are proposed. Nottingham H.O.U.S.E achieves 36kWh/m^2/year on the fabric alone, exceeding fabric standards required under FEES for even an apartment block. With an EPC rating of B, this represents a 46% reduction in CO_2 emissions compared with Part L 2010 Building Regulation requirements.

Saint-Gobain contributed a range of products and systems selected for their appeal of minimizing total energy consumptions and maintaining an inexpensive structural scheme, as well as assisting the students with the specification of the house and providing technical support.

Find out more about the Nottingham H.O.U.S.E project by visiting:

http://www.saint-gobain.co.uk/university-students-zero-carbon-house.aspx

SAINT-GOBAIN

Certifying the assessors

SSAIB Chief Executive Geoff Tate describes the BAFE SP205 UKAS-accredited certification scheme's aims, what it involves and the benefits to customers and certificated service providers alike...

The important area of fire protection standards is one that British Approvals for Fire Equipment (BAFE), the independent third party registration body for the fire protection industry, is dedicated to improving. Established 30 years ago as an independent not-for-profit organisation, it's supported by statutory bodies, fire and rescue services, insurers, and leading trade and certification bodies including SSAIB.

BAFE's objective is to bring a single registration scheme to market for each fire protection product or service for which third party certification is considered appropriate, and life safety fire risk assessment is one of the most recently introduced of these. In England and Wales employers, owners, landlords or occupiers of business or other non-domestic premises are responsible for fire safety and known as the 'responsible person'/'duty holder' – fire safety rules are different in Scotland and Northern Ireland.

Competence and training

It's essential that the person(s) carrying out the fire risk assessment are competent and have received appropriate specialist training, while the purpose and scope of the assessment should be clearly specified and the resulting documented assessment should be 'suitable and sufficient'. While the fire risk assessor has a duty of care to the organisation involved, ultimate responsibility for the adequacy of the fire risk assessment rests with the duty holder (normally a company) or responsible person. This follows a change in fire safety law with the introduction, in October 2006, of the Regulatory Reform Order (Fire Safety) 2005.

Given these circumstances, BAFE's SP205 UKAS-accredited certification scheme enables those responsible, and required under law to carry out a fire risk assessment of a premises, to employ a specialist

third party company to provide this. Taking such a step will allow them to demonstrate that they've taken the necessary reasonable action to comply with their legal obligations and requirements under fire safety legislation.

Besides those responsible for carrying out such an assessment, the new independent third party certification service offered by SSAIB and others will also benefit fire risk assessment providers, who'll be able to use their accreditation to attract end user customers. Certification provides a benchmark recognition of a company's capability in providing high quality fire risk assessments – by showing that they have the required technical and quality management competency, and that their assessors possess the relevant proficiency and knowledge.

Interest in fire risk assessment is growing steadily, driven by factors including the scope of the Regulatory Reform (Fire Safety) Order 2005 in England and Wales and the equivalent Scottish legislation – the Fire (Scotland) Act 2005 – and Northern Ireland – the Fire and Rescue Services (Northern Ireland) Order 2006. Achieving SP205 certification offers accredited providers with a significant marketing tool by enabling them to display a valuable certification mark (including the 'crown and tick' logo). Here at SSAIB we've invested time and resources in achieving this UKAS accredited approval, so that end users with responsibilities under the law can rest assured that risk assessment service providers holding certification approval will provide fire risk assessments that fully comply with the law.

Independent views

So how do companies themselves, who've already achieved been certificated under the BAFE SP205 scheme, feel it will provide benefits? Michael Clifford, Managing Director of one company – Beacon Fire Safety – which gained it last year, comments: "This will assist us in demonstrating to our existing and potential clients that we are a competent provider of fire risk assessments and that we are serious in proving this commitment to them."

Meanwhile, offering another independent viewpoint, is Paul Gotthardt, Director of Fire Safety Solutions. He believes the scheme allows customers an easier way of ensuring that the responsible person/duty holder has fulfilled their obligations: "Gaining SP205 certification helps me to prove to our existing and potential clients that we carry out due diligence and are up to the mark. A little, or indeed the wrong knowledge, can be dangerous and the SP205 scheme provides a benchmark for reassurance. This is a tremendous marketing tool and we'd recommend it to others." ■

Fire risk assessment – what's involved

A fire risk assessment is a process involving the systematic evaluation of the factors that determine the hazard from fire, the likelihood that there will be a fire, and the consequences if one were to occur.

The process involves a physical inspection of the building to determine the adequacy of the existing fire precautions and the need for any additional measures. Of equal importance to the physical inspection is a review of fire safety management in the organisation and consideration of the human factors – how people will respond to an emergency and whether they will take appropriate action.

The scope of a survey involved in a fire risk assessment should include fire hazards, emergency escape lighting, compartmentation, fire detection and fire alarm systems, and smoke control systems.

Courtesy of CS Todd & Associates Ltd

SSAIB, the UK's leading fire, security and telecare certification body for organisations – which celebrates its 20th anniversary in 2014 – also offers a range of management systems certification schemes, including ISO 9001 quality management systems certification and ISO 14001 environmental management systems certification. Over 1500 companies are now on the SSAIB's register.

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BAFE – Helping you to meet your fire protection obligations

Current fire protection legislation across the UK requires property managers of all non-residential premises to have adequate fire protection. It is their responsibility to ensure that there is an adequate, updated fire risk assessment and that all aspects of the requirements are carried out competently. This is not only to ensure that customers, staff and premises are adequately protected, but also to minimise the risk of costly unwanted false alarms.

A competent fire risk assessment is one of the basic Health and Safety requirements for any employer. The most recent CFOA guidance for the Reduction of False Alarms and Unwanted Fire Signals highlights some of the solutions to this problem, amongst which is the use of third party certificated providers of fire protection services: http://www.bafe.org.uk/uploads/DOC53C531E465792.pdf

To demonstrate that the responsible person (duty holder in Scotland) has met their legal obligations a large number of public authorities and commercial organisations large and small, now insist that their fire protection services are carried out by a company that has been third party certificated. Many now specify that providers are BAFE registered. You can find out if your potential provider is third party certificated, by looking on the BAFE website: http://www.bafe.org.uk/companies.php

BAFE is the independent third party certification, registration body for the fire protection industry. We develop schemes for UKAS accredited certification bodies to assess and approve companies to recognised standards. There are now more than 1175 BAFE registered companies across the UK. Our aim is to support property managers to ensure that they get quality fire protection for their premises, staff and service users.

In 2012 BAFE launched the first UKAS accredited scheme for Companies who carry out Fire Risk Assessments (SP205) which is a vital part of meeting obligations under fire legislation. The scheme considers the competence of the individual assessors as well as the quality requirements for the organisation. There are a growing number of companies registering to the scheme, throughout the UK.

If you are looking for the supply and maintenance of portable extinguishers, look for one of the 330 Companies accredited to BAFE Schemes SP101/ST104. Companies are certificated to ISO9001 and all of their technicians are assessed by BAFE for initial and ongoing competence. There are currently more than 1200 BAFE registered technicians, working for our registered companies.

For installing or maintaining fire alarm systems Companies should hold BAFE modular SP203-1 scheme approval. This scheme includes design, installation, commissioning and maintenance of fire detection systems and also requires that all equipment used is third party certificated. The scheme now has over 750 registered companies. Registration to this BAFE scheme is often a key requirement criteria in tenders for the provision of fire alarms.

Our Emergency Lighting scheme (SP203-4) sets out the standards and staff competence criteria to be met. It is modular as with the fire alarm scheme and is achieving growing recognition from end users.

There are a range of other BAFE schemes covering particular sectors of the fire protection industry and details can be found on the BAFE website, along with a complete search facility to find registered companies in your area.

So if you want to be sure you are getting your fire protection from companies who are properly and regularly assessed look for more information using the details below...

Stephen Adams
Chief Executive
BAFE
info@bafe.org.uk
www.bafe.org.uk

BAFE - Helping business to meet their fire protection obligations

Don't gamble with your fire risk assessment!

It is a legal requirement across the UK that all premises have a full and competent Fire Risk Assessment and then implement the fire protection requirements. The 'responsible person' has the duty to ensure that they have carried out these obligations – but how can they be sure that they have used competent contractors?

BAFE has developed a scheme for Companies who carry out Fire Risk Assessments (SP205) which is a vital part of meeting legal responsibility obligations under fire legislation. Providers are rapidly recognising the value of this scheme and gaining certification. After a number of fatal fires, such as the one at Rosepark Care home in Scotland and Lakenal House in London, there have been updated requirements for fire risk assessments.

BAFE is the independent, third party certification, registration body for the fire protection industry, founded nearly 30 years ago with a wide range of industry bodies represented on our Council.

We develop schemes for UKAS accredited certification bodies to assess and approve companies to recognised standards. There are now more than 1150 BAFE registered companies across the UK. Our aim is to support property owners and specifiers to ensure that they get quality fire protection for their premises, staff and service users.

If you are specifying the supply and maintenance of portable extinguishers, look for Companies accredited to BAFE Schemes SP101/ST104. Companies are certificated to ISO9001 and all technicians are assessed by BAFE.

For installing or maintaining fire alarm systems Companies should hold BAFE modular SP203-1 scheme approval. Our Emergency Lighting scheme (SP203-4) sets out the standards and staff competence criteria to be met.

There are a range of other schemes for different fire protection requirements.

So if you want to be sure you are getting your fire protection from companies who are properly assessed look for more information at:

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The business of fire safety partnerships

Graham Ellicott, CEO of the Fire Industry Association (FIA) sheds light on how businesses can now access Primary Authority Schemes for fire...

In 2009 RAFKAP Schemes were launched by the British Retail Consortium and the Chief Fire Officers Association (CFOA). RAFKAP stands for Retail and Fire Key Authority Partnerships and these schemes were designed to deliver consistency in fire inspection and enforcement, enabling fire and rescue services to target resources on high-risk businesses. These schemes were an early forerunner of Primary Authority Schemes.

Lead Fire Authority Schemes have also existed for some time, for example in 2012 Derbyshire Fire and Rescue (DFRS) entered into such a scheme with South Yorkshire Housing Association (SYA). In this scheme DFRS provided a Liaison Officer from within the Fire Protection Department who acted as a single point of contact for both parties. Plus, DFRS offered advice to SYHA in relation to all new build projects and were available for consultation for projects that fell outside of the Derbyshire area.

Looking further back in 2005 the then Labour Government commissioned a report from Sir Phillip Hampton entitled 'Reducing Administrative Burdens: Effective Inspection and Enforcement'. This report then became known as 'The Hampton Report' and it looked at the impact that regulators were having on the ability of business to compete and contribute to the recovery of the economy. The report concluded that across the regulatory gamut there were a number of factors that impacted on a business, such as inconsistent advice, excessive enforcement and inspection. The Hampton Report published a number of recommendations and all of these were accepted by the government.

Following on from the Hampton Report, the government, via The Regulatory Enforcement and Sanctions Act introduced the Primary Authority Scheme (PAS). PAS was developed as a partnership scheme based in law with statutory guidelines.

These were designed to create business investment in growth by developing confidence that regulators in different local authority areas would not place competing demands on a business which in turn could impose extra financial burdens on it. PAS includes a variety of 'strands' including:

- Assured Advice which would be provided by the regulator to a business and this would be accepted by enforcers of the same regulations;
- Inspection Plans would be agreed between the regulator and business so as to co-ordinate inspection activity under an agreed local inspection programme that was risk based;
- Enforcement Referral whereby the partner regulator has the ability to stop proposed Enforcement Action that is not consistent with the Assured Advice.

PAS was to be available to any business that operated across more than one local authority area, and it was to be applied to the majority of local authority regulatory services including the Fire Safety Order.

However CFOA opposed PAS for the Fire Safety Order and argued that its implementation would be contrary to the implementation of local Integrated Risk Management Plans. Thus, the Fire Safety Order was not included at this time in PAS.

In 2012, via the Enterprise and Regulatory Reform Bill, the government proposed a number of changes to PAS which included it being available to trade associations and franchises. In order to see if the 'new' PAS was suitable for fire safety law, two six-month pilot schemes were run from January 2013. These were:

- A Statutory Scheme managed by the Better Regulation Delivery Office (BRDO) of The Department for Business, Innovation and Skills (BIS);
- A non-Statutory Fire Authority Partnership Scheme managed by CFOA.

These pilots were independently evaluated and it was decided that the Statutory Scheme was the most appropriate option.

In April 2014, PAS was finally extended to the Fire Safety Order and to date there are 91 partnerships listed with Hampshire Fire and Rescue Service and London Fire Brigade, being responsible for approximately two thirds of them.

The FIA welcomes the extension of PAS to the Fire Safety Order as the provision of consistent assured advice is a step forward for all concerned. However, the trade does have one area of concern and that is where the Fire and Rescue Service involved in a Partnership has an arms-length company that provides fire related services to the other party. This could lead to the accusation of conflict of interest when enforcement issues are concerned, plus, there will always be the suspicion that the work was obtained because the business partner feels that it will make life easier in general for itself if it uses the arms-length company. ■

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HAAGEN®

FIRE EXTINGUISHER TRAINING: BEST PRACTICES

Steps for a successful safety program

The most important thing to consider when designing your fire extinguisher training program is your actual workplace. Focus your training on the type of emergencies your employees may face. For example, an office complex, manufacturing facility, hospital facility, and University dorm should all have markedly different programs.

Every successful program should combine classroom and hands-on instructional elements. Many of the basics can and should be covered before allowing hands-on training.

Trainees should leave the program with knowledge of sources of fire, classes of fire and their corresponding fire extinguishers, how to identify an extinguisher, how to assess a fire situation, and fire emergency protocols.

Sources of Fire:

- Fires are chemical reactions that occur when fuel, oxygen, and an ignition source combine.
- Fire extinguishers work by removing one or more of these sources, with different extinguishers working in different ways. For example, water extinguishers remove the heat and carbon dioxide (CO_2) extinguishers remove the supply of oxygen.

Five Classes of Fire:

- Class A fires involve ordinary combustible materials such as cloth, wood, paper, rubber and many plastics.
- Class B fires involve flammable and combustible liquids, such as gasoline, alcohol, diesel oil, oil-based paints and lacquers.
- Class C fires involve flammable gases.
- Class D fires involve combustible metals such as magnesium, titanium, and sodium.
- Class F fires involve vegetable oils, animal oils or fats in cooking appliances.

Choosing the Correct Fire Extinguisher:

Many fire extinguishers are designed for use on specific types of fires. The most common fire extinguishers are:

- Class A: water
- Class B: foam, CO_2, dry powder
- Class C: water, foam
- Class D: dry powder
- Class F: wet chemical

Users must understand that operating a fire extinguisher which does not match the class of fire can actually increase the fire hazard and endangers the user and those nearby.

Identifying a Fire Extinguisher:

- Teach employees how to identify an extinguisher, including its class and the size of fire it is designed to combat by the markings on the fire extinguisher.
- Help employees identify the actual extinguishers found around their place of work.

Assessing a Fire Situation:

- As portable fire extinguishers are designed for incipient stage firefighting, employees should be familiar with how to properly asses a fire situation.
- Individuals should not use a portable fire extinguisher to combat fires larger than themselves.
- Individuals should also asses the fire's location (is it fully visible or has it spread behind walls or equipment?), levels of heat (is the room too hot to remain in comfortably?), presence of thick smoke or fumes, and the availability of sufficient exit routes.

Additionally, each organisation should clearly instruct employees as to what alerting actions are required and when evacuation is required. Ideally, employees should never attempt to fight a fire without signaling that there is an emergency.

[THE NEXT LEVEL OF EXTINGUISHER TRAINING IS HERE

Tips for Hands-On Training:

Consider these tips for further engaging and educating employees:

- Simulate various fire situations, including different types of fires or fire level difficulties.
- Consider using digital fire simulators where live burns aren't permitted.
- Have employees work with varying sizes of extinguishers to understand the potentials and limits of each.
- Teach employees to maintain proper distance from fires depending on the size of extinguishers used and the type of fire.
- Teach employees to check the pressure gauges and test extinguishers before approaching a fire. Have trainees select from multiple training extinguishers where one or more are not fully charged.
- Keep class sizes small to make it easier for everyone to participate, ask questions and stay engaged.

About HAAGEN:

HAAGEN is a leading manufacturer of fire and safety training tools used worldwide. HAAGEN products employ smart technology to give trainees realistic and cost-effective hands-on training.

HAAGEN offers a complete line of fire and safety training products that allow professional instructors to conduct realistic and effective hands-on training exercises. Major product categories include fire extinguisher training, haz-mat training, rescue manikins, and live fire demonstration systems.

HAAGEN shares its customers' passion for the critical roles they play in keeping citizens, workers and firefighters safe through good training. Thousands of organisations and millions of individuals around the world have trained with HAAGEN systems.

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Behavioural safety ensures effective organisation

Rob Burgon, Workplace Safety Manager at the Royal Society for the Prevention of Accidents (RoSPA) details how our behaviour at work can influence our health & safety...

In the workplace, there are human factors – such as the working environment, organisational and job factors, and human and individual characteristics – which can affect how a person behaves.

Everyone can make errors, regardless of how well trained and motivated they are but in the workplace, the consequences of such human failure can be severe.

With that in mind, it is essential that employers consider certain aspects when trying to manage human failure to avoid accidents and ill health at work.

These are: the job, the individual and the organisation.

Let us first talk about the job. This includes areas such as the nature of the task, workload, working environment, the design of displays and controls, and the role of procedures.

Employers should design tasks in accordance with ergonomic principles to take account of both human limitations and strengths. This includes matching the job to the physical and the mental strengths – such as perceptual, attentional and decision-making requirements – and limitations of workers.

When considering the individual, their competence, skills, personality, attitude, and risk perception, all come into play. Individual characteristics can influence behaviour in complex ways but certain characteristics such as skills and attitude can be changed and enhanced.

The working environment also plays a significant part in the behaviour of an individual or group. Factors such as work patterns, the culture of the workplace, resources, communications and leadership should also be considered.

So, what can we take from this? Firstly, that human factors not only concerns the tasks that people are set but also who is doing the task, i.e. how competent and skilful they are at carrying it out, and the place in which they are working.

As all of these factors influence behaviour at work in a way which can affect health and safety, it is essential that human failures are managed to prevent major and occupational accidents, and ill health, all of which cost businesses money and their reputation.

It is crucial to understand that human factors not only influence the safety culture of an individual, but also affect the culture that exists within an organisation. Safety management systems should include human factors, which allow them to be examined in a similar way to any other risk control system.

The best way for businesses to achieve these goals is by having good technology, together with a skilled workforce with staff placed in jobs suitable for their abilities. Remember, successful businesses achieve high productivity and quality while ensuring health and safety.

The influence of biological, psychological and organisational factors on an individual at work can not only affect their personal health and safety, but also their efficiency and productivity.

For example, someone is more likely to suffer injury if exerting a large proportion of their strength to complete a task and could possibly cause damage to the product and tools.

Rob Burgon
Workplace Safety Manager

If the mental demands of a task are too high – i.e. if it involves diagnosing faults under significant time pressures – then there can be both a health issue for the employee but also a quality, and possibly safety issue for the production line, process and plant.

It is also essential that workers are properly trained for their roles – this is the employer's responsibility.

As individuals have a wide range of abilities and limitations, a human factors (or ergonomics) approach focuses on how to make the best use of these capabilities.

"As all of these factors influence behaviour at work in a way which can affect health and safety, it is essential that human failures are managed to prevent major and occupational accidents, and ill health, all of which cost businesses money and their reputation."

In order to improve the health and safety of workers, employers need to ensure that jobs and equipment are fit for them, which would in turn lead to a better managed and more effective organisation. ■

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Excellence in workplace safety and health

Behavioural safety is a key part of a business's journey towards ensuring excellence in workplace safety and health. Here Jill Joyce, Senior Policy & Research Adviser at the Institution of Occupational Safety and Health (IOSH) explains the process that companies can take...

Behavioural safety programmes can help to prevent work related accidents and diseases, which are expensive for companies. Research has shown that up to 80% of work related accidents are caused by employees' behaviour.[1] Behavioural safety is about identifying bad habits that could cause accidents or lead to ill health and reinforcing good habits. It's important not to confuse this approach with inspections, which are looking for unsafe conditions. Safe behaviour is regarded as a critical work related skill so unsafe behaviours can act as an early warning system for accidents and incidents. If we measure these behaviours, this provides information we can use proactively to improve workplace safety and health.

What do organisations need to do before introducing a behavioural safety programme?
If a behavioural safety programme is to be effective it must be implemented well. There are several stages to follow for a successful implementation. The first is to assess whether the company is ready culturally for such a programme. For example is there management commitment to the idea, does the company have a good internal communication strategy and is there a 'fair blame' culture? A survey could be carried out before the programme starts to measure the safety climate.[2]

It is essential to have support from both the management and work force. The best way to gain support from employees is to involve them in the programme. A steering group needs to be set up to oversee the programme and it is important that this is representative of the whole workforce.

The next step is to train the observers how to identify critical safety behaviours, what to record and how to provide feedback. It's important that everyone is

using the same criteria to judge behaviours. It is usual to compile a checklist of critical behaviours. These can be based on analysis of previous accidents or incidents. Near misses are particularly important to consider as they may give an indication of behaviours that could have led to accidents. When the checklist is ready, it is useful to establish a base line by conducting initial observations and noting the current level of safe behaviours. This enables future progress on the programme to be measured.[3, 4]

Then there follows a continuous loop of observation, feedback and review and if necessary training. It's important that feedback is phrased positively so that safe behaviours are reinforced. For example, someone who is acting safely would be praised, but someone who was not would be told how they could change their behaviour without apportioning blame to them. The data from the observation process can be used to examine trends and identify areas for improvement. Participative goals that employees help to set are more effective.[5] Rewards can be given for meeting safe working goals, for example at the London Olympic Park, these ranged from verbal praise to monetary rewards, vouchers, knock off early schemes, T shirts and fleeces etc.[6]

Visible leadership is important

Managers need to show commitment to the process and can do so by allowing observers time to conduct their observations and encouraging employees to report problems with safety and health. They should praise individuals they see working safely and ensure there are resources available if any corrective actions are necessary.

It's also important to understand why employees might behave unsafely. For example, do work deadlines mean that they have to cut corners (for example not using a mask because it is uncomfortable and a job will not take long to do)? Do employees understand the risks associated with a particular task or are there ergonomic factors that prevent them behaving safely? At the London Olympic Park construction site, employees handed out yellow and red cards to highlight unsafe behaviour. These were followed up with a discussion with the employees concerned to establish why they acted unsafely.

Jill Joyce
Senior Policy & Research Adviser

Behaviour based approaches work best when the physical environment and plant are well maintained and procedures are in place. The benefits of introducing a behavioural safety programme within an organisation is the opportunity it provides for the whole workforce to co-operate together proactively to continuously improve safety and health. ■

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Optimising behavioural performance

Imagine achieving around 12 percent productivity improvement, 30 percent reductions in insurance premiums, 30-70 percent reductions in undesired incidents and significantly reduced operating costs, all within a year or two for relatively little investment. Really! How? you ask.

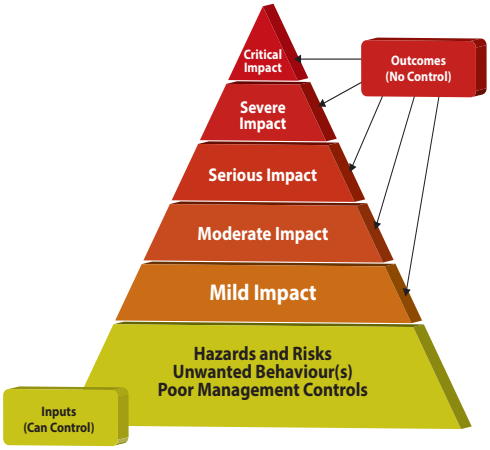
Well, now imagine your management team and workforce aligned with and engaged in a common purpose to improve performance, with both identifying and fixing bottlenecks, and challenging unwanted behaviours within a mutually trusting and supportive atmosphere. Does this sound like your place of work? or, is it something you aspire to?

Behavioural approach

Derived from the Industrial/Organisational Psychology discipline, the behavioural approach used to achieve these proven real world results, have been implemented over the past five decades in a wide variety of work settings. Applicable to quality, productivity, and safety performances, the purpose is to reduce the number of incidents caused either by poor management controls and/or hazards present in the working environment; those triggered solely by 'unwanted' behaviours; or those triggered by an interaction between poor controls, hazards and behaviours.

Defined as an 'unexpected and unwanted event' an incident can be property damage, a quality reject, a personal injury, or a catastrophe. For example, in a bottling facility a worker was removing plastic bottle stoppers with a sharp knife pointed toward his stomach, from glass product bottles rejected by quality control. With the unsafe behaviour noticed by a safety psychologist during a site visit, discussions revealed one bottle per minute was being rejected due to misaligned or damaged labels (1440 per day!). The root problem was traced to the labelling machine, where, with minor variations along the horizontal and vertical axis, it became clear that the stack of labels were not sitting in their feed-tray properly. Smoothing these so they sat flush fixed the labelling issues, and eliminated the potential for an injury from the workers unsafe use of the knife when handling the rejects. The annual cost savings were around €2.6 million.

Incident pyramids, such as that shown, illustrate that most incidents have a relatively mild impact, and that critical impacts (i.e. catastrophic) are relatively infrequent events. It is a matter of chance, however, whether a mild impact event may have been more serious, as the severity of outcome cannot be controlled in the same way as the inputs. Preventative opportunities arise, therefore, from controlling unwanted behaviours, eliminating hazards, and tightening management controls at the base of the pyramid. By simultaneously focusing on all three, the possibility of a critical impact event is significantly reduced, while greatly improving performance and efficiencies.



In the occupational safety arena, research shows that people's behavioural choices account for around 56% of all potential serious injuries and fatalities (SIFs), with poor management controls (e.g. job planning, poor quality rules & procedures), and physical hazards and risks accounting for the remainder. Well-designed and executed Behavioural Safety approaches systematically address these three factors in a proactive and planned manner by targeting people's behaviour at each layer of the incident causation chain.

Incident causation

The universal model of incident causation consists of five layers: [1] the Strategic level relates to Senior Management decision-making; [2] the Operational level refers to line-management implementation issues; [3] the Tactical level reflects support functions such as Human Resources, Purchasing & Supply, Finance, etc.; [4] the Behavioural Level, primarily concerns employees operational behaviours;

and [5] the Defensive level represents the presence and types of control measures.

Incidents occur because system faults reside, or are created by people's behaviour, in each layer. On their own they are harmless, but combined with others they can breach any defences to cause an incident. Very often, unwanted behaviour is the trigger that causes two or more of these system faults to combine. The greater the number of system faults at the top three layers, the greater the variety of local triggers there are at the behavioural layer, which could potentially breach a greater number of loopholes in the defensive layer. If there is an alignment of the breaches at each layer, an incident will occur.

This tells us that safety is a social activity: the behaviour of one person can affect many. It makes sense, therefore, to help remove any system faults by focusing on the safety-related behaviours of people at each level.

By focusing on people's behaviours at each layer in the incident causation chain, Behavioural Safety processes also create a safety partnership from a combination of management's safety leadership activities and employee engagement in the safety effort. Developing this partnership is important as safety leadership can impact people's behaviour by as much as 86%, and engaged employees are 5 times less likely to be involved in an incident.

Targeting behaviour

At both the 'Strategic' and 'Operational' levels, well-designed and executed Behavioural Safety processes help by targeting safety leadership behaviours of the management team, to ensure safety is on their radar and is consistently demonstrated. At the 'Tactical' level,

Behavioural safety processes focus on the behaviours of those support functions directly impacting the safety of operations workers (e.g. purchasing of fit-for-purpose equipment). At the 'Behavioural' level the focus is on operational safety behaviours (e.g. filling product tanks). At the 'Defensive' level the behaviour of those responsible for corrective actions, management of change procedures, emergency procedures, etc., are targeted to ensure the defensive systems are functioning as intended.

To achieve this, project teams examine a facilities previous incident history to identify specific behavioural problems resulting from the interaction between people and their wider working environment. These include those arising from various management systems (safety and non-safety), the quality and effectiveness of leadership, the resources available (financial and non-financial) and the overall safety culture.

Once identified, attempts are made to discover the triggers (e.g. unavailable equipment) driving the unwanted behaviour(s) (e.g. using improvised tools), and what factors are maintaining them (e.g. getting the job done to meet deadlines), so appropriate corrective actions can be taken.

Executing the change strategy usually involves removing any inappropriate behavioural triggers and establishing a monitoring process to help improve the frequency of the desired behaviours. The results are used to facilitate feedback, appropriate corrective actions (e.g. remove hazardous materials, etc.), and the tracking of progress. Long term data trends are used to adapt the process to suit the particular circumstances (e.g. shift focus to other problem behaviours).

Conclusion

Organisations good at managing safety also tend to manage operations well – in other words, operational and safety excellence go hand-in-hand. Well-designed and executed Behavioural Safety processes are known to provide a return on investment of around €1.3million per 100 workers, per year, from incident reductions. In addition, there is strong evidence showing productivity improvements, as well as reductions in insurance premiums and operating costs. It achieves these cost-benefits by identifying and eliminating system faults, while fully involving all personnel in the safety improvement journey within a mutually trusting and supportive atmosphere.

In the next four editions, we will be providing further articles on how to optimise or introduce a Behavioural Process to achieve maximum benefits.

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Planning for asbestos removal

The importance of planning for asbestos in construction work cannot be underestimated. Tracey Boyle – Chartered Occupational Hygienist and current Honorary Secretary of BOHS outlines many of the pitfalls in failing to plan for asbestos removal...

Often, when acting as an expert witness in civil litigation in relation to asbestos management, asbestos surveying and personal injury claims for asbestos-related diseases, I receive telephone calls along these lines:

"Hello, I'm a solicitor acting for Principal Contractor. PC disturbed asbestos on site while working. It cost £000s to remove and the project was delayed by months. The Client is blaming PC and refusing to pay extra costs and imposing time penalties. We need an asbestos expert to investigate and report on the incident."

When investigating these incidents, while the details vary, the incidents often follow a familiar pattern as detailed here.

Health and safety before, during and after construction work is currently legislated for by the Construction (Design and Management) Regulations 2007 (CDM). Everyone in construction has heard of CDM and almost all construction projects must comply with the obligations under CDM. There are duties placed on the Client, the CDM Co-ordinator, the Designer and the Principal Contractor. In my experience, the construction industry and its clients are less clear about the duties placed upon them in relation to the management of asbestos, even though asbestos is still to be found in about half a million commercial premises in the UK.

Under CDM, the client or client's agent puts together a tender package of health and safety information. Asbestos usually appears on a checklist of potential health and safety issues to be considered. Sometimes an asbestos survey is appended. This is often a management survey that has been undertaken to allow the client to comply with its obligations under the Control of Asbestos Regulations 2012.

"Contractors tendering for a contract with insufficient information about asbestos will almost always under-estimate, if considered at all, the costs associated with asbestos removal because he doesn't want to add unknown costs to his tender as he will out-price the competition and lose the contract."

Often, the management survey is accepted as sufficient for the construction project, the tenders are submitted and the contract is awarded. Work commences and after some time into the contract, asbestos not identified during the management survey is discovered and work is halted. Or it is discovered that sub-contractors have been pulling out partitioning constructed from asbestos insulating board for the last week, exposing themselves and a number of other contractors to asbestos and spreading contamination throughout the building.

The priority of course is to resolve the immediate problem. The client instructs the principal contractor to engage a licensed asbestos removal contractor (LARC) and get the site cleared. The LARC arrives on site, provides a quote and informs the contractor that work cannot start until 14 days after the quote has been accepted because the HSE has to be given 14 days notification of the works. The actual asbestos removal and clearance procedures may take several weeks to complete.

Tracey Boyle MSc CFFOH, Honorary Secretary of BOHS

And so the recriminations start. The client says they provided information in the tender package. The principal contractor says that the information wasn't detailed enough. The sub-contractor says that his men have been exposed. HSE gets involved, solicitors get involved, expert witnesses get involved, and costs spiral while the project is delayed for several weeks or even months.

This type of situation arises because, on the issue of asbestos, all parties very often seem to have limited knowledge of it and its associated problems when it isn't considered properly at the planning stages of a project.

Under both CDM and CAR2012, the client should inform tenderers/contractors about asbestos on the site. Asbestos and the Control of Asbestos Regulations are specifically mentioned in the HSE's CDM ACOP.

If the client doesn't know what asbestos is present on the site, they should commission a suitable and sufficient survey for inclusion in the tender documents. This will allow the tenderers to take account of asbestos when preparing the quote for the tender. What does suitable and sufficient mean? Refurbishment or demolition projects require a refurbishment/demolition survey.

This entails surveyors inspecting cavities and voids in a building; above suspended ceilings, inside ducting and risers, inside lift shafts and under floorboards. If a building is occupied, it may not be possible to fully complete a refurbishment /demolition survey at the pre-tender stage. If this is the case, then this should be acknowledged in the tender package and should be dealt with openly. A requirement of the tender should be that the principal contractor commissions a refurbishment/demolition survey prior to commencement of the construction phase. The costs and time associated with the removal of any additional asbestos found should be outwith the main tender pricing and timings, as until the survey is completed and an LARC has quoted for any removal required, no-one knows what the costs and time constraints will be.

Contractors tendering for a contract with insufficient information about asbestos will almost always underestimate, if considered at all, the costs associated with asbestos removal because he doesn't want to add unknown costs to his tender as he will out-price the competition and lose the contract.

The client will almost always select the cheapest quote in a tender process. When the survey is commissioned, the client or contractor will select the cheapest surveyors and the survey may not be well-executed. The surveying contractors know this, so they put in a cheap quote. Because of this, the surveyors do not have enough time and they don't have the correct access equipment. If they had quoted for a reasonable amount of time and hiring in mobile access equipment or scaffolding, they would have lost out to a cheaper surveying firm. And so it goes on. In an effort to

control costs, asbestos is not looked for, or not found on site in a controlled manner, but is found or disturbed in an uncontrolled way during the construction phase of a project. This costs everybody a lot more, including financially, the reputations of all concerned, and in terms of health risks to workers.

"In my experience, the construction industry and its clients are less clear about the duties placed upon them in relation to the management of asbestos, even though asbestos is still to be found in about half a million commercial premises in the UK."

The solutions are relatively simple. They do involve slightly higher upfront costs, but these pale into insignificance compared to the costs of decontaminating a construction site and resolving legal disputes due the unbudgeted time and costs associated with asbestos found on site during the construction phase of a contract.

I would advise that:

- The client should commission a suitable and sufficient survey from a reputable firm of asbestos surveyors and include the survey report in the tender documentation, highlighting where asbestos removal will be necessary as part of the contract;
- Those submitting a tender should obtain quotes from reputable LARCs, including a time budget. These costs should be included in the tender;
- If the client/client's agent is unsure of costs they can get independent quotes from LARCs. Tenders with very cheap asbestos removal budgets should be rejected;
- The client should insist that all contractors and sub-contractors working on their project have received asbestos awareness training;
- Construction site managers should receive training in asbestos management so that they have a better understanding of asbestos surveys and how to interpret the information presented. They should also have an understanding of asbestos removal contracts;
- The principal contractor can move the project forward once the asbestos has been removed, but all contractors should remain vigilant for other ACMs. When a building is being demolished, ACMs may become apparent that were not accessible even during the most vigilant refurbishment/ demolition survey.

BOHS qualifications in asbestos (the P400 series) are respected and recognised worldwide. They cover both theoretical and practical asbestos training and are aimed at individuals who need to demonstrate a level of training and competence in order to be able to carry out risk assessments of asbestos containing materials. For more information visit www.bohs.org/education ■

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Time to love bungalows again

Rural communities face an urban exodus if a sustainable solution to the countryside's housing crisis is not found. It is time for bungalows to be recognised as part of this solution says Henry Robinson, President at the CLA...

Since the 1940s, house building in the countryside has stalled. For decades, retirees looking to downsize have been left with nowhere to go. With no suitable alternative housing available to them, and reluctant to lose their support networks by moving into towns and cities, many older people have felt they have no option but to remain in costly-to-run family houses. Not only has this removed much-needed family housing from the market, it has debilitated rural services, limited rural employment and prevented rural employees living close to their place of work.

With Britain's aging population expected to account for 54 percent of households aged over 65 by 2021 and in rural areas, the number of over-65s rising 2.5 times faster than in towns and cities, this situation can ultimately only lead to the death of rural villages.

In the CLA's housing policy document 'Tackling the housing crisis in England' we clearly identify the need to enable elderly owner occupiers, retired rural employees and tenant farmers, to downsize as a key restructuring requirement within villages and offer up bungalows as part of the solution. A solution since echoed by Housing Minister Brandon Lewis.

Bungalows provide a smaller, easy to maintain and more manageable living space for older generations who do not feel ready to move into retirement housing. They allow older occupants to remain in the area they know and have contributed to, simultaneously freeing up larger, vitally needed family housing.

For decades, landowners have been frustrated with the severe and entrenched limits put on bringing forward land for any kind of rural development.

Henry Robinson, President,
CLA (Country Land and Business Association)

Where small housing units existed, it has paid to extend them as much as possible to cash in on the plot value removing them from the retirement market. Local authorities must look at issuing planning restrictions preventing them from being extended upwards or outwards meaning that they remain available for older people. The development of the new National Planning Practice Framework (NPPF) and National Planning Policy Guidance (NPPG) has been an arduous journey, but the results are finally beginning to deliver change. It is my view that the positive planning changes should be used to deliver new bungalows in rural villages.

"Bungalows provide a smaller, easy to maintain and more manageable living space for older generations who do not feel ready to move into retirement housing. They allow older occupants to remain in the area they know and have contributed to, simultaneously freeing up larger, vitally needed family housing."

There is still some stigma surrounding bungalows but this can be addressed with good design. The NPPG states that local plan allocations are relevant to all types of settlements and focuses in part on older persons housing, and with the re-launch of Building for Life 12, some of the well-deserved criticism of bungalows on aesthetic grounds can be put to be bed. This is because alongside the design policies of the LPA, the ubiquitous kit-built, pebble dashed, shallow-roofed bungalows of the past, should be easier to refuse.

The beauty of bungalow developments is that although they require bigger plots than two story homes, they are low-impact on the skyline in instances where the site is highly visible topographically. This is why we have identified deep pitched roofed properties of traditional appearance as appropriate in rural locations.

Don't forget, less than 10 percent of the UK land mass is covered by development activity – much less than many people believe to be the case. Despite the fact they are more land hungry, in view of our aging population time bomb, bungalows have a role to play in all settlements – not just rural. ■

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Does new home affordability have to compromise energy efficiency?

Julia Evans, Chief Executive of BSRIA gives consideration to missed opportunities when building new affordable homes...

In the run up to the 2015 elections, the Conservatives have pledged to build 100,000 new 'starter' homes that will be made available at 20% below the market rate to first time buyers under the age of 40. In order to help reduce the cost burden on developers and house builders the houses will be built on brownfield sites and will also be exempt from meeting the zero carbon standard that would normally apply to all new homes.

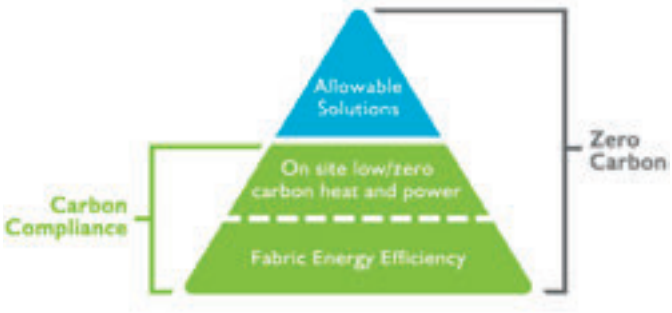
The issue of providing adequate new housing has been addressed several times in the last few years. In early 2014, the Lyon's housing review was published on behalf of the Labour Party which highlighted the inability of the supply of new homes to meet demand and called for clarity of government policy to support the house building industry. It stated that while there was a need to simplify access to suitable land through the planning process, there was an awareness and demand for high quality development, in terms of good design and sustainability, which should not be undermined.

The Red Tape challenge launched in 2012 set to rationalise the technical housing standards that developers and house builders, had to comply with in addition to the Building Regulations. This has led to the development of the Housing Standards that are being currently consulted upon and will help significantly streamline the compliance procedures for the industry.

While further simplification of procedures to support the 'starter' homes proposal may be seen as a saving

in terms of time and therefore cost, compromising on the energy efficiency of the homes appears short sighted. Scaling back the environmental standards of the new homes is likely to transfer the impact directly to the occupants in the form of high running costs.

In the Queen's speech earlier this year the government reinforced its commitment to meeting the Zero Carbon Homes standard, to build all new homes from 2016 with no net CO_2 emissions from the use of regulated energy (for space heating and cooling, domestic hot water, fans and pumps, ventilation and fixed lighting). To achieve this a three-tiered route is recommended by the government, in which a minimum standard of fabric and services energy efficiency must be met along with a limit on CO_2 emissions for which on-site renewable energy generation may be used. The remaining emissions would be addressed by mechanisms permitted under 'Allowable Solutions' and it was announced that more details on these could be expected shortly.



The Zero Carbon Buildings Policy. Source[1]

It is important that all new homes address the requirements of current policies and help strengthen the mechanisms for future application. New homes need to be built to be resilient to future challenges of rising energy costs, fuel security and the health and well-being of occupants. An area of increasing concern with new housing is the ability of the homes to deal with rising summertime temperature. The impact of exposure to increased temperatures over prolonged durations can have significant health implications, especially for the vulnerable population that includes young children.

The Department for Communities and Local Government (DCLG) funded the Performance Gap project facilitated by the Zero Carbon Hub to look into the difference between the intended energy performance and the actual energy used by new homes. This saw participation from house builders, developers and academia among other stakeholders of the house building industry, and the findings were published this summer in their End of Term report [2].

This report highlighted a shortage of knowledge and skill within the industry and the urgent need for training and upskilling across the board. It was acknowledged that the industry in its present state does not have the required expertise for mass delivery of homes performing to the energy efficiency standards they were designed to.

Reducing the energy efficiency required from such a significant number of new homes would be a huge missed opportunity for addressing the shortcomings identified in several studies looking at housing in the UK. While the shortage in availability of new, affordable homes in the country is widely acknowledged, it needs to be ensured that the issue of affordability does not compromise the provision of a durable product that is a long term asset. ■

[1] http://www.zerocarbonhub.org/zero-carbon-policy/zero-carbon-policy

[2] http://www.zerocarbonhub.org/sites/default/files/resources/reports/Design_vs_As_Built_Performance_Gap_End_of_Term_Report_0.pdf

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Addressing fuel poverty in the UK

John Perry, Policy Adviser at the Chartered Institute of Housing (CIH) discusses how housing has a huge role to play in reducing fuel poverty statistics...

In 2014 there are estimated to be 2.3 million households living in fuel poverty in the UK [1] – and more than 3 million families [2] are likely to cut back on food this winter to pay their fuel bills.

Housing has a huge role to play in improving those statistics. By far the biggest impact can be achieved by improving the efficiency of the housing stock itself – but to secure the full benefits of energy-efficient homes it is important to work with tenants on energy use, and not just work on properties.

The scale of the challenge is huge. The government's target is to cut UK carbon emissions by 80% by 2050. Insulating our housing stock to a high standard has to be a major part of this, because housing contributes more than a quarter of Britain's total emissions. The government's Carbon Plan aims to achieve 'near zero' carbon emissions from housing by 2050. To achieve these targets, we have to insulate one more house to very high standards every minute across the UK. That's 625,000 per year.

Right now the sector isn't achieving anything like the right pace or standards of change. For example, the Committee on Climate Change expected 130,000 solid wall homes to be insulated in 2013; fewer than 25,000 were actually done. The case for a national retrofit programme that would achieve government targets is set out by the UK Green Building Council in its report A Housing Stock Fit for the Future [3].

Of course all social landlords need to ensure their stock meets the Decent Homes Standard – but this is far below the levels of energy efficiency needed to achieve the 80% by 2050 target. While for new homes there is the planned 'zero carbon' standard and currently the Code for Sustainable Homes, there is no equivalent for the existing stock. The National Federation of ALMOs (arms-length management organisations) has called for an ambitious energy-efficiency target [4] to form part of the Decent Homes Standard for delivery by 2020.

The policy environment presents significant challenges. Policy has shifted away from direct investment in greening the housing stock towards incentivising households through the Green Deal. We are facing a long-term problem which needs proper investment as well as a long-term plan. So much reliance has been placed on the Green Deal as the centrepiece of government environmental policy that the extremely low take-up now presents a major obstacle. But could this be turned into an opportunity? The Green Building Council has called for a revived and revamped Green Deal [5] that could be much more attractive to householders if it offered lower-cost finance.

We also need to revamp the Energy Company Obligation (ECO) so that it reaches many more homes and concentrates both on the fuel-poor and on hard-to-treat properties (like its predecessors such as the Community Energy Saving Programme). Leicester City Council used CESP to comprehensively insulate a low-income estate of over 1,000 houses, including right to buy properties. Such schemes make a huge difference to residents because they deliver high standards and hence real savings in fuel bills, not the marginal effects that often come from (say) only doing roof insulation, which is where ECO now focuses. We badly need to tackle hard-to-treat homes such as those with solid walls. Over 7 million households live in such homes, including half of those affected by fuel poverty.

John Perry
Policy Adviser
Chartered Institute of Housing (CIH)

As Affinity Sutton's Jeremy Kape has argued, the valuable role that social landlords can play in improving the take-up and technical standards achieved by both ECO and Green Deal needs to be recognised by putting them at the forefront of schemes. Many now have the technical skill and customer-facing experience to deliver programmes that work and are cost-effective. They should be seen as a frontline resource. Social landlords have also shown how they can contribute towards the shift to renewable power sources, particularly through investments in solar PV.

While new build is less important environmentally than dealing with the existing stock, it's vital that we stop building homes that aren't fit for purpose because they burn too much energy. We should move to zero carbon new homes across the industry as soon as possible, especially as the typical extra cost of building a semi-detached house to the zero carbon standard is now down to less than £5,000 [6].

Finally, housing providers have a big role in making the case for change. This extends from the most basic level of their day-to-day interactions with tenants about fuel bills and how they heat their homes, to the installation of new kit like SMART meters that help people understand their energy use, to broader work with residents' groups and acting as a powerful lobby for action.

Rates of home insulation and of investment in renewables are heading downwards instead of accelerating as they need to. We can get back on track, but we don't have any time to lose. And as we make efforts to do so, the housing industry has a huge role to play.

About CIH:
The Chartered Institute of Housing (CIH) is the independent voice for housing and the home of professional standards. Our goal is simple – to provide housing professionals with the advice, support and knowledge they need to be brilliant. CIH is a registered charity and not-for-profit organisation. This means that the money we make is put back into the organisation and funds the activities we carry out to support the housing sector. We have a diverse and growing membership of more than 22,000 people who work in both the public and private sectors, in 20 countries on 5 continents across the world. Further information is available at: www.cih.org ■

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/319280/Fuel_Poverty_Report_Final.pdf
[2] http://www.childrenssociety.org.uk/news-and-blogs/press-release/over-half-poor-uk-children-denied-key-support-keep-their-homes-warm
[3] http://www.ukgbc.org/resources/publication/housing-stock-fit-future-making-home-energy-efficiency-national-infrastructure
[4] http://www.almos.org.uk/document?id=6238
[5] http://www.ukgbc.org/press-centre/press-releases/energy-efficiency-must-be-national-infrastructure-priority-urges-uk-gbc
[6] http://www.housingexcellence.co.uk/green-stories/sweett-group-analysis-reveals-its-getting-cheaper-build-zero-carbon-homes

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Energy efficiency in homes

Energy efficiency can be the most cost-effective and quickest way to reduce carbon emissions and meet the challenge of increasing energy prices however, the public sector needs to do much more to take advantage of these benefits. Despite considerable effort through government funded schemes, typical homes in GB could still be saving a lot more. It is estimated that a minimum 10% saving on both electricity and gas could be achieved through further simple and cost effective energy saving measures, i.e. measures that save energy and money. That is equivalent to £2.5 billion per year of unnecessary energy consumption. Utilita believes that consumers are not making these savings because they do not have easy access to the right information and do not have the right incentives. Utilita believe that offering solutions to help customers monitor and save on their energy usage is a key way to help reduce this spending.

Utilita Energy is the leading supplier of prepayment gas and electricity in the UK, focusing solely on the needs of the prepayment market. Issuing free smart metering technology to every customer with built-in features such as Emergency and Friendly Credit supported by remote top-up facilities, allows people to monitor and top-up their energy at the touch of a button, ultimately giving them the tools to stay in control of their energy usage.

Despite the rise in energy prices, Utilita recognise the need to keep things affordable, as proven in the service we already deliver to over 140,000 customers. We pride ourselves on being an alternative pre-pay option to the 'Big Six'. Utilita are passionate and determined to make the pre-payment energy sector fairer and more accessible and feel that further collaboration with the government would be an important step toward achieving this.

A major determiner within the public sector, and potentially responsible for the lack of recognisable savings demonstrated, is a lack of knowledge or understanding around current energy usage and the role smart metering can play, not only in changing energy behaviours, but also in the provision of data which identifies areas where cost savings can be best applied. Through Utilita's relationships with Housing Associations and Local Authorities, we are helping to change this with the availability of usage data and the application of energy saving support to residents, delivered via workshops and on an individual level.

Smart metering will potentially transform householder's understanding of their energy consumption creating new opportunities for better home energy management and engagement with the energy markets. Government conservatively estimates that SMETS[1] compliant meters which include the 'In' Home Display (IHD), will stimulate behaviour change resulting in sustained energy savings of between 2-3% but other estimates are much higher[2]. But smart meters will possibly have their most significant impacts in providing the near real-time and

historic feedback that allow the effects of installation of measures and implementation of energy advice to be quantified and visualised. Here smart meters can open up flows of information to householders, scheme designers, installers and others such as energy advisors that can underpin energy efficiency and sustainable energy schemes, thereby encouraging further energy and carbon savings and other social and economic benefits. The results of the national trials of smart meters overseen by Ofgem known as the Energy Demand Research Project (EDRP) clearly describe how this feedback was influential for householders when presented in conjunction with particular measures. Utilita want to further strengthen engagement with public sector companies and work in conjunction with the government to support this.

We're extremely eager to do our part in raising awareness, though campaigns and marketing launches, and have a proven track record in helping customers on lower incomes; ensuring our energy is obtainable and affordable. Utilita are proud to be the first energy supplier to cater solely for the prepayment market, developing user-friendly ways to enable control for our customers. Taking this unique approach to energy means a tighter control on client expenditure and helps our customers to dictate on their own usage. It's because of this we recognise the importance of working in partnership with public sector organisations for a multitude of reasons.

The smart meter rollout will see every household in the UK installed with smart metering technology by 2020, but it is important that we do not forget those wanting a prepayment energy service and the positive impact this could have on public sector spending. It is often the case that social housing residents are penalised for using prepayment meters set at a far higher cost than those who have the choice to pay via a monthly or quarterly direct debit plan for their energy usage. Over the last 10 years Utilita have partnered with a number of housing associations and community organisations, installing their residents with advanced smart metering technology set at the most competitive prepayment rate against the 'Big Six'. This experience sets us apart as one of the most responsive prepayment energy suppliers supporting communities across the UK today.

There are about 4.1million households (approximately 16% of the UK population) currently using prepayment meters, which are costing them more than paying via a direct debit service. Although the difference has decreased in recent years, these customers still pay on average around £105 more per year for their electricity and/or gas. A prepayment energy service doesn't fit most supplier models and it's these customers who pay the price.

A customer of Utilita's for just over 7 years recently said: "When you know what you're going to spend, you can budget. We see what money we have for the week, sort out the gas and electric, few other things, then work out what we have spare…"

Allowing customers, especially those on the breadline, to take control of their energy usage is at the heart of what Utilita offer. We recognise the importance people put on feeling in control and work hard not to forget that. No one likes large energy bills landing on their door mat or feeling that their energy usage is spiralling out of control – suppliers may know the score but deciphering bills a month after energy has been used puts many customers on the back foot. Opting for a prepayment energy service is becoming more acceptable in today's market, attracting a more energy conscious and savvy customer fed up of receiving regular, overestimated energy bills. The greatest way of reducing energy costs is to encourage people to use their energy efficiently and it's our job to ensure those wanting a prepayment energy service, are equipped with the right tools to do just that.

1 SMETS2: the Smart Meter Equipment Technical Specifications:

2 These are the figures used in the government's impact assessments. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/276656/smart_meter_roll_out_for_the_domestic_and_small_and_medium_and_non_domestic_sectors.pdf

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Investing in greener neighbourhoods

Steve Cole, Project Co-ordinator for the Neighbourhoods Green Partnership at the National Housing Federation highlights the importance of investing in the long term sustainability of communities...

If you've recently had an energy bill, you might be surprised to learn that in the UK we have low energy prices. You might be more surprised to learn that in many ways this is a bad thing. Historically low energy prices have meant the UK has little perceived need to invest in energy efficiency. Compared to our European cousins, our housing stock, which accounts for nearly 30% of the country's energy use, is highly inefficient.

As a result, in the UK, the sixth richest country in the world, 2.28 million homes are in fuel poverty [1]. That's one in 10 households that struggle to heat their home. Why? And, what can be done?

Housing Associations, as social enterprises who invest in the long term sustainability of communities are playing a crucial role in creating greener neighbourhoods. Working in partnership with Housing Europe to deliver the Powerhouse Nearly Zero Energy Challenge [2], one of the key things we've learned at the National Housing Federation is that with 70% of Europe's 2050 housing stock already built, any attempt to deliver energy efficiency must look at retrofit. However, individual homeowners do not represent a large enough market to develop retrofit technology at scale. Housing associations with their large stock portfolios, either individually or in partnership with other organisations, are best placed to make retrofit happen.

Whether it is it the Austrian government's substantial grant funding to ensure all new build is at the rigorous Passivhaus standard or the Dutch government's starter capital for Energiesprong, a radical energy efficient retrofit which uses energy performance contracts as tradable commodities to fund improvements, the right sort of financial support is crucial. That's why we're calling for the next government to create a Housing and Infrastructure Bank. Not just to increase the level of public and private investment in housing but to ensure that there are reliable, funding streams which target strategic outcomes (rather than the whim of the government of the day) to deliver energy efficient new buildings and retrofit those which already exist.

Where the business conditions are right, great work is already taking place. We want to ensure this happens more often and at a lower cost. For example, Alliance Homes [3] have procured the UK's largest Social Housing renewables contract. Worth up to £600m and with the capacity to deliver photovoltaics to 75,000 homes across the South West of England, the programme not only helps to take residents out of fuel poverty through localised generation, it reduces the carbon footprint of the housing stock and generates much needed revenue to fund future energy efficiency investment programmes. Wouldn't it be great if we had the housing investment bank to support such role outs across the country?

When we think about greener neighbourhoods, we tend to think about energy but it is by far from the only area. Housing associations are significant landowners, in many cases they maintain more land than local authority parks departments. From shading in summer to grey water recycling, integrated landscaping plays an important role not just in energy and resource efficiency but in creating, or recreating, places in which people want to live and in which it is healthy to do so.

While the traditional image of a social housing landscape may be more Cell Block than South Downs National Park housing associations are increasingly delivering great places to live with great green spaces. Take Peabody's Islington Estate where the landscape of 173 Grade II listed homes was retrofitted with a new rainwater garden to minimise surface water flooding, provide a great new green space for residents and deliver a Social Return on Investment of 1.95 (higher than HS2 [4]). While the Lottery funded Active Neighbourhoods [5] project Sanctuary, Midland Heart and WM Housing Group are currently running in Birmingham, and are looking at ways residents can take ownership of and maximise the health opportunities of their green space.

That, for me, is the crux of the relationship between housing associations and greener neighbourhoods. There's a great quote by Ralf Protz of Kompetenzzentrum in Berlin: "I sometimes have the impression that low energy housing engineers feel that people should stay outside, so that they do not interfere with the perfect energy-efficient house they have created." All too often green neighbourhoods struggle because the neighbourhood is forgotten.

Housing associations understand that this is not about an adversarial relationship but a complementary one. If places truly are neighbourhoods then all of the green systems, be they energy saving or urban agriculture [6] work to their maximum potential. People are the thing that can make or break these changes and housing associations are the perfectly placed organisations to join the green with the neighbourhood. ■

[1] http://www.independent.co.uk/news/uk/politics/228m-british-households-now-living-in-fuel-poverty-9532501.html

[2] http://www.powerhouseeurope.eu/

[3] http://www.alliancehomes.org.uk/main.cfm?type=ENERGYEFFICIENCYFO1

[4] http://b.3cdn.net/nefoundation/797749042e390fcfd1_sym6b94y9.pdf

[5] http://www.neighbourhoodsgreen.org.uk/about/birmingham

[6] http://www.neighbourhoodsgreen.org.uk/resources/FoodGrowing

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Planning for the risks

Edward Rees, Business Development for eShare, looks at why housing association boards are looking at software to help improve governance and keep informed on risk.

No two housing associations are the same. Some are registered charities whilst others are not. They are often private organisations but, in the eyes of EU regulations, should be recognised as a public entity for procurement purposes. As a legal entity, they might be considered a company, a trust, a co-operative, or an industrial and provident society. What unites them is their goal – to provide affordable housing and deal with the challenges facing local communities.

It is therefore a highly diverse board who have the responsibility to make sure the money invested, often from the public purse, goes to achieving this goal. The make-up of the board is likely to include representatives from the local government, members of community groups, business people, politicians, and residents. Many board members are volunteers, but some, particularly in larger housing associations, are paid non-executives. Such a range of people mean it is crucial information is equally accessible for all.

In the case of the Cosmopolitan Housing Group, cash flow problems related to the development programme, led to the group being brought to the brink of insolvency. The lack of a proactive approach in obtaining, storing, and reviewing the relevant information on the financial risks seem to have been the main cause of the catastrophe. Yet, Cosmopolitan was not the first housing association to suffer from an ambitious development plan, which failed due to weak governance and management. In 2007, Ujima Housing Association experienced insolvency for similar reasons.

To prevent this happening again, The Homes and Communities Agency made several suggestions and assessing risk has moved up the agenda. The specific recommendations include: many references to the board being aware of the risks, obtaining the advice of expert independent advisors, and keeping aware of the activities of subsidiary groups.

Boards need to re-evaluate their communication practices and access to information – especially that which builds the risk profile of the housing association. Risk registers are a key example of complex documents written and displayed for risk experts, but with the right software, they can be displayed more conveniently for boards.

The National Federation of Housing is a perfect example of a board adopting the appropriate software for managing their governance activities. Stephen Bull, Head of Governance and Company Secretary at the National Housing Federation stated: “As the trade body for housing we want to be seen to be embracing the latest technology and leading the way for other boards. We want to set an example that all housing association boards can follow.”

The National Housing Federation use BoardPacks software for their leadership team and audit and risk committee. It is a system based on the secure backdrop of some of Microsoft’s well-tested architecture, but accessible to board members through either a web browser or their choice of tablet.

The apps do not require previous technological knowledge and provide the framework for timely access to vital information. As housing associations are put under increasing pressure to recognise and plan for the risks they take, putting the appropriate software in place has never been an easier decision.

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The challenge and opportunity of ending cold homes

Fuel poverty affects millions of vulnerable people in the UK. Here Chiara Vitali, Parliamentary Campaigner at the Association for the Conservation of Energy discusses the contributing factors to the crisis...

Millions of people this winter will once again face a stark choice between living in a dangerously cold home and spending more than they can afford on energy bills. Many families will spend the coldest months living in one room inside their home, unable to heat the rest. People will be forced into debt to keep their home warm, or have to choose between putting money in the energy meter or food on the table.

Fuel poverty affects millions of the most vulnerable people in the UK – damaging their health and quality of life. As energy prices continue to rise, the crisis deepens.

One of the contributing factors to this crisis – the price of energy – has been the subject of heated discussion over the past year with the main political parties variously promising price freezes, energy market regulation and cuts in energy bill levies. Conspicuously absent from the majority of political debate, however, is a clear recognition of the main cause of the high levels of fuel poverty found in this country – the poor energy efficiency of our aging housing stock means a vast amount of energy is required to heat our homes.

Homes with modern levels of energy efficiency require far less energy to stay warm – as seen in countries such as Sweden where, despite a harsh climate and higher energy prices, fuel poverty levels remain much lower than in the UK. Bringing homes up to a modern standard – energy performance certificate band C or above – is the only long-term solution to fuel poverty.

Recent weeks have seen some welcome developments as voices in mainstream politics begin to publicly recognise the poor energy efficiency of our homes as the driving cause of the energy bill crisis facing the country. Some political parties have even made pledges ahead of the election to make energy efficiency a national infrastructure priority and launch a national programme of energy efficiency retrofits.

"Fuel poverty affects millions of the most vulnerable people in the UK - damaging their health and quality of life. As energy prices continue to rise, the crisis deepens."

These are all positive steps. However, we must go further. At the current rate of improvement people could be left living in dangerously cold homes for up to 45 years. Designating energy efficiency as an infrastructure priority and allocating additional resources to provide full-house retrofits could bring the homes of all those at risk of fuel poverty up to a modern standard of band C by 2025.

While this is an ambitious target, it is achievable with the right approach. Local authorities, with their detailed knowledge of the housing stock, are well placed to play a much greater role in delivering an enhanced fuel poverty programme. An area-based approach focusing on low-income areas will allow efficient and targeted delivery. The most crucial factor, however, is the level of ambition and appropriate resources to ensure that targets are delivered. Allocating a tiny fraction of the infrastructure budget to a retrofit programme could boost current rates of improvement and make ending cold homes in 10 years entirely achievable.

The case for raising our ambition is unarguable on many levels. Cold homes cost thousands of lives each year and cause misery for millions of households. Age UK estimates that treating cold home-related illnesses costs the NHS over £1bn per year. But beside the cost of inaction, the opportunity presented by rising to the challenge is great. Investment in energy efficiency is a powerful way to boost economic growth. New

modelling shows that making a major energy efficiency programme an infrastructure priority would bring a high return on investment, cut carbon emissions and create hundreds of thousands of jobs all over the country. It is time to seize the opportunity to end cold homes. ■

Chiara Vitali
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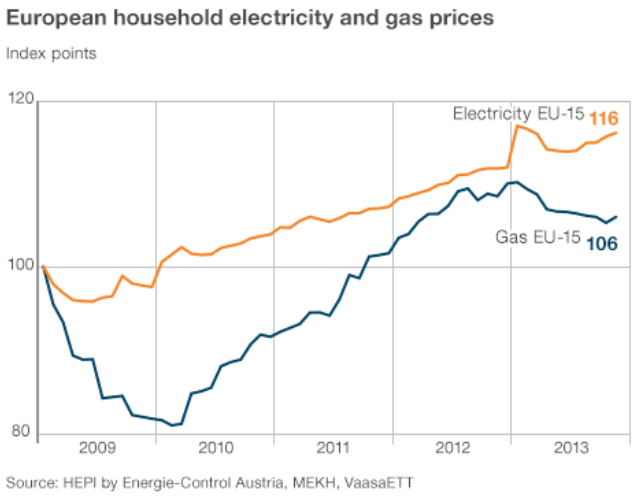
Reduce your energy costs by up to 18%

Have you noticed that every time you pick up a newspaper there's an article about how energy prices are increasing yet again? Every month thousands of householders over Europe are becoming more energy smart in order to combat this trend and they are doing it by arming themselves with home energy monitoring devices that are helping them to save 18% on their bills.

What are the benefits of energy monitoring?
The average energy bill in Europe has risen around 20% over the last 2 years, and energy devices like ours can help the householder recoup this cost by saving on average 18% a year for the home.



Here's the interesting part, the devices themselves are passive and don't automatically save any energy. The devices display the real time energy consumption of the home in a way that's convenient to the user and this constant reminder and checking by the user makes them more aware and more likely to change their behavior in a positive way that encourages them to save.

What are the different technologies?
There are a few different ways for consumers to view their energy consumption and choosing the right solution can make a difference to the amount they save. The right product depends on the way the consumers want to see their energy reports. There are basically 3 different ways to view home energy consumption

In-home energy displays (IHD's)

In-home Displays (IHD's) do exactly what they say, they sit inside the home and show the homeowner their energy consumption. Home owners will place the display in easily viewable places within the home, some choose the kitchen or their coffee table or even their bedside table. Having this device around the house makes it a constant reminder for the user. Our elite In-home display is the world's biggest selling display of its kind and has been adopted by government energy saving projects around the world with much success.

Did you know?
In the biggest government energy saving project of it's kind, over 340,000 IHD's were use to save the average home in Queensland Australia an average of £220 (€277). Click here for more details.

Online energy platforms and apps

More and more homeowners want to be able to check their energy use remotely or while on the go. The engage online platform and app give people the chance to view their consumption in real time from their smart phone, laptop, PC or tablet. Users can also view a history of their usage, the cost so far (day/week/month) and also how they are performing against a preset budget amount.

Watch the engage video here

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Individual appliance monitor and control

This is the latest in energy monitoring. It's now possible for homeowners to monitor and control individual appliances in their home through a smart phone app. Not only does this allow the user to see how separate appliances are performing it also give them the ability to switch the device on and off from an app. The ego app also allows its user to set timers and automatically shut down appliance that have been on standby for too long.

Watch the ego video here

Summary

As you can see there are different options to suit each type of consumer's application and lifestyle, but the most important thing is that these devices give the most useful information to the user in the simplest way. This encourages the user to become engaged in their own energy use and change their habits. After a while of using these devices this behavioral becomes intuitive.

Independent reviews and surveys have shown that by adopting this type of technology the average saving home in the UK saves around 18% on their electricity bill*. This works out at an average saving of £120 a year.

*Based on Ofgem figures of £667 average Electricity bill

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Helping people to monitor, reduce and save

About efergy

Efergy is a global manufacturer of energy monitoring systems utilising a variety of technologies including current transformer sensors, infra-red sensors and Advanced Metering Infrastructure. The name derives from 'efficient energy' and our goal is to help you to reduce your energy use, save money and save the environment.

Action for warm homes

Jenny Saunders, Chief Executive of National Energy Action discusses the importance of energy efficiency to reduce fuel poverty...

With winter approaching it is likely that fuel poverty, or more generally the issue of energy unaffordability and its impact on the health and wellbeing of the poor and elderly, will once again feature heavily in the news headlines. Around 2.5 million households in England (around 10%) are still classed as living in fuel poverty, and unable to afford to heat their homes, despite years of campaigning by National Energy Action and a government commitment 14 years ago to eradicate the problem by 2016.

Fuel poverty is caused by 3 factors – poor quality energy inefficient housing, low incomes, and high energy prices. Of these 3, the popular narrative tends to focus almost exclusively on energy prices, however improving the energy efficiency of our housing stock is by far the most effective way to tackle the problem in a long term and sustainable way. Government surveys show that 35% of households living in the least energy efficient properties live in fuel poverty compared to only 2% in the most efficient; that 65% of fuel poor households live in properties with Energy Performance Ratings of E, F, or G (on a scale of A-G), lacking adequate insulation and efficient heating systems.

There is also a strong correlation between fuel poverty and general poverty, and capping energy prices and mandating rebates on fuel bills for those in the lowest 3 income deciles can bring some relief, but improving the energy efficiency of their homes could save them hundreds of pounds every year, making them more resilient to anticipated future price rises.

For over 30 years NEA has promoted the benefits of energy efficiency, increasing understanding amongst policy makers and building capacity in communities and companies. Last year we assisted 27,000 low-income households – working through our Warm Zone subsidiary company and with project partners we provided insulation, heating, energy advice and

Jenny Saunders, Chief Executive, National Energy Action

income maximisation services. We supported 10,000 stakeholders to improve advice and services for their clients, and trained 2852 front-line advisors working with vulnerable people. Our experience, and the evidence that we have gathered through research and evaluation, has demonstrated that whilst improving energy efficiency is the most effective way to tackle fuel poverty, it also offers much wider benefits to society – releasing additional money into the local economy that would have been wasted on energy; enhancing streetscapes, and reducing the burden on over-burdened health services.

At a political level this has been recognised, however resources to tackle domestic energy efficiency have been inadequate. Whilst 2 million low-income households benefited from heating and insulation measures funded directly from the Treasury via the Warm Front scheme, the government's approach to funding these measures since 2011 has been via obligations placed on energy supply companies (ECO). This market mechanism has not been entirely successful in reaching the most vulnerable and a mid term policy review caused a hiatus in delivery and disruption in the supply chain.

We are now at something of a crossroads. The government has recently reasserted its commitment to tackling fuel poverty, this time with a new statutory target for England to ensure that as many fuel poor homes 'as is reasonable practicable' achieve a minimum energy efficiency standard of band C by 2030, with interim targets of Band E by 2020 and Band D by 2025. This is supported by a new fuel poverty strategy for England which is currently under consultation, presenting the most significant opportunity in a decade to influence the future direction of fuel poverty policy in England. However, whilst NEA agrees with the overall aspiration, to reach it will require enhanced and coordinated action and additional resources. Central to the success of the strategy will be the provision of a sustainable, long-term, Treasury-funded energy efficiency infrastructure programme that is better targeted to meet the needs of fuel poor households and will ensure that help is directed to those who need it the most via locally led partnerships. We are urging the government to act on NEA recommendations which will ensure that by 2025 95% of households currently affected by fuel poverty will have affordable warmth and that future generations will not have to endure the misery of living in cold, damp homes.

National Energy Action (NEA) is a national charity which campaigns for greater investment in energy efficiency to help those who are poor and vulnerable, and deliver advice and services to eradicate fuel poverty. ■

NEA
Action for Warm Homes

Jenny Saunders
Chief Executive
National Energy Action
www.nea.org.uk

An ambitious Danish strategy for energy efficiency in buildings

Rasmus Helveg Petersen, Danish Minister for Climate, Energy and Building details how ambitious goals are helping to reduce energy consumption and create an energy efficient nation...

As much as 40% of the overall Danish energy consumption is used for heating, light and ventilation in buildings. As a result energy efficiency in buildings plays a significant role in our climate and energy policy. And, as a consequence the Danish government launched an ambitious and comprehensive Strategy for Energy Renovation of Existing Building-stock in May 2014.

The strategy is the largest ever undertaken to reduce energy consumption in existing buildings in Denmark. It contains 21 initiatives, is based on comprehensive analysis, and targets both specific building segments such as single family dwellings and multi-apartment blocks as well as office and public buildings.

The strategy is the result of a collaborative network process involving key stakeholders within building renovation. I am convinced that this co-creation of the strategy will prove to be the key to a successful implementation. When carried out, the initiatives are estimated to reduce the present net energy consumption for heating and domestic hot water in the existing buildings stock by 35% in 2050.

A strategy which covers many areas

With the strategy we cover a wide range of issues. The strategy provides a strategic framework for making the energy performance certificates more reliable, giving them a more obvious link to energy renovation. It includes an upgrade of the energy requirements for buildings and building parts, a strengthening of information activities, and an enhancement of data availability. A number of initiatives target training, education and innovation. And finally, the strategy addresses issues like financing and better compliance.

The implementation has already begun for a number of the 21 initiatives. Let me give 2 examples:

In October 2014 "Better Housing – better savings" was rolled out on a national scale. "Better Housing – better savings" takes energy efficiency and energy savings right into our homes. A number of trained Better Housing counsellors help homeowners with all the aspects of an energy renovation: a mapping of the home's energy status, an overview of potential solutions, a budget to bring for financing discussions with the bank, and last but not least, an offer to help coordinate and execute the renovation.

Another example is the energy labelling scheme. This has been upgraded to create a greater incentive for renovations and is now aiming more directly at increasing energy efficiency. Potential property buyers can now go directly from online house adverts to the specific digital energy label. Energy efficiency has become a selling point, and the digital energy label offers a quick overview of a building's overall economic profile.

With the energy renovation strategy we send an important signal to both building owners and construction industries. And I hope that everybody will use these measures as the basis for long-term commitments and investments in new energy solutions.

We have a tradition for ambition

One of the success stories in the Danish building regulation has been the stepwise tightening of the

Rasmus Helveg Petersen
Minister for Climate, Energy and Building

building requirements. Over the years energy efficiency has come to play a bigger part in the requirements. Step by step we have successfully increased our ambitions. As one of the new initiatives we propose to upgrade the energy requirements for windows and other elements which make up the building's environmental footprint.

Furthermore, leading by example, the Danish government has committed to reduce the energy consumption in state-owned buildings by 14% by 2020 with 2006 as base year. This initiative will ensure implementation of the EU Energy Efficiency Directive. The initiative is a continuation of a long term Danish effort (since 2006) to reduce the energy consumption in buildings used by the government.

A continuously ambitious energy policy

The Danish government has a clear goal to have a society based on 100% renewable energy in 2050. This may be perceived as ambitious, but in fact the goal is a logical consequence of an energy policy which is about both climate and economy.

On November 7th the Danish government presented a policy-based strategy for the building sector as a whole, aiming to create growth, productivity, employment and sustainability. My hope is that we in the years to come will see the blooming of the initiatives from both this strategy and the strategy for energy renovation.

Danish energy policy has required courage and investment, but it has in turn reaped many benefits, both environmentally and economically. Danish companies in general have a competitive advantage. They have the important knowhow, and they use less energy than their foreign competitors.

So, I see no reason not to continue having ambitious goals. We will all benefit from it – and more importantly, our climate, our welfare and our future depend on it. ■

Rasmus Helveg Petersen
Minister for Climate, Energy and Building – Denmark
www.kebmin.dk/en

Catalysing a sustainable energy future

Europe wants to mitigate climate change and promote renewable energy. What will it take? Chemistry!

After lengthy debating the European Union recently sharpened its targets for CO_2 reductions, and raised its ambitions on renewable energy. The new goals can be reached – but only with further advances in the chemistry behind some of the most promising energy and carbon capture technologies. At DTU Chemistry we are very much aware of this fact.

For a decade now, our department at the Technical University of Denmark (DTU) has had a Center for Sustainable Chemistry. The department and its researchers have taken out a dozen patents. Most of them are within catalysis. Catalysts enable processes to be carried out under industrially feasible conditions of pressure and temperature.

For instance, the strong emphasis on biomass as a renewable energy source in Denmark and a number of other European countries can only be successful through improved efficiency. Not only do we need to take out more energy from each ton of biomass, we also need to deal with environmental issues. In other words we need to ensure, that solving a climate related problem does not create an environmental one instead in the form of harmful smoke or unwanted waste products.

Young talented scientists are the primary driver for transforming science into innovation. The program entitled International Master in Advanced and Applied Chemistry attract some of the best brains in the field form a range of countries

From patent to innovation

Innovations at DTU Chemistry address both the energy efficiency side and the environmental side of biomass utilisation. Similarly, a number of the techniques invented here are relevant for Carbon Capture and Storage (CCS). The developments happen in a cross disciplinary effort by our catalyst groups, and the Center for Energy Resources Engineering (CERE).

CCS has a strong role in the EU efforts on climate change mitigation. A number of international reports by the International Energy Agency and other authoritative sources have stated that CCS is a necessary measure, as a large proportion of the world's energy supply will continue to come from coal and other carbohydrate sources for at least several decades.

A high number of patents do not in itself guarantee implementations that will benefit companies, solve energy challenges, and contribute to the development of society. At DTU Chemistry we are highly conscious of the need to encourage innovation actively. Depending on circumstances this can either be in the form of spin-out companies, or cooperation with existing companies.

Professor Erling Stenby,
Head of Department, DTU Chemistry

International Master Program attracts

Young talented scientists are the primary driver for transforming science into innovation. Not only do they contribute strongly to the scientific advances, they are also typically highly motivated when it comes to putting the scientific ideas into practice.

Therefore, our department has established a program entitled International Master in Advanced and Applied Chemistry. For a series of years now, the program has attracted some of the best brains in the field form a range of countries.

Fortunately for us, a large proportion of our international candidates choose to continue their career with us, typically as PhD students.

We cannot take all credit ourselves. We do benefit from the fact that the Danish PhD system offers much better conditions for young researchers, especially in terms of salaries, but also regarding laboratory facilities, status etc. compared with the international average.

Informal contacts aid innovation and careers

At DTU Chemistry we are able to enroll approximately 25 new PhD students annually. We note with great satisfaction that a steadily increasing part of these new projects are financed from sources outside DTU. Public funds, private businesses and private foundations all take growing interest in our department. This aids us in carrying out excellent research and proving top level training to our students.

Just held for the 5th time in a row, the annual DTU Chemistry PhD symposium is where our PhD students present their projects to colleagues and a growing number of external participants.

Besides actual knowledge sharing events such as the PhD symposium will form the basis for informal contacts which – as we know – are often the best starting points for future joint projects, either based on science, business or a combination of both. For some years now, the department has held a high level of patenting, and I am pleased to see that a growing number of inventions are taken into industrial use. Some times this is done in cooperation with existing industry, while at other occasions spin-outs are created.

The top choice within the natural sciences

This activity has not passed unnoticed by our surroundings. For instance, our staff has achieved high "hit rates" on prestigious grants such as the Sapere Aude program from The Danish Council for Independent Research. The program is geared for allowing extraordinary talents a fast-track, and much in the spirit of the program a number of our younger scientists have established themselves and their groups at the international scene over a short span of years.

Much like the success of high profile athletes will spur interest from kids and youngsters, so do excellent young scientists function as role models. This year more than 200 students began a chemistry related education at DTU. For a series of years now, DTU Chemistry has not only kept on breaking its own records in attracting applicants but also conquered the title as the top priority for students of engineering and natural sciences in Denmark.

The growth in activity will soon become physically visible. In a years' time, we will be able to inaugurate a new building at the DTU Campus. This will not just be a highly needed extension of our existing office and laboratory space, but also take us a giant step up when it comes to state-of-the art equipment and standards for environmental and work environment conditions.

Technical University of Denmark DTU

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ELECTRIC POWER FOR THE FUTURE

At the Norwegian University of Science and Technology

The Department of Electric Power Engineering is among the international leaders for teaching and research within its field. Strong-point areas include energy technology, energy consumption and energy planning.

The Department contributes to research and teaching at graduate (Master's) and doctoral (PhD) levels within its field. As a result, it makes a significant contribution to developing new methods and new technology for efficient and environmentally friendly energy systems.

The Department has a key role in the development of the interdisciplinary Energy and Environment engineering programme at the Norwegian University of Science and Technology. The Department with partners have made this into a high quality professional programme that is tailored to the needs of Norwegian energy utilities and industry.

A major research objective is the further development of environmentally friendly electrical energy technology.

The Department has a range of up-grading and post-graduate courses that cover the key disciplines. These courses are used for systematic staff updating by both energy supply companies and industry.

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Reducing energy costs while cutting emissions

Gregor Paterson-Jones, Managing Director of Energy Efficiency at the UK Green Investment Bank gives an overview of how investing in energy efficiency can help reduce costs as well as carbon emissions...

It's hard to believe that the Green Investment Bank has only been in existence for 2 years. In that time, we have backed almost 40 new projects which will mobilise up to £5bn into the UK's green economy.

More importantly, all of these projects will be profitable. Once built, they will generate an annual net profit of between £10m to £15m for taxpayers.

Delivering a UK wide impact, we have financed vital new infrastructure, activated private capital and we are innovating so others can follow.

These themes might well be our key messages, however, the last one of innovating so others can follow is perhaps more applicable when it comes to reducing costs for public services.

We are leading the way in financing ground breaking technologies, helping to create new markets and building inventive financial products on fully commercial terms.

Let me give you 3 examples from the last 2 years, at Westernmost Rough in Yorkshire, we are backing pioneering new offshore wind technology and in London, with TEG Biogas, we are turning the capitals' waste into renewable electricity.

Lastly, in Glasgow, we used our Green Loan to help the city make the switch to low energy street lighting with the cost of repayments covered by their energy savings.

We are working hard to replicate this across the UK as lighting our streets can account for as much as 30% of a local authority's energy consumption.

Adding new technology to older infrastructure is one of the best ways of reducing energy consumption and saving money in the public sector. We can help with building retrofits, onsite generation, industrial processes and infrastructure.

Retrofitting technologies, such as LED lighting, heat exchangers and smart metering, could save UK businesses £3bn to £5bn a year, according to the Carbon Trust, the energy saving advisory body.

This could easily be replicated in the public sector. One of our priority sectors for investment is public sector energy efficiency, especially in the NHS and local authorities where we have a track record of activity.

We have developed an innovative offering with the Green Loan and the Health Sector Energy Efficiency Programme. It allows us to use the full spectrum of financing across debt and equity with the ability to fund long-term projects.

Our experience with Glasgow City Council Green Loan shows local authorities can retrofit their streetlights with LEDs, and using the savings to repay the capital and interest used to finance them, and in certain cases structured with cash left over from day one.

In September, we concluded a deal with De Lage Landen (DLL) to announce a new £50m funding alliance focused on NHS energy efficiency projects.

The first project funded by the alliance is a £7.5m investment into Queen's Medical Centre in Nottingham, part of Nottingham University Hospitals NHS Trust, where £7.5m is being invested to finance the installation of a suite of energy production and reduction measures.

Continued on page 88...

BioBoost

Biomass based energy intermediates boosting biofuel production

Converting residual biomass into high energy density intermediate energy carriers for heat, electrical power, transportation fuels and chemicals production is the aim of the collaborative EU-project BioBoost (Biomass based energy intermediates boosting biofuel production).

BioBoost investigates three promising conversion pathways for several residual biomass feedstocks which are converted by fast pyrolysis, catalytic pyrolysis or hydrothermal carbonisation to intermediate energy carriers for subsequent use in different applications.

The applicability of the different energy carriers is investigated in existing and upcoming applications. For environmental and economic assessment of the overall value chains, a heuristic transportation model on biomass and bioenergy carrier transportation is being developed and integrated.

The collaborative BioBoost project is coordinated by the Karlsruhe Institute of Technology (KIT) and is funded by the 7 Framework programme of the European Union under grant agreement 282873.

www.bioboost.eu

Gregor Paterson-Jones, Managing Director of Energy Efficiency UK Green Investment Bank

Continued from page 86...

The project has been developed under the Carbon and Energy Fund (CEF) framework and it will be delivered by the energy services company, Interserve.

As with previous NHS energy efficiency projects, the Trusts and Health Boards that will benefit from the new funding won't need to find the capital upfront. The money saved by reducing their energy bills more than covers the cost of the repayments.

GIB estimates that energy efficiency measures could, across the UK, cut the NHS's current £750m energy bill by up to 20%, saving £150m each year.

Investing in energy efficiency isn't just about cost savings and environmental benefits. Investment in energy efficiency could provide the NHS with more reliable and resilient systems that would significantly reduce costs and operating risks.

Energy efficiency technologies can also be used to improve industrial processes such as pumps, refrigeration and heating, motors and how we use water. They can be used to generate heat and electricity on-site, often using renewable fuel sources. And small changes like a switch to low-energy lighting can add up quickly. We recently helped NCP to change all the light bulbs in their 149 car parks to low energy, saving themselves 65% on their energy bill.

We don't have to look far for examples of good practice like these. And it doesn't have to be large multi-national companies.

We recently helped Bernard Matthews install 179 renewable energy boilers in their turkey farms, helping them towards their target of sustainably generating 100% of their own energy. In the whisky industry we are working with a number of distilleries, helping them lower their costs and reduce their risks. Our first project at Tomatin distillery, just south of Inverness, cut the cost and carbon emissions of producing the single malt that's exported to 40 countries.

As we celebrate our 2-year anniversary, we closed a further round of deals in the energy efficiency market. The first was in the financial sector, a new area for us. Global banking group Citi put in place innovative energy efficiency measures to cut their energy use by 10% at its London data centre with energy efficient cooling units and efficiency improvements to the building's air conditioning system.

I hope these examples have given you the impression that energy efficiency is an option for everyone. Whether you are running an organisation that's big or small I'm confident that we can help you save money, modernise your systems and improve your environmental performance. We stand ready to back these types of projects and can do it in a way that means you do not have any up-front costs with payments made from the savings in energy costs. ■

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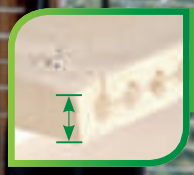

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The benefits of energy efficiency in public sector estates

Alexandra Hammond, Associate Director for Sustainability at Essentia, Guy's and St Thomas' NHS Foundation Trust details how sustainability programmes within the public sector can help reduce utility consumption and costs...

Addressing utility consumption, typically the second highest overhead cost to the public sector after staffing, presents an intriguing challenge; rather than losing valuable resources such as front-line staff through cutting costs, utility reductions benefit everyone. Reductions in energy, water and waste spend release finances to improve services, mitigate environmental harm, and even help suppliers to meet their government mandated obligations to improve utility efficiency [1]. It is one of the few cost pressures on the public sector whereby a cost reduction leads to greater organisational strength and flexibility.

Real and lasting reductions in utility use are possible and well worth pursuing. However, embedding the principles of sustainability in the organisation is not achieved by accident. For this to really work, it is critical that sustainability is fully integrated into business objectives.

Key to success is the development of strategic sustainability plans that are pragmatic and anticipate the future aims of the organisation. In the case of the NHS, the plans need to empower clinicians to take decisions to enhance sustainability aims, for example through offering reliable and peer-reviewed advice on alternative prescriptions for patients, such as powder inhalers, which have a lower environmental impact and deliver the same or better outcomes than the environmentally harmful alternative [2].

In order to succeed in making sustainability relevant to the organisation, sustainability plans need to be developed with and by the people who set the strategic direction of the organisation; the sustainability plan must align with and enhance these objectives, as well as focus on achieving high-level and wide-reaching buy-in to the implementation of the plan. People who will deliver the plan need to design it.

Alexandra Hammond, Associate Director Sustainability Essentia, Guy's and St Thomas' NHS Foundation Trust

Sustainability programmes are only as effective as their ability to adapt to the wider objectives of the business. For example, at Essentia, we are working with Guy's and St Thomas' NHS Foundation Trust to develop a portfolio of energy efficiency works that will ensure the Trust achieves its required carbon reduction targets and saves over £1 million each year, as well as improving collaboration across its £500 million capital development programme. Through the energy savings programme, the capital development team is empowered to ensure projects consider energy management, and works across projects to rationalise equipment and make sure the Trust estate can adapt to future service needs.

By putting together a strategic plan that delivers a range of projects, you can blend the "quick wins" with those that add value but perhaps do not have the necessary defined paybacks. Thus, you can achieve a programme of investment that delivers true and lasting value to the organisation. This is something that has been achieved at Barts Health NHS Trust through their energy performance contract, procured through Essentia's bespoke framework. An energy performance contract is a partnership with an energy savings company (ESCo) that enables an NHS trust to improve the energy efficiency of its buildings and facilities. The contract guarantees that the measures implemented by the ESCo will generate sufficient savings to pay for the projects, and all savings accrue to the trust. At Barts Health NHS Trust, the investment in building infrastructure to achieve utility savings has released funds that will be used to improve the lives of people in the local area. Fuel poverty will be addressed and significant investment will be made into the local economy to support the people who live and work in Barts' health catchments, which includes the London borough of Tower Hamlets, one of the most deprived boroughs in the United Kingdom.

What we've learned through our work at Guy's and St Thomas' and with other organisations, is that sustainability actions deliver financial, social and environmental value. Sustainability interventions complement and enhance the ambitions and vision of any organisation. Sustainability programmes must be core business. ■

[1] https://www.ofgem.gov.uk/environmental-programmes/energy-companies-obligation-eco

[2] http://sustainablehealthcare.org.uk/sustainable-respiratory-care/resources/2012/06/selected-topics-sustainable-copd-2012

Alexandra Hammond
Associate Director, Sustainability
Essentia, Guy's and St Thomas' NHS Foundation Trust
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Power to the people

Utility Networks (UN) – a division of the Energy and Utilities Alliance (EUA) looks at what is needed to keep the utility industry providing 'power to the people'...

The UK's energy network is in a cycle of transition. On one hand they have to address the challenge of maintaining a safe, reliable and efficient network, which will allow for future growth, while on the other hand they have to keep tariffs reasonable and fair without compromising the sustainability agenda. In terms of utility infrastructure the UK's isn't perfect; but the changes that have been overcome; in order to retain a robust and functional system are remarkable.

In order to appreciate this, you have to understand where the industry has come from and where it is today. Thirty years ago the landscape was somewhat different; we had an electricity industry that comprised of 12 regional boards responsible for local distribution, and the Central Electricity Generating Board. The gas industry also comprised of 12 regional boards throughout the UK.

Both of these industries were vertically integrated producers, transporters and suppliers of gas and electricity. There were 39 water authorities, 10 of which were state owned and 29 were in private ownership. In terms of utility supply, whether domestic or commercial, your geographic location determined your infrastructure provider. In effect it was a monopoly with no choice of provider or supplier.

In the present day the landscape has changed dramatically. Some will tell you it is a vast improvement whilst others will say it's a mess that is difficult to navigate through.

The electricity industry is now split across the country by 14 licensed distribution network operators (DNOs), and each is responsible for a regional distribution services area. The 14 DNOs are owned by 6 different groups, and are regional based around the board regions, and own and operate the distribution network of towers and cables that bring electricity from our national transmission network to homes and businesses. They don't sell electricity to consumers. This is done by the electricity suppliers.

In addition there are also a number of smaller networks owned and operated by Independent Network Operators (IDNOs). These are located within the areas covered by the DNOs.

Since the DNOs are natural monopolies, they are regulated by OFGEM to protect consumers from potential abuse of monopoly power. In order to be able to distribute electricity through the network, DNOs and IDNOs must hold a licence. The licences contain conditions which, among other things, limit the amount of revenue which these companies can recover from their customers.

Gas has a similar structure of 4 Gas Distribution Networks (GDNs), with split – not necessarily equally – assets. OFGEM have granted licenses in a similar manner to electricity, but these companies are called Independent Gas Transporters (IGTs) and as such can also construct anywhere in the country within the GDN's networks.

Water is not dissimilar; there are now 26 water authorities in the UK regulated by OFWAT. As a consumer, water supply and subsequent sewerage is by catchment area, and unlike electricity & gas there is no independent suppliers, unless you are a very large user or building a very large domestic development.

Now it becomes a little more complicated; but beneficial to the consumer. Over and above the DNO's, IDNO's, GDN's and IGT's we have some more choice for you. OFGEM and OFWAT have championed 'competition in connections' which for the consumer, domestic and commercial alike is driving prices for infrastructure down, or at least keeping them low.

We now also have Utility Connections Providers (UCPs) and a further acronym for their chosen activity as follows:

- National Electrical Registration Scheme (NERS)- 194;
- Gas Industry Registration Scheme (GIRS)- 97;
- Water Industry Registration Scheme (WIRS)- 91.

These schemes can be found at www.lloydsregister.co.uk

That is, I am sure you will agree an awful lot of competition (and acronyms). However it is a structure that reflects the age of competition and comparison websites we live in. But it is not without its flaws, particularly in electricity and water services, which are fragmented.

For example; electricity and water connection operatives face regional restrictions and differing qualification standards. Also the method used for quoting connections, be they for individual or multiple services can be confusing.

In the case of gas however, the industry is streets ahead, with streamlined processes and the ability for connection operatives to work anywhere in the UK. This model needs to be replicated across all utilities, and would require OFGEM, OFWAT and Lloyds, with Industry Advisory Panels to let all UCP's self-determine design, connection and commissioning of services & networks. The approach would require no upfront funding, as adequate finances are available, the regulators just need to use their powers to resolve unnecessary restrictions. The result would be more competitive prices for the customer.

However this is just one – albeit quite significant – piece of the utility architecture required to maintain a safe, reliable and efficient network. In addition to mobilising the market, the industry also needs to manage the supply and demand changes, which will accompany the transition to a low-carbon future – all the time keeping prices at levels customers and other stakeholders consider reasonable and fair.

In order to do this, the workforce needs to be in place. An estimated 50% of current employees are set to leave the energy and utility sectors and 200,000 new recruits will be needed by 2023. The government and energy and utility employers must 'take the bull by the horns' and continue to strengthen the UK's energy and utility workforce over the next 3 years.

The challenges facing energy networks in the near future are very real. Investment and efficiencies are needed, and the workforce must be attracted and maintained. To achieve this, the industry needs to work together. It must also communicate its key messages to government effectively, in order to secure an energy policy that will support the needs of the industry and the people it serves.

The role of Utility Networks is to facilitate the delivery of industry messages to the government. For membership enquiries contact Caroline Taylor – 01926 513762, caroline@eua.org.uk. ■

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Geothermal – the challenge for local, secure, clean, and stable energy

Geothermal energy is widely used throughout Europe, here Alexandra Latham from the European Geothermal Energy Council sheds light on how it could be a great alternative heat source...

European governments have made a long term commitment to decarbonisation with a target to reduce Green House Gas (GHG) emissions by 80-90% by 2050, compared to 1990 levels. To reach this goal would mean the decarbonisation of the electricity as well as the heating and cooling sectors.

So far, the debate has focused on the electricity sector, whilst the issue of heating and cooling, notably renewable heating and cooling, has remained in the shadows. This is despite the knowledge that 47% of the final energy consumed in Europe is used for heating and cooling our homes, businesses, and tertiary buildings, as well as industrial processes, and that around 75% of the gas we import is burned for heat (2/3 in households and 1/3 in industry). As fears about energy security grow and consumers tire of the volatile price of gas, policy makers need to look to more stable, sustainable and competitive ways to keep us warm. Geothermal energy, the energy stored as heat beneath the surface of solid earth, is one such option.

Geothermal energy can be divided into 2 categories, shallow and deep.

Shallow geothermal resources, coupled with a heat pump, provide heat to buildings and industry, and heat/cold storage. It is the most widely used form of geothermal energy, with a market in almost every region in Europe and about 1.3 geothermal million heat pumps installed today, according to the 2013/2014 EGEC Market report. The potential is, however, much larger. Low renovation rates and a lack of awareness of the holding back development of shallow geothermal.

Deep resources can be used to produce power or heat or both (in combined Heat and Power (CHP) plants). This kind of energy was historically developed in countries including Italy and Iceland, but the technology has developed quickly and there is now good potential in areas which have yet to be explored, including the UK.

Geothermal power plants are base load and despatchable and can vary their output according to system demands; for example, in CHP plants the share of power and heat generation can be adjusted. The flexibility geothermal provides is important: as the electrical grid increasingly comes under stress due to the integration of fluctuating energy sources such as wind and PV, geothermal can stabilise the grid.

The development of deep geothermal resources for district heating is becoming increasingly popular as local authorities look for ways to make their energy supplies local, competitive and reliable. There are at present 240 geothermal district heating systems with a total installed capacity of 1.1 GWth operating in 22 countries in Europe. The potential is growing as shallower and lower temperature resources are being developed at lower costs than ever before- today 25% of the European population lives in areas directly suitable for geothermal district heating, according to research by the geodh project (geodh.eu). We can

expect a boom in the next few years as more authorities begin to explore the potential in their areas and build the administrative frameworks necessary for development.

Both shallow and deep geothermal, and geothermal for power and for heat, can provide secure, reliable and flexible energy, but 5 key issues need to be addressed.

Increased awareness and more resource assessment

Geothermal Technology has progressed but many, from politicians and public authorities, to financial institutions and citizens, are unaware of the potential- particularly so if their area does not have a history of geothermal development. There needs to be more transparency about the costs of heat and the options available to consumers, and there must be better communication between installers, architects, planners and consumers.

A level playing field and a secure policy and market environment which enables long term investment

The energy market is at present distorted, which makes understanding real costs difficult. Although renewables are ready to replace fossil fuels, they remain subsidised and benefit from historical support, and without taxes on carbon and other emissions in non-ETS sectors, this replacement will be difficult.

In October, the European Commission published a report on costs and subsidies in for different power generation technologies in the Europe. It shows that in 2012, geothermal received only €70m in support, €20m of which came from the European level. In comparison, solar received €14.7bn, coal and onshore wind €10.1bn, nuclear €7bn, and natural gas € 5.2bn. In terms of historic R&D, geothermal was only allocated 0.8% of the total national and EU resources.

Whilst national governments need to carefully consider the way the heat market is controlled, sound policy is also needed at the European Level.

The removal of regulatory barriers, and simplified procedures for operators, developers and policy makers

Geothermal projects are often held back by complicated, insufficient and incomplete administrative procedures. Some existing systems need to be reconsidered, and in places where the geothermal resources have not historically been developed, systems need to be designed and established. The GeoDH project has recently completed an analysis of procedures in different EU member states, has made proposals for effective frameworks, and is currently offering training programmes for local authorities.

The development of innovative financial models

Geothermal projects are capital expensive and have a risk profile which does not fit well with traditional financing and insurance models. Specific enabling tools, for example specialised risk insurance for geothermal projects, need to be developed and financers should be trained to be able to understand the risks and benefits of large scale geothermal projects.

The mobilisation of existing funds, for example structural funds and EIB loans should be considered, and local authorities are encouraged by the Commission to investigate trans-national procurement.

Support for technicians and civil servants

In many cases, civil servants are not able to approve or support projects as they have not received sufficient technical training. This situation must improve, and regional authorities need to be able to implement specific programmes to facilitate the switch away from fossil fuels.

Fundamentally, geothermal for heating and cooling needs to be considered more seriously in order to make the necessary transition to a stable energy future, and the potential for geothermal needs to be better understood. A coordinated push is needed; whilst the industry is ready to provide solutions, policy makers at the regional, national and European levels need to put enabling measures in place. ■

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Silica and scaling problems in geothermal power plants

A possible profitable solution

Geothermal systems in Iceland

Iceland is a volcanic island straddling the Mid-Atlantic-Ridge, a mid-ocean-ridge where two major tectonic plates pull apart from each other. It is also sitting directly over a mantle plume – a localised upwelling of hot magma from the mantle. This unique geological setting makes the island particularly volcanically active with a large number of active volcanoes. This combination is also what makes Iceland the largest volcano island in the world with over 30 active volcano systems. In just the last 4 years there have been three volcano eruptions in three different volcano systems and one of these eruptions (Bardarbunga system) is still ongoing at the time of writing. Icelandic volcanoes have accounted for a third of the total global lava output in the last half millennia.

Geothermal activity is a phenomenon that is closely associated with active volcanoes. An active volcano means that there is a heat source in the form of a magma chamber, or magma intrusions at a depth of typically few kilometres under the surface. A heat source alone is not a sufficient condition for geothermal activity. You also need water, and to have a sufficient amount of water to set up a hydrothermal convective system, the rocks have to be permeable enough to allow meteorological water (or sea-water) to penetrate it and move around. The area around many volcanoes in Iceland meets all these conditions, because the rocks are very permeable due to tectonic and volcanic rifting. There are plenty of fissures allowing water to seep deep down to be heated by the heat source.

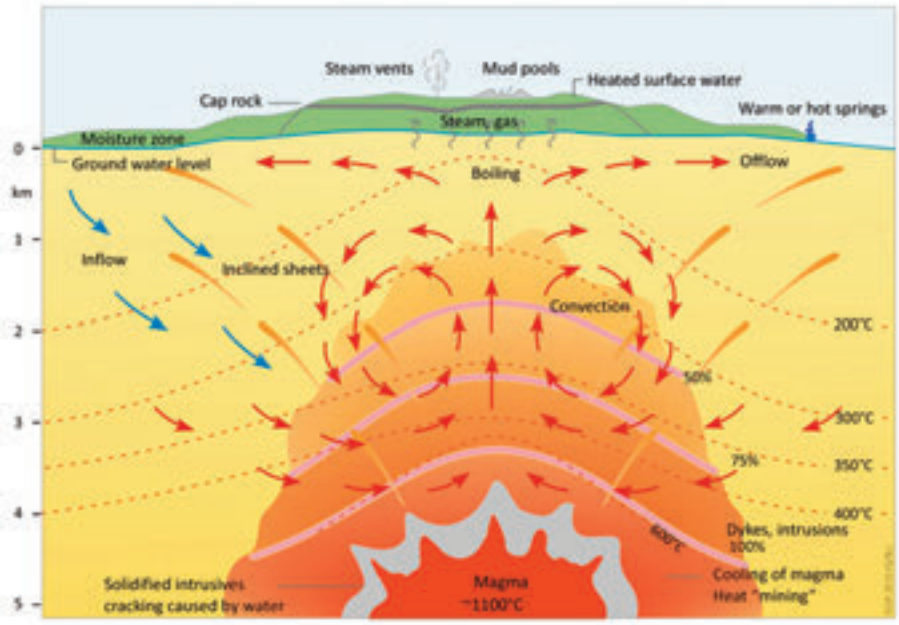
Once enough water is trapped in the permeable rocks above the heat source, capped by impermeable cap rock at the surface, heat transfer by convection instead of conduction will be possible. Hot water deep down moves up toward the surface where it cools and sinks to be heated again. This system of hot rocks and trapped hot water in a convection is called a geothermal system, and the collection of hot water with lot of dissolved solids, the geothermal fluid, is the geothermal reservoir. The surface area above a geothermal system is generally called a geothermal field and usually exhibits visible signs of the activity taking under the surface, e.g., hot springs, geysers, and fumaroles.

Geothermal systems are classified as high temperature if the temperature at 1 kilometer depth is above 200°C and as a low temperature system if the temperature is below 150°C. There are many geothermal systems in Iceland and four high temperature systems are currently being exploited for the production of both electricity and hot water. Two of these areas are situated on the Reykjanes peninsula where the Mid-Atlantic-Ridge is uplifted above sea level. The geothermal fluid in these systems is very saline as it is mostly seawater that recharges these reservoirs, and the geothermal fluid is hence called geothermal brine.

Utilisation of geothermal systems

The most obvious and common way of utilising a geothermal system is to drill a deep enough well into the hydrothermal system in order to bring the extremely hot geothermal fluid to the surface. A typical well or borehole in high temperature geothermal fields in Iceland is somewhat over 2km deep, and up to 3km deep in some areas. The temperature of the geothermal fluid brought up from such conventional boreholes can be up to 360°C.

As the geothermal fluid is brought to the surface its pressure drops accompanied with a lowering of the boiling point of the fluid. At the top of the well it is most commonly a two phase mixture of water and steam. It is necessary to separate the two phases in order to get high quality steam for electrical generation. This is done in special separator stations which are usually the first part of a geothermal power plant. Once the steam has been separated from the fluid it can be passed through turbines to produce electricity, and the still very hot pressurised separated water can be put through heat exchangers to heat up



A typical high temperature geothermal system. *Source United Nations University – Geothermal Training Programme: http://www.unugtp.is/en/organization/what-is-*

cold water for district heating and domestic use. Such combined heat and power plants are the most common type of geothermal power plants in Iceland.

Silica and scaling problems in geothermal power plants

Geothermal power plants can be quite complex and the utilisation of geothermal power is not without problems. Unlike conventional oil or gas fired power plants where the working fluid is simply clean water, the working fluid of geothermal power plants is geothermal fluid which has a complex chemical composition varying from area to area. Geothermal fluid is basically water containing a lot of dissolved minerals and dissolved gases. Complex processes and reactions take place as the fluid depressurises (and boils) on its way up the wells and also in the separation stations as the fluid as allowed to flash, i.e., to boil at high temperatures and pressure to produce more steam.

Boiling of the fluid releases dissolved gases which in turn will drive the pH level of the fluid up making it more alkaline. This typically leads to the formation of metal sulphides and calcites that can form very hard scales on the insides of well casings and also on the inside of surface pipes.

The mineral with the highest concentration in geothermal water in Iceland is silica or silicon dioxide. Typical silica concentrations in geothermal fluids in Iceland are between 0,6 and 1,2 grams per litre. The hot geothermal fluid dissolves both amorphous (opals) and crystalline (quartz) forms of the rock mineral at great depths and pressures, and at the high temperatures the silica exists in its water dissolved state as silicic acid.

Silica while in the form of silicic acid can form hard glassy scales and also combine with various metals to form various silicates that can also cause scaling. There exists various methods to control silica scaling so it doesn't cause too much problems for heat exchangers and surface piping in geothermal power plants. This usually involves keeping the water from becoming oversaturated with respect to amorphous silica by carefully controlling the temperature and the pressure of the water. Once the water becomes oversaturated with respect to amorphous silica as it cools further, silica scaling occurs rapidly and in large quantities. This type of scaling is especially problematic for injection wells.

The disposal of waste water and the sustainability of geothermal power

The mentioning of injection wells brings up the pivotal question of what happens to geothermal waste water and how sustainable the geothermal resource really is. Geothermal waste water is a mixture of the separated geothermal fluid and the condensed steam after it has been used to produce electricity. Natural recharge rate of geothermal reservoirs varies between areas and is in most places less than the outflow of geothermal fluid due to utilisation. If the geothermal resource is to be sustainable, great care must be taken to not overexploit the system. This will lead to a pressure drop in the system and reduced flow from wells resulting in less and less power production capacity.

In order to avoid this, the water taken out of the system must be returned back into the system. This is accomplished by drilling deep injection wells and injecting the waste water back down into the reservoir. This is the preferred method of geothermal waste water disposal but silica scaling can

make reinjection problematic and costly to the point of risking overexploitation. This is one of biggest and costliest problems associated with geothermal utilisation in Iceland.

A look at the problem from a new perspective

The silica that precipitates out of geothermal fluid as it cools is called precipitated silica and, precipitated silica is in itself a valuable product that is heavily used in a wide variety of industries. Precipitated silica is used as a filler and reinforcing agent in rubber and plastics. It is heavily used in the manufacturing of adhesives, inks, pigments and coatings. It is used in the food and pharmaceutical industries as an anti-caking agent, it is used as a cleaning agent in toothpaste, and as an adsorbent in cosmetics. It is also used in skincare products and in silica food supplements. The list of all the applications of precipitated silica is much too long to list here. The important point to take from this, is that the troublemaker itself can be made into a valuable product.

The amount of silica that precipitates out of geothermal waste water in Iceland amounts to over 40,000 tonnes annually and if extracted and purified it could be sold for between 1 and 20 USD per kg, depending on its purity and surface area. When used in healthcare products and supplements the price per kilogram can go over 1000 USD.

Could large scale extraction of silica from geothermal waste water prior to reinjection be a viable solution to the scaling problems that are making reinjection difficult and costly? And thereby at the same time helping to improve the sustainability of the geothermal resource in Iceland (and elsewhere), while at the same time creating new revenue streams from geothermal utilisation?

GeoSilica Iceland

GeoSilica Iceland is an Icelandic start-up company that is already producing high value precipitated silica from geothermal waste water for use as a silicon food supplement in the form of colloidal silica. The product is expected on the market late next month. The company is actively researching ways to efficiently extract and purify precipitated silica from geothermal waste water on a large scale. Preliminary feasibility studies indicate that this is definitely a possibility, at least for some geothermal areas in Iceland. The greatest challenge is to be able control the particle size distribution of the final silica sols and tailor it to specific applications.

There are other valuable minerals besides silica in geothermal fluid. An example is lithium. As boreholes get deeper, it is expected that the concentrations of such metals, and even precious ones such as gold, will increase substantially. Extraction of such metals from the fluid has to be done downstream of silica extraction. Drilling extremely deep wells in order to reach 400-600°C hot supercritical hydrous fluid is the objective of the Icelandic Deep Drilling Project (IDDP). The main benefit of such deep wells is that a single borehole can provide up to 10 times more power than a conventional borehole. A secondary objective of this project is the extraction of valuable metals from the extremely mineral rich fluids from such deep wells.

When this becomes a reality, GeoSilica Iceland wants to be ready with the knowhow and technology required to extract silica from the geothermal fluid produced by such wells, in order to make the extraction of metals easier.

In summary: The large scale extraction of silica from geothermal waste water would make it easier to re-inject it back into the geothermal reservoirs, thus improving the sustainability and the utilisation of the resource, while at the same time, enabling the extraction of other precious metals.

GeoSilica is currently looking for funding in order to scale up its production capacity and bring its products to European and other international markets. GeoSilica strives to be a socially responsible company and intends to improve the society by conducing towards healthier environment, creates new jobs, maximising the utilisation of the geothermal resource in Iceland and contribute to EU sustainable objectives.

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Volcanoes and geothermal energy

Taking advantage of the power of the Earth interior

Prof. Joan Martí is the leader of the Group of Volcanology at the Institute of Earth Sciences Jaume Almera, CSIC, of Barcelona, Spain. The research of his group addresses different aspects of the volcanological science, including dynamics of volcanic systems, hazard assessment and characterisation of volcanogenic geothermal and mineral resources. His work on 3D modelisation aims at improving the imaging of the interior of volcanic systems, thus helping to understand their behaviour and the distribution of geothermal reservoirs, as a way to define better exploration and exploitations guidelines.

Volcanos are one of the most evident manifestations of the Earth's energy. Volcanic eruptions are a fascinating natural phenomena, which have attracted the curiosity of humans since the earliest times. Volcanos have created spectacular landscapes that today attract millions of visitors from around the world. However, volcanic eruptions may have significant impacts on society and the environment, showing us the worst face of the Earth's power. However, this same power may also show a very different side when we consider its role in creating the Earth's atmosphere, allowing life to develop on our planet, and the important energetic and mineral resources associated with volcanoes.

Volcanoes are the main source of geothermal energy. Compared to the normal geothermal gradient of about 25°C per km of depth in most of the world, when magma (i.e. molten rock generated at the Earth's interior) enters the crust, for example, as a shallow intrusion beneath a volcano, this normal gradient is perturbed locally as temperature rises around the intrusion. The extent and duration of such a thermal anomaly depends mostly on the temperature and volume of the intruded melt. The presence of hot magmas below the surface of active volcanic regions offers the prospect of harnessing a huge amount of geothermal energy. The geothermal energy is a renewable resource, as it exploits the abundant Earth's interior heat and water, which once used and cooled, is then piped back to the reservoir. Having the use of this natural energy source has important implications for preserving the environment.

The economic and energy crisis that today affects modern society pushes us to look for cleaner and more sustainable energy sources, among which geothermal energy occupies a prominent place. Geothermal energy associated with volcanoes is of much higher enthalpy (i.e. energetically efficient) than other sources such as tectonic or the geothermal gradient itself, so it offers a much better option where available. However, there are some questions we should ask ourselves to ensure that geothermal energy is a suitable and recommendable alternative to the hydrocarbons derived from other renewal energies. Where does geothermal energy originate? What does it take for a geothermal deposit to be economical? How do we estimate reserves? How can we recover this thermal energy, and how can we use it in practise? Are there any adverse effects for the environment as geothermal energy is tapped and recovered, in particular in comparison with other types of energy? How can we discover that an important geothermal reservoir is nearby? Answering these questions requires us to conduct detailed research on the volcanic systems that host the geothermal reservoirs, in order to establish correct exploration and exploitation strategies. Otherwise, the lack of knowledge on the characteristic of a geothermal reservoir and of its container, as well as on the causes that it originated from, may conduct to extremely expensive and

unproductive strategies. It is necessary to improve and standardise the geophysical, geological and geochemical technologies needed to characterise and monitor enhanced geothermal systems in order to minimise the exploration and exploitation costs by reducing the drilling uncertainties. A better characterisation of the reservoirs should result in reducing the amount of drilling required to set up a new geothermal power plant. Geological, geophysical and geochemical information on the volcanic systems and their hosted geothermal reservoirs must be combined to obtain realistic and reliable 3D simulation and visualisation models that should help to improve the efficiency of exploration and exploitation strategies significantly reducing their costs.

Europe was pioneering in the exploration and exploitation of geothermal energy with the experience of the Larderello, Italy, in 1904 where geothermal steam was harnessed to generate electricity. Other projects have been developed later in Italy and in other European sites to exploit geothermal energy. The most successful being Iceland, where more than 26.5% of the nation's energy is geothermal, as well as nearly 87% of home heating and hot water requirements of the country. The European leadership in this field should be promoted by improving exploration strategies, making them more effective and costless, to help make geothermal energy accessible less favourable regions, which are located in active volcanic areas, thus contributing to improve the sustainability of our planet. In fact, several countries in Latin America (México, Costa Rica, El Salvador, Guatemala, Nicaragua, Chile), Asia (Indonesia, Philippines, South Korea, Thailand, Japan), or Africa (Kenya, and Ethiopia) have already opted for the use of this type of renewal energy. Clearly, the use of geothermal energy is an important investment in the future in which Europe can not be excluded.

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The CCS revolution

Jon Gibbins, Director the of UK Carbon Capture and Storage Research Centre (UKCCSRC) details the progress made with carbon capture & storage (CCS), and how it's gaining momentum...

The opening of the world's first power plant to capture its carbon dioxide has started an exciting new phase of activity for the UK CCS Research Centre.

Carbon capture and storage (CCS) for power plants is just another stage in cleaning up fossil fuel use. This began with capturing dust, then acid rain gases – oxides of sulphur – and most recently oxides of nitrogen. Carbon dioxide does not cause local or regional problems in the same way as these pollutants, so the politics and regulation are more complex, but the general principle of adding a clean-up process once the need is considered to justify the cost is familiar in the electricity generation sector. Also familiar are the stages in how the clean-up technology is perceived, going from 'science fiction' through 'impossibly expensive and complex' to 'major investment but necessary' and finally 'obviously just a routine part of any power plant'. CCS is now in early stage 3 and we are working hard to get it to stage 4 as quickly as possible.

The growing number of working CCS power plant projects is the key to making progress. The province of Saskatchewan, Canada, with a population of just over 1 million people gained the distinction of being first in the world to operate a commercial power plant with carbon dioxide capture when its Boundary Dam 3 power plant was officially opened on 2 October. In Saskatchewan the electricity utility, SaskPower, is a 'Crown Corporation', owned by the province. It can therefore take a long-term view on investment and give weight to the benefits of securing local jobs through continued coal mining and an extended life for Saskatchewan oilfields, using carbon dioxide injection to recover more oil, in contrast to the simpler, but less rewarding, approach of paying a similar price to buy natural gas for power generation.

Revenues from carbon dioxide sales for 'enhanced oil recovery', EOR, using the captured carbon dioxide are also a key factor in enabling power plant CCS projects in the USA. At present 3 coal-fired CCS power plants are being built (Kemper County, Futuregen 2 and Petra Nova) and a fourth is expected soon (the Texas Clean Energy Project, TCEP). The existence of a viable market in North America, supported by EOR, is a magnet for global CCS players that seek learning-by-doing and hence keep on the leading edge of power plant CCS technology. The Petra Nova project has a significant Japanese stake holding and uses Japanese technology and the TCEP proposal has similar major Chinese involvement.

The UK also offers the prospect of a viable market for CCS power plants through our 'Electricity Market Reform' (EMR) arrangements that provide a 'level playing field' for all low carbon technologies through access to feed in tariffs with a 'contract for difference' to cover the additional costs for renewables, nuclear and CCS. CCS is expected to be competitive with renewables, based on required support costs and the system benefits of providing a controllable electricity output that is always available to meet demand. The UK's use of cost-effective CCS will be greatly facilitated by the recent EU 2030 climate and energy policy framework agreement. This includes national emissions reduction targets but, unlike the 2020 agreement, does not also specify national renewable energy targets.

Two power plant CCS projects are being developed in the UK at present, to be funded under EMR plus up to £1bn capital support as a grant to help meet first-of-a-kind costs. The natural gas-fired Peterhead power plant in Scotland uses a 'post-combustion' capture process to remove most of the carbon dioxide in the exhaust from a conventional gas turbine. Interestingly

Mike Monea, SaskPower's President, CCS Initiatives, and UKCCSRC Director, Jon Gibbins

the technology proposed is a variant of the Shell Cansolv equipment already installed at Boundary Dam, making it a second generation project able to take advantage of some of the lessons already learnt. The coal- and biomass-fired White Rose project in Yorkshire has a fairly conventional steam boiler and turbine but, instead of burning the fuel in air, it uses a mixture of recycled combustion products and pure oxygen in an 'oxyfuel' combustion process. Extra costs are involved in initially extracting the oxygen from air but the separation of carbon dioxide after combustion is then much easier.

Both the Peterhead and White Rose projects and their associated pipelines and deep (several kilometres below the sea bed) geological carbon dioxide storage sites are being designed and costed at present. Government decisions on whether or not to fund the projects will be made after the General Election, in late 2015 or early 2016, with the up-front costs of getting a CCS industry started in the UK having to be balanced against the benefits. A recent study by the TUC and the CCS Association showed that if CCS is available then the wholesale price for electricity in 2030 could be 15% lower. CCS is also the only way to decarbonise energy-intensive industries such as cement and steel. Estimated Gross Value Added gains from CCS deployment in the UK are £2bn-£4bn per year by 2030, increasing to £5bn-£9bn per year if the UK is in time to get a share in the global CCS market. The UK offshore industry might also be able to use CO_2 injection to help maintain oil production, especially if the different parts of government involved can work together effectively to ensure the wider potential benefits for the UK economy are realised.

The UK CCS Research Centre, established in 2012 with funding from the Engineering and Physical Sciences Research Council (EPSRC) and the Department of Energy and Climate Change (DECC), is working hard to take advantage of the opportunities offered by the first wave of CCS projects. Academics need to interact closely with industry to extract the maximum learning from early, full scale CCS experience and to incorporate it in second and third phase projects in the UK and globally. The prize is major cost reductions, through radical improvements in existing technologies and novel approaches. It is also crucial to start now on developing the capacity in people, expertise and facilities required to support the exponential growth in CCS deployment that is expected over the period 2025-2035 and then again between 2030-2050, to help deliver the very deep emissions cuts required by mid-century.

The UKCCSRC already has an agreement with SaskPower for joint research building on the Boundary Dam project and further links with other projects are being pursued. As CCS moves out of the laboratory and off the drawing board, and we have to keep up with the intellectual challenges posed by real world experience, UK CCS scientists and engineers are going to get more, not less, busy. ■

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Managing Carbon lock-in from Gas-fired Power Generation

Dr Ward Goldthorpe, Portfolio Manager for Carbon Capture and Storage (CCS) and Gas Storage at The Crown Estate discusses the role of gas-fired power in decarbonising electricity systems...

Our energy system is changing. Already on windy days as much as 20% of UK electricity is generated from wind turbines and other renewable sources. Over the next 15 years there is an expectation that the cost of producing renewable electricity will decrease and its share of supply will increase. But what happens when the wind doesn't blow and the sun doesn't shine?

Unfortunately many renewable energy sources are variable, and that is one of the reasons why governments talk in terms of a portfolio of electricity generation technologies. The variability in electricity production has to be matched by sources that can fill the gap, virtually at a moment's notice. Currently the best way of doing this at scale is to use natural gas-fired turbines that have very fast start-up and shut-down times.

The most efficient gas-fired power stations use a configuration known as combined cycle gas turbines, or CCGTs, and these emit about half of the carbon dioxide (CO_2) per unit of electricity of a modern coal-fired power station. So a combination of renewables with low carbon base-load generation such as nuclear and fossil fuels with CCS, along with CCGTs that can "load-follow", is the practical way forward over the coming decades in the absence of cost-effective very large scale electricity storage technologies.

CCS is an infrastructure chain comprising technologies that remove carbon dioxide from the exhaust gases of power stations and industrial plants (such as steelworks and cement plants), transport it to a storage site, and then pump it more than a kilometre underground into stable geological formations that will keep it there permanently like the oil and natural gas accumulations of the North Sea.

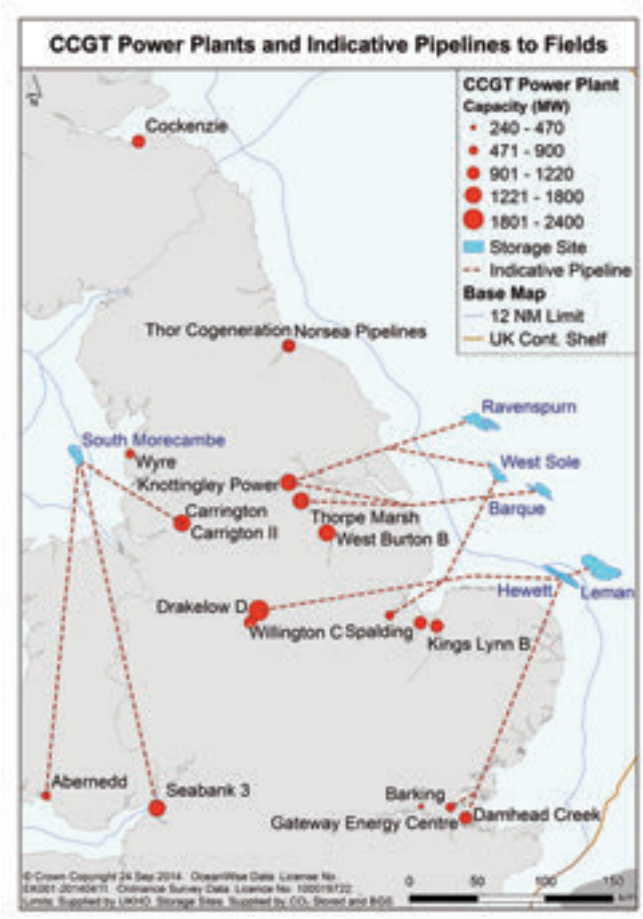
This pathway to electricity decarbonisation is complicated by a number of factors that together are described as the "energy trilemma". Meeting the three requirements of energy security, affordability and decarbonisation over the next 15 to 20 years is a complex task. New low carbon technologies and power plants cost more than conventional ones based on fossil fuels. In the UK the power station fleet is ageing and there is a pressing need to build new base-load capacity to ensure the total portfolio delivers affordable secure electricity over the next 5 to 10 years. At the same time, however, CO_2 emissions need to be curbed.

The demonstration of coal and gas fired power plants with CCS in the UK is still at the stage of engineering and design studies, and the first low carbon power from these is not planned to be generated until about 2019. As part of the response to this trilemma UK regulations require new coal fired power plants to meet an emissions performance standard (which effectively mean CCS has to be installed on at least part of the plant) AND new CCGT plant has to be "carbon capture ready" (CCR).

Carbon Capture Ready

The EU Directive on the geological storage of carbon dioxide (2009) requires Member States to ensure power stations greater than 300 MW generation capacity consented after April 2009 be "capture ready", and specifies 3 conditions that must be met:

- Suitable storage sites are available;



- Transport facilities are technically and economically feasible; and

- It is technically and economically feasible to retrofit for CO_2 capture.

After consulting with industry in 2008, the UK's consenting regime modified these criteria to require that "a suitable area of deep geological storage offshore exists" and that the "economically feasible" criterion be applied to the full CCS chain. Applications for consent must identify 2 storage sites within the suitable area.

A downside to this "middle ground" policy and regulation both in the UK and across Europe is the risk that CO_2 transport and storage infrastructure is not built in time to enable retrofitting of these unabated CCGTs so that carbon budgets and climate targets can be met. Because power stations have long operating lives this will lead to carbon-lock in, or the creation of new emissions for which there is no mitigation solution other than offsets.

The effectiveness of a CCR policy is critically dependent on how realistic the future transport and storage options are. The figure opposite shows consented CCR CCGT plants in the UK, their storage site choices and some possible transport links. A number of these could never be realistically deployed and thus will eventually lead to residual emissions in the future that will not be abated without prohibitive costs. Any viable decarbonisation plan will need to recognise and account for this eventuality.

A key objective of governments' energy and climate policies should therefore be ensuring carbon lock-in is reduced to the lowest possible level. To effectively manage this risk, governments need to be mindful of the negative impact of:

- Large scale deployment of renewables without a system-level strategy for managing variability;

- Allowing new CCR CCGTs to be unabated for long periods of 25+ years;

- Slow progress in demonstration of CCS at scale; and

- Weak application of the CCR conditions in the EU Directive.

The process of appraising storage sites to a suitable level of confidence takes time and is undertaken by companies outside the power sector, working with different investment options and criteria. Ensuring we appraise enough storage over the next 10 years will be one of the most important foundations for the efficacy of the CCR policy and decarbonisation of the whole energy system at lowest cost in the future. ■

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Biomass to energy in Finland

Mika Järvinen, Associate Professor at the Department of Energy Technology at Aalto University discusses how burning black liquor for energy can reduce CO_2 ...

In Finland, one third of electricity is produced by nuclear power, one third by fossil fuels and last but not least one third by renewables. The share of renewables is covered half by hydro-power and half by burning black liquor, and other wood related fuels.

Although black liquor may sound a bit exotic; it is just the side product of papermaking. In the papermaking process, the fibers of the wood are separated by chemical cooking and then used to make paper. The rest of the organic part of the wood and the residual cooking chemicals forms the black liquor. Liquor is burned in the modern Kraft Recovery boilers very efficiently. The burning of organic part releases heat that is used to make electricity and heat. The inorganic part is effectively regenerated and recycled in an almost fully closed process, a very positive thing from an environmental point of view. From the energy point of view, black liquor is a biofuel and CO_2 emissions can be considered as neutral.

In addition to 10% of electricity and heat produced in Finland from black liquor, Finland has long traditions and history in the development of the black liquor combustion technology and, currently the main 2 recovery boiler manufactures are operating in Finland. In addition to this, even though the population of Finland is only 5.5 million people, the research community and activity around black liquor combustion is at the same level than in the other black liquor superpowers USA and Canada.

Research on black liquor combustion, especially the spraying of black liquor into the furnace was started by Ari Kankkunen in the early 90's, and today the research is carried out on an industrial scale. The most important topics are related to better control of the spray; it is essential that the droplet size, injection velocity, and the direction can be accurately controlled. Poorly defined spray properties such as too small or too large droplet size, wrong distribution or too high velocity of the spray will lead to major boiler fouling problems. These could result in blocking the heat transfer section of the boiler, or we could have a poor recovery efficiency of the inorganic cooking chemicals. The 2 figures above are just samples on how important the correct spraying temperature is.

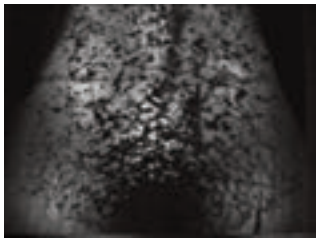

Figure 1. Black liquor spray with correct spraying temperature and mass flow results in correct droplet size, no fouling or problems in chemical recovery.

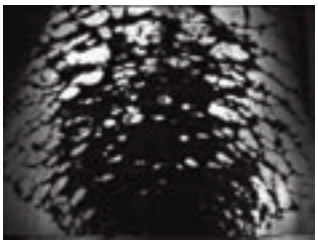

Figure 2. Wrong spraying temperature (only 2 °C lower from optimal), results in too large droplet size, significant problems in chemical recovery and boiler operation.

As here, it is often noted that small details make a huge difference in large industrial processes. Real improvements can be achieved only by understanding the processes sufficiently and on principal level. Long live the black liquor. ■

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The path to wind power

The development of wind farms in the UK could have a bright future with agreeable planning processes and responsible, community-minded owners working together. Here, Adjacent Government delves into the possibilities...

Many scientists and governments agree that the burning of fossil fuels (coal, oil and gas) is causing our climate to change dramatically. Last year the UK government predicted that global warming will expose many millions more people to the risks of hunger, drought, flooding and diseases like malaria, and produce irreversible losses of species.

Renewable energy sources such as wind power are an essential tool to utilise if we are to address climate change with obvious benefits such as the fact that it is clean, safe, abundant (especially in the UK), affordable [1] and helps to create jobs.

RenewableUK [1] have stated that wind energy already makes a significant contribution to the UK, with an output of 15.5TWh in 2011 – equivalent to the annual electricity demand of 4.7 million homes. So, it makes perfect sense that support for wind power should be high. According to Yes2Wind [2], opinion surveys regularly show that just over 8 out of 10 people are in favour of wind energy, but there are still many who are opposed, especially those living in close proximity to a site. But is this improving through better engagement with communities?

Onshore wind provides many environmental, social and economic benefits. Research conducted by RenewableUK on onshore sites has shown that for each installed megawatt (MW), around £100,000 stays in the community and surrounding areas during the lifetime of the project. Not surprisingly, communities are becoming more engaged and are reaping the benefits of local development.

Planning processes

The planning policy for onshore wind is contained in a number of documents, principally the government's National Planning Policy Framework (NPPF), the National Policy Statement for Renewable Energy Infrastructure and online planning practice guidance for renewable and low carbon energy.

To protect important environmental sites, the government's aim was to make clear that the need for renewable energy did not automatically override environmental protections and the planning concerns of local communities. The government has also proposed that communities should receive an increased community benefit package when an onshore wind farm is accepted in their area.

The NPPF directs that when determining planning applications for renewable energy development, LPAs should:

Not require applicants for energy development to demonstrate the overall need for renewable or low carbon energy and also recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should also expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

The NPPF makes clear that renewable energy development is not normally considered appropriate development for green belt land. In such cases developers will need to demonstrate very special circumstances if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources.

The Goole Fields Wind Farm – case study

In September 2010, RWE Innogy UK received planning permission by East Riding of Yorkshire Council to build a wind farm on a section of land south east of the town of Goole. Councillors on the planning committee voted unanimously in favour of the Goole Fields Wind Farm.

"Renewable energy sources such as wind power are an essential tool to utilise if we are to address climate change with obvious benefits such as the fact that it is clean, safe, abundant (especially in the UK), affordable 1 and helps to create jobs."

Goole Fields Wind Farm comprises 16 turbines, each standing at 124.8 metres high (from the base to the tip of the turbine blades) generating a total capacity of around 32.8 megawatts (MW). This is enough electricity to meet the average annual needs of thousands of homes each year.

The topography of the site is flat arable land with areas of woodland at the southern end and has significant drainage features under the control of the Environment Agency or Internal Drainage Board.

The first phase of construction started in January 2012, which saw the foundations set and the electrical and civil works completed and has been fully operational since August 2014. In addition, consent has also been approved for a further 17 turbines immediately to the west of the first phase farm taking the total to 33 turbines.

The Community fund

The Goole Fields Community Fund is worth £1.6m over the lifetime of the wind farm and is due to be making its first awards in January 2015. The panel in charge of allocating the funds are made up of local people and is facilitated by East Riding of Yorkshire Council's (EYRC) Rural Policy & Partnerships Team – operating a transparent administration process.

EYRC requested in the early stages that the provision of community funding is secured through a section 106 agreement (s106). The s106 provides a mechanism which make a development proposal acceptable in planning terms that would not otherwise be acceptable, and in the case of Goole, there is an obligation that RWE Innogy UK provide the community fund with an annual payment based on the total installed capacity of the wind farm.

Conclusion

This article aims to show how wind farms can be of benefit to the UK. The case for wind power is a true 'green' option, the planning processes and policies are clear that development is possible, and by showing that investing in the local community benefits that community, could this particular case study be a shining example of 'how to get it right?' ■

[1] If you are interested in developing a commercial wind farm, RenewableUK offer free advice and guidance. Please visit http://www.renewableuk.com/en/renewable-energy/wind-energy/onshore-wind/interested-landowners.cfm#sthash.toA5tyA9.dpuf

[2] The first offshore wind turbines in the UK are producing power more cheaply than our newest nuclear power station. The UK Government's figures show that all wind power will be cheaper than nuclear power by 2020. Source: http://www.yes2wind.com/support_resources

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Modelling the melting process in the Earth's crust

Over the last 50 years geoscientists have gained a much better understanding of just how dynamic the Earth is via our understanding of plate tectonics and the consequences of it. One of the most spectacular dynamic features of our planet is magmatism, which impacts our lives most prominently in volcanic eruptions. Magmatism has helped shape the Earth and its atmosphere, providing the main conduit for transporting material through the Earth. The magmatic cycle starts deep in the Earth when the mantle or crust begins to melt via processes driven by plate tectonics. A major consequence of continental collision is the thickening and heating of the Earth's crust. When the deep parts of the Earth's crust reach temperatures greater than about 650°C the rocks can begin to melt in a process we refer to as partial melting or anatexis. Such processes are inferred to be occurring beneath the Himalayas today and affect the way the Earth's crust behaves by radically changing its strength.

Once formed, silicate melt may separate from the solid residue and migrate through the crust. Partial melting is one of the most important processes that occurs in the crust because it is a process that allows material to move between different parts of the crust, and allows the crust to chemically differentiate. As the melt produced is a mobile phase that can leave its source and, being buoyant, typically rises to higher levels in the crust, sometimes making it to the Earth's surface. It is often via such differentiation processes in the Earth that we get the economically important concentrations of valuable metals that our society relies on.

The difficulty in understanding deep Earth processes is that they cannot be directly observed. Instead, geoscientists must study ancient rocks that were once deep in the Earth, undertake experiments at conditions similar to the deep Earth or utilise our understanding of thermodynamics and mechanics to model the processes.

One important way of understanding the high pressure and temperature processes that operate within the Earth is via equilibrium thermodynamics. Thermodynamic modelling allows us to investigate processes that we cannot directly observe and to test hypotheses. This method has been applied to geological processes for many decades, but increasingly so in the last twenty years as computing power has increased. Today, thermodynamic methods are widely used in geosciences to understand the conditions in which different rocks form. A way in which we do this is to produce phase diagrams that show which sets of minerals are stable for different pressures and temperatures. These diagrams can then be compared to the sets of minerals that we observe in a range of rock-types to understand conditions of formation and to make predictions of metamorphic processes.

For my work in partial melting, the main aim is to build suites of thermodynamic descriptions for minerals and silicate melt that can be used together to predict deep Earth processes, including the melting process. These thermodynamic descriptions define the thermodynamic properties of

Migmatites are rocks that originated deep in the Earth's crust and have undergone melting

minerals as a function of their composition, pressure and temperature such that metamorphic geologists can use these to model what may happen deep in the Earth at high pressures and temperatures. A major challenge we face is to build these models in sufficiently complex chemicals systems that would make them relevant to the natural world. Most minerals are not pure compounds of fixed composition but what we call solid solutions that can vary markedly in their composition, for example from iron rich to magnesium rich. To undertake any calculations we need models that describe the thermodynamic properties of a mineral as a function of its composition range. Much of my work is dedicated to building these models for solid solution minerals. Silicate melt presents its own difficulties because it may vary greatly in composition and lacks the defined crystal structure of solid minerals. However, without a thermodynamic model for melt we are very limited in what we can do.

With adequate thermodynamic models, we can make predictions of the melting process, including understanding the pressures and temperatures at which melting occurs, the amount of melt that is produced and the composition of that melt. When crustal rocks melt, they are strongly compositionally partitioned with the melt being considerably richer in silica, potassium, sodium and importantly water than the original rock. Water is a very important component in melting as it lowers the temperature at which rocks melt by hundreds of degrees. Without water, the crust would rarely undergo any melting. When the melt crystallises at shallower levels including the Earth's surface it releases this water, which in volcanoes may cause large explosive eruptions.

To understand the melting process we must study rocks that originated deep in the crust and have undergone melting. These rocks are called migmatites and are mostly composed of dark layers (melanosome) representing the solid residue and light layers (leucosome) representing crystallised melt. In many migmatites, we can thermodynamically model the amount of melt produced and compare this with the amount of leucosome in the rock to understand how much melt may have left the source rock and migrated to higher levels in the crust.

We are currently embarking on a research program funded by the German Science Foundation (DFG) to make new thermodynamic models for partial melting of metabasic rocks (metamorphosed basalt). Our ability to model these rocks at high temperature is currently limited by the lack of an appropriate model for melt, and this limits our understanding of how these rocks form.

My work forms part of a collaborative research centre at the University of Mainz, Germany called VAMOS (volcanoes, atmosphere magmatic open systems). This centre is aimed at better understanding the magmatic process and its consequences from the formation of melt in the Earth, its transport through the Earth and its eruption. The centre involves collaboration between geoscientists and atmospheric scientists to better understand how solid Earth and atmospheric processes are connected.

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A new bio-based EU

Bio-based industries could help the EU be a leading contender in a global bio-based economy, here Dirk Carrez, Executive Director at the Bio-based Industries Consortium details why...

With sustainability at the heart of the bio-based economy, growth can be decoupled from resource depletion and environmental degradation. The bio-based economy is an opportunity for the EU to transition more rapidly to a low-carbon and resource efficient society. It can establish the EU as a leading contender in a global bio-based economy that is expected to reach the €200 billion mark by 2020.

The global race with the USA, China, and Brazil has, however, underpinned the need for public and private players to join forces and to translate the EU's innovation potential into commercial-scale products. This is why the EU has teamed up with the Bio-based Industries Consortium (BIC) - a grouping of more than 70 agriculture, forestry, chemicals, paper, pulp, biotechnology and energy firms, among others – to form the BBI, a €3.7bn Public-Private Partnership on bio-based industries that will be partly funded through the EU's Horizon 2020 research and innovation programme. Some €975m will come from the EU and another €2.7bn from industry partner BIC. This should provide plentiful business opportunities in Europe's green economy.

The BBI, which launched its first Call for Proposals in July, will fund research and innovation projects in the area of the bio-based economy. Its main objective is to create a competitive, innovative and sustainable Europe, to lead the transition towards a post-petroleum society, and to decouple economic growth from resource depletion and environmental impact. Its vision is that the bio-based industries will optimise land use and food security through a sustainable,

Dirk Carrez, Executive Director, Bio-based Industries Consortium

resource efficient and largely waste-free utilisation of Europe's renewable raw materials for industrial processing into a wide range of bio-based products, such as advanced transportation fuels, renewable chemicals, biomaterials, food ingredients, feed and bioenergy. In doing so, bio-based industries will play an important role in spurring sustainable growth and boosting Europe's competitiveness by re-industrialising and revitalising rural areas, providing tens of thousands of high-skilled research, development and production jobs over the next decade. And this is mainly due to the fact that in a bio-based economy, bio-refineries – or the industrial installations that convert biomass into greener everyday products – need to be built close to where the biomass is, i.e. in rural areas.

Europe has the potential. It's a matter of deploying it. The BBI is thus a key enabler as it will focus on bringing technology to maturity through specific R&D projects, and by upgrading and building demonstration and flagship bio-refineries ("first-of-its-kind" production plants) that will process the biomass into a range of innovative bio-based products. Equally important is the BBI focus on building new value chains based on the development of sustainable biomass collection and supply systems with increased productivity and improved utilisation of biomass feedstock, while unlocking the utilisation and valorisation of waste and lignocellulosic biomass.

As per the Horizon 2020 rules for participation, all stakeholders can submit innovative proposals to the BBI and demonstrate beyond state-of-the-art. The BBI is unique in bringing previously unrelated industries together and develop totally new value chains. By finding other ways of generating fuel and other products from plants and waste, the bio-based industries will significantly cut our dependency on fossil fuels and fossil-based products.

"In doing so, bio-based industries will play an important role in spurring sustainable growth and boosting Europe's competitiveness by re-industrialising and revitalising rural areas, providing tens of thousands of high-skilled research, development and production jobs over the next decade."

But public involvement is essential. It is often too risky and expensive for private companies to invest in the research necessary to turn agricultural waste into products like plastic and fuel. Moreover, individual companies can rarely bring new technologies to market across the EU on their own. This is where the BBI can make a difference. At one end of the production chain, the BBI will help find new sources of biomass, and at the other, it will try to support new markets for bio-based products by, for example, developing new products or new fossil-free applications. ■

Dirk Carrez
Executive Director
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Nanobiotechnology for Diagnostics Nb4D Group

The Nanobiotechnology for Diagnostics (Nb4D) Group belongs to the Institute of Advanced Chemistry of Catalonia (IQAC), one of the institutes of the State Agency CSIC (Consejo Superior de Investigaciones Científicas), and to the Biomedical Research Centre Network of Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN). The group is led by Prof. M.-Pilar Marco, Professor of Research of CSIC, and is composed of a multidisciplinary, highly qualified team of investigators.

Since 1996 Nb4D investigates the design of new strategies for the development of a new generation of diagnostic tools and devices that increase the effectiveness of the actual methods. A large part of the investigation is centred on combining specific bioreceptors with micro(nano)particles and devices designed to produce optical or electrical signals. Right now, the knowledge generated about the properties that materials have at the nanometre level allow for the design of new strategies for the detection and quantification of biomarkers of interest in different fields.

Basic research is performed around 3 lines: (i) the development of bioreceptors with defined properties (affinity, specificity); (ii) the preparation and characterisation of functional biohybrid materials, resulting from the incorporation of specific bioreceptors on inorganic materials with optical or electrical properties and; (iii) the implementation of these bioreceptors or biofunctional materials onto transducers based on new micro/ nanobiotechnological approaches.

All of the research is aimed at providing diagnostic alternatives to the clinical and food safety fields. In the clinical field the Nb4D group is active in cardiovascular, neurodegenerative or infectious diseases, therapeutic drug monitoring and adverse drug reactions. In the food safety field, methods are being developed for the detection of residues of pesticides, veterinary drugs or pathogens.

Among the capabilities of the Nb4D group it is worth mentioning its expertise and knowhow related to the production of antibodies against a variety of substances,

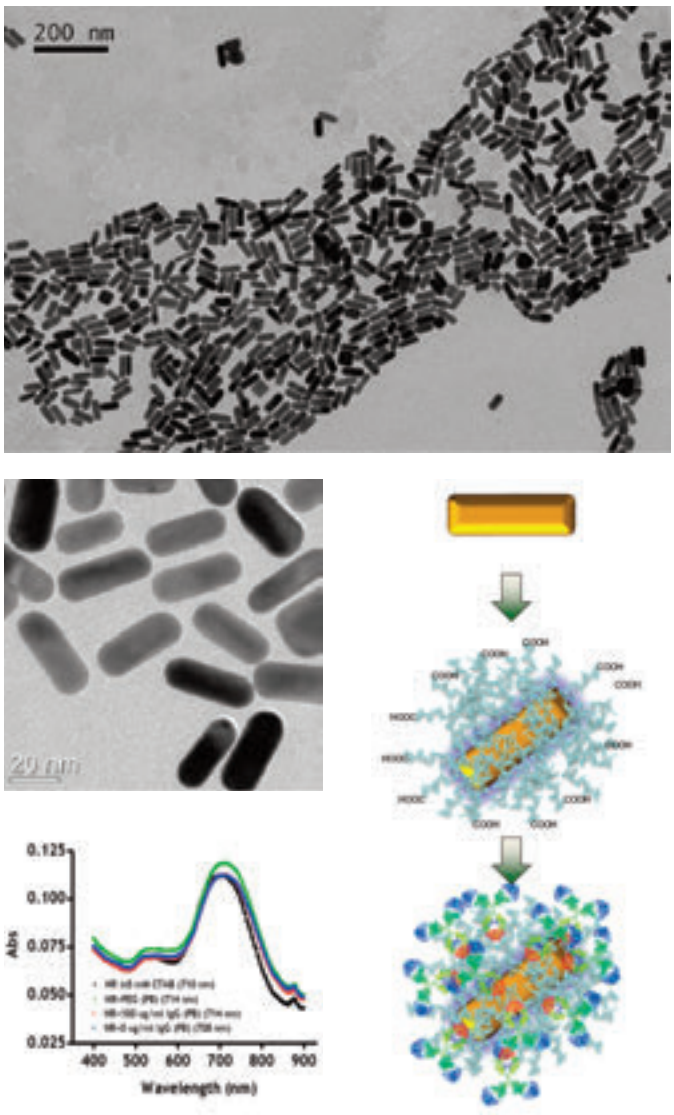

Figure 1. Noble metal nanoparticles can be used to develop specific nanoprobes resulting from the covalent attachment of bioreceptors to their surfaces. These nanoprobes can be employed to develop optical biosensors based on their localized surface plasmon resonance (LSPR) properties

including small non-immunogenic molecules, for which it is an internationally recognised referent. Also the group has the knowledge to create functional biohybrid materials and nanoprobes resulting from the covalent biofunctionalisation of surfaces and nanoparticles. Moreover it

Figure 2. Members of the Nb4D team

possesses the capacity to establish diagnostic methods and technologies based on microplates (e.g. ELISA), microarrays and on optical (SPR, surface plasmon resonance; LSPR, localizes SPR; EW, evanescent wave) or electrochemical (impedance spectroscopy, amperometric) transductors. The latters permit the development of high performance biosensor-based diagnostic methods or point-of-care (PoC) devices providing rapid responses, selective to the presence of particular biomarkers (even in complex biological matrices) and possibilities for multiplexation, miniaturization or automation.

Since its creation, the Nb4D group has participated in more than fifty projects, many of them at the European level, collaborating with recognized research groups from the public and the private sector. Moreover, it holds stable research collaboration contracts with European and US companies. As a result of the research performed, numerous specific antibodies along with immunochemical techniques, including biosensors, with various applications have been developed. The Nb4D group possesses a portfolio of patents protecting bioreagents and technologies, which in some cases are under exploitation by biotech companies. Results have also been published in nearly 200 peer-reviewed international journals of high impact factor. The Nb4D group also trains predoctoral students and partakes in doctorate and master programmes.

The Nb4D group has an important collection of specific antibodies and bioconjugates for the detection of cardiovascular biomarkers, microorganisms, anabolic androgenic steroids, oral anticoagulants, veterinary drugs (antibiotics, steroid hormones etc.), pesticides, industrial residues etc. In 2009 the group created the Custom Antibody Service (CAbS) infrastructure whose objective is to provide services and scientific assessment related to the production of antibodies, whether monoclonal or polyclonal, bioconjugates (proteins, biotin, fluorophores, nanoparticles etc.) and the development of immunochemical detection methods. Nowadays, CAbS provides services to a large number of entities including public research bodies (25%) and private enterprises (75%).

For more information about the scientific activities of the Nb4D group as well as the results from their investigation in the form of products or patents please consult the webpage.

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Carbon, Capture, Conversion and Neutralisation (C^3N)

According to the recent Fifth Assessment Synthesis Report presented in Copenhagen by the Intergovernmental Panel on Climate Change (IPPCC), to face the irreversible effects of climate change, greenhouse gas emissions (CO_2) need to fall by as much as 70% around the world by 2050 and to zero by 2100. Implementing such reductions poses substantial technological, economic, social, and institutional challenges. BFS blue Enterprises has developed a technology to capture, neutralise and transform industrial CO_2 emissions into products with applications in a range of markets including energy, pharmaceuticals, nutrition, cosmetics, and biotechnology. Using a sophisticated technology to accelerate the power of nature, BFS provide a feasible mitigation pathway for CO_2 emissions.

CO_2 Capture... and Conversion

Because of the way our cycles of production and consumption work, our food, energy and environment are intricately linked. With the consistant global development of the past century, it is increasingly difficult to satisfy our world with sufficient food and energy. Meeting these demands has a direct impact on the environment, especially through the emission of greenhouse gases, particularly atmospheric CO_2, which is currently at an unprecedentedly high concentration of nearly 400 ppm (September 2013).

According to the global scientific and environmental community (UN, NASA, IPCC, EPA, etc), if current emission rates continue, we will soon reach a point of no return: irreparable damage resulting in a lack of potable water, changes in food production conditions and increased mortality rates from natural disasters such as floods, storms, and droughts. Climate change is not merely an environmental issue; it has deep economic and social implications. Though many of these natural phenomena have already been documented, energy from fossil fuels has allowed for most of society's modern comforts, making it difficult to implement changes in behaviour.

According to the International Energy Agency, $1tn of investment is needed worldwide each year for the next 36 years to stave off the worst effects of global warming and keep the Earth habitable.

BFS technology presents some of the answers to the big problems we have represented so far, with lower investment:

- Technology based on the capture, neutralisation and conversion of the CO_2 from flue gases. Carbon Capture and Storage (CCS) technology is a technology that removes carbon from the flue gases and stores it in geological formations to prevent it entering the atmosphere and contributing to climate change. The big difference is that BFS blue technology not only captures, but also converts the CO_2 (not storage) into some other products.
- Food. Some other products can be essential goods for food.
- High value products (Omega 3, antioxidants, vitamins, sitosterols, polysaccharides, natural colorants, etc.) from a commercial point of view.
- True alternative to fossil fuel; storable, high-density energy to be used even to get all the derivate products that currently are obtained from fossil oils (plastics, paints, chemicals, etc).

The BFS combination of high value products plus blue petroleum, allows us to produce the first biocrude – fully competitive with fossil oil both in price and flexibility.

Unique Technology

Human activity is moving dangerously towards the Earth's natural cycle; the CO_2 absorbed during photosynthesis (reduction) is later reintroduced into the atmosphere through the natural process of combustion (oxidation). With the industrial revolution, humans have destroyed this natural balance by drastically increasing the concentration of CO_2.

Figure 1. The 3rd cycle of CO_2. www.biopetroleo.com.

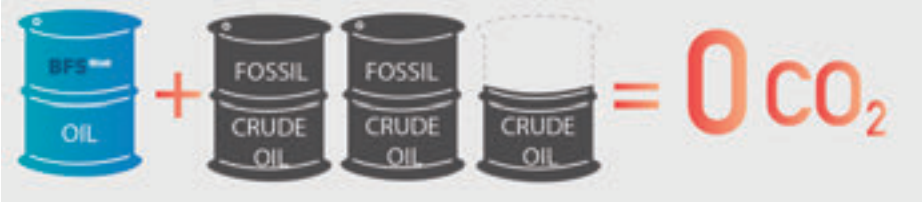
To reverse this situation, BFS has developed a unique technology (3rd Cycle of CO_2) to accelerate CO_2 reduction based on Carbon, Capture, Conversion and Neutralisation (C^3N). C^3N is an alternative, or in some cases complementary, to the CCS technology. In BFS technology CO_2 is captured, but instead of being buried, is used to feed marine phytoplankton (the building blocks of life) that capture the CO_2 via photosynthesis and transform it into valueable bioproducts.

Figure 2. BFS' tested and certified (SGS) Industrial plant that absorbs CO_2 emitted from an adjacent cement factory. Watch a video of the Plant Tour here

With patented technology, BFS blue Enterprises cultivates these marine phytoplankton on an industrial scale with a fully-automated, aseptic process to ensure high-quality, homogenous production throughout the year. Because of the modular nature of the plant (seen in Figure 2), production is divided into sectors to produce different products, making BFS technology highly adaptable to market demand.

Crude oil with 0 Emissions

To produce 1 BBL of crude oil, BFS technology permanently neutralises 1 ton of CO_2. Given the average combustion emissions of one barrel of oil being 390 kg of CO_2, BFS completely offsets 2.5 barrels for every barrel of blue petroleum, ensuring a net emission of 0 from the combustion of the 3.5 total barrels.



In this way, we can maintain our present energy model without changing our current lifestyle or infrastruture, even after the end of fossil energy.

This means that, 3.7 Million of BBL per day of BFS blue oil will neutralise the EU's CO_2 emissions from crude oil (EU crude oil consumption is 12.7 MBBL/day).

To reach this production of 3.7 MBBL per day of BFS blue Petroleum, would require a much lower investment than $1tn/year (According to the International Energy Agency, this is roughly the amount of investment needed worldwide each year for the next 36 years to stave off the worst effects of global warming and keep the Earth habitable). In fact the investment in total, from 2015 to 2050 would be €1.4tn; €38.3bn/year, around 0.4% of the GDP every year up to 2050; from this point on, no additional investment would be needed and the plant would generate a revenue of €544bn per year.

Conclusions – Reflection

Is €38.3bn/year an expensive budget to neutralise 100% of the CO_2 emissions coming from the crude oil in the EU? Clearly not. This budget is not so much if we take into consideration that the economic impact of climate change can suppose expenditures of more than 5% of the GDP every year. There are also figures, unrelated to climate change, that put into perspective the investment needed – proving it is not as high as it seems. For example, the Mobile Apps sector has revenues of more than €38 bn/year, and €1.7tn is the annual worldwide budget for military expenditure... spreading peace is worth it, but so is stopping the effects of climate change.

The potential of the technology goes beyond the European Union, and does more than just reducing the CO_2 emissions coming from crude oil. Here, in figure 3, we can see an example of the worldwide CO_2 budget (before the non reversible global warming) and the effect of BFS blue technology in a global project.

Figure 3. Worldwide CO_2 Budget. Potential of BFS blue Technology to capture and neutralise the CO_2 emisions.

BFS blue

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Innovative Bioproducts

Viscofan BioEngineering combines natural sciences and engineering to provide innovative bioproducts as new solutions for cell biology, tissue engineering and regenerative medicine. Viscofan BioEngineering is a business unit within the food industry Viscofan (MCE:VIS) which has its headquarters in Spain and an annual turnover of €800M. Our main operations are located at Viscofan's subsidiary, Naturin Viscofan GmbH in Weinheim, Germany.

Our activities are focused on the industrial-scale production of bovine dermal very native collagen type 1, and its further development into products for cell biology and regenerative medicine. We offer an innovative ultrathin scaffold which consists of intact collagen fibrils and builds very stable film structures without the need for further cross-linking. The suitability and superior performance of these films for cell biological purposes has been thoroughly assessed in collaborations with a multitude of academic partners in Germany, Spain, France, Italy and the UK for various indications, such as myocardial infarction, age-related macular degeneration, wound care and urethra repair. Of particular relevance is our initiative in cardiac repair, where we use allogeneic hADSCs seeded on our collagen membrane to treat ventricular dysfunction from ischemic origin (Arana et al 2013, Arana et al 2014). These studies in rats and Göttingen pigs guarantee that our collagen membrane is a very convenient substrate for ADSC-based regenerative medicine approaches.

Viscofan BioEngineering is committed to co-developing new collagen-based solutions for regenerative medicine with research partners. We will soon be able to offer our collagen products in R&D and CE-certified grade to underpin this development. In an interesting example of corporate entrepreneurship, Viscofan BioEngineering is willing to take the lead in promoting the clinical development of collagen-based products bringing ATMPs (Advanced Therapy Medicinal Products) or medical devices to proof of concept stage in humans.

Viscofan BioEngineering provides a unique opportunity to develop regenerative medicine therapeutic approaches that can be easily transferred to the clinic. Viscofan BioEngineering is also willing to share its expertise in pan European policy-making initiatives and is currently involved in a Knowledge Innovation Community initiative addressing the topic of Healthcare Innovation. With the cooperation of top quality European researchers and the support of European and National funding institutions, we are willing to contribute to the growth of the regenerative medicine market in the coming years.

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Leadership with sustainability ethics

The vision for a sustainable global society requires a core value of ethics. Here, Douglas F Williamson of Earth Charter International outlines their role in promoting sustainable ethics and the training and education offered to achieve this goal...

For most people, sustainability or sustainable development tend to mean a focus on how human societies can balance people's needs, environmental protection, and economic health. Sometimes it is framed as "People, Planet, Profit". Most often, it is interpreted as a focus on environmental protection and conservation, and what compromises are fair to make between protecting the ecology and ensuring the adequate provision for human needs and desires. The Earth Charter perspective on sustainability is much deeper than that and considers a sustainability paradigm that balances society, the ecology, and the economy as a zero-sum game to be a shallow definition of sustainability.

The Earth Charter Center for Education for Sustainable Development in Costa Rica

The Earth Charter is a declaration of fundamental ethical values that comprises an emerging consensus vision of a sustainable global society. This vision resulted from a decade-long consultation process in the 1990s that included hundreds of organisations representing thousands, if not hundreds of thousands of individuals, all major faith and religious groups, including indigenous perspectives, and representatives from all sectors of human societies. No document has ever been drafted with such participation, and the inclusive process of the creation of the Earth Charter is a major basis for its legitimacy as the emerging global vision of a sustainable Earth Community.

What makes the Earth Charter vision of sustainability so valuable is its core ethics of respect, care, compassion, and the integral perspective of the interconnected nature of all life on Earth. The view of the Earth Charter is that all life is both interconnected and interdependent, that sustainability comprises not only compromising between ecology, economy, and society, but that it requires a constant attention to ecological integrity, social and economic justice, democracy, non-violence, and peace and that these are all part of the same system. The corruption of an official in Asia is just as unsustainable as the clear-cutting of a forest in South America, the shutting off of water in poor North American cities and the lack of educational opportunity in Africa. Achieving sustainability requires addressing all of these issues.

Principle 14 of the Earth Charter states, "Integrate into formal education and life-long learning the knowledge, values, and skills needed for a sustainable way of life." Within this principle are several sub-principles that focus on children and youth, inclusion of the arts and humanities along with science in sustainability education, the role of the media in awareness raising, and the importance of moral and spiritual education. This principle and its sub-principles are a main source of inspiration for what we do at Earth Charter International (ECI) and through the Earth Charter Center for Education for Sustainable Development in Costa Rica.

For the past decade, ECI has been actively helping international processes to solidify Education for Sustainable Development (ESD) practices, developing educational materials, and offering training and courses on a variety of topics related to sustainability. A key component of all of the Earth Charter educational programmes is the introduction of sustainability leadership training.

One of the most important sustainability leadership attributes is the ability to employ a set of integral and systemic values, such as the Earth Charter. Familiarity with the Earth Charter as a sustainability leadership tool is indispensable as it allows a leader to filter behaviors, choices, and strategic decision making through the high standard set by the Earth Charter. Using the Earth Charter, a sustainability leader will be able to take both long and short term views, see potential effects both locally and globally, and balance more fairly the multiple aspects and possible impacts of decisions from an interconnected sustainability perspective.

A good example of sustainability leadership using the Earth Charter is the City of Montpelier, the capital of Vermont, where the leaders used the Earth Charter to craft the city's 100-year Master Plan[1].

ECI has been running youth education programmes, mostly online, for almost a decade. These programmes attempt to unite young leaders from all around the world, and particularly from developing regions. These programmes all have a strong focus on sustainability leadership training. Since 2007, ECI has trained hundreds of young people and provided them with a variety of skills, including sustainability leadership capacities using the Earth Charter.

In 2012, ECI opened its training Center in Costa Rica, which operates under a UNESCO Chair for ESD. The Center offers short intensive training programmes, mostly targeting professionals in a variety of fields. In the first half of 2015, the Center is offering programmes, mostly in English but also some for Spanish speakers, on transformative learning and teaching for educators, on the systems view of life

Douglas F Williamson
Communications Manager

for private sector and governmental leaders, and on sustainability communications for emerging leaders, communicators, and CSR professionals. All of these programmes rely heavily on the Earth Charter as an ethical framework for sustainability, and all of them seek to augment the sustainability leadership capacity of their participants. ■

For more information on the Earth Charter and its programmes, visit www.earthcharter.org

[1] http://www.earthcharterinaction.org/content/articles/574/1/enVision-Montpelier-Sustainability-city-planning-with-the-Earth-Charter/Page1.html

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A need for leadership

Our global human society is at a crossroads. By continuing straight ahead on the current road we will adhere to the behavior of indiscriminate burning of fossil fuels. This behavior will cause CO_2 in the Earth's atmosphere to rise to 450 ppm (parts per million) by 2050, which, together with other greenhouse gases like methane, will cause the Earth's average temperature to increase by at least +2°C compared to its pre-1850 average. Without severe cutbacks in greenhouse gas emissions, by 2100 the CO_2 will reach 550 ppm and it is estimated that the average temperature will rise by +3°C compared to its pre-industrial level. These temperature increases are very high, meaning our society, as we know and desire it, will be unsustainable. Essentially, the road we are on ends at a cliff. We are already far along this road of severe increases and climate change, which will only become worse in the decades to come.

"What do we require for changes to happen? One central need is for leadership. Such leadership cannot be the result of simply occupying a position that exists, but rather is the result of a person who acts with conviction and dedication toward an unselfish goal and on behalf of the common good."

Over the last 400,000 years the CO_2 concentration in the Earth's atmosphere (as preserved in deep ice cores) has varied between 200 ppm and 275 ppm. At no time during that period has CO_2 been above 300 ppm. For 1000 years prior to circa 1850, the Earth's atmospheric CO_2 averaged narrowly around 275 ppm and the global climate during that time was relatively constant. Such stability allowed a flowering of the human community from 0.1 to 1.5 billion people and expansion to virtually all habitable land masses. In the last 150 years since 1850 we have grown to a society of over 7.3 billion people and are increasing at about 1 million every week. In the next 25 years we will add 2.5 billion more people. At the present time, as CO_2 shoots past 400 ppm (about 2.0 ppm increase per year), all ice forms on the Earth are melting to add freshwater to the oceans. This added water, together with the large thermal expansion of water already there, means that humans living in coastal areas (over 100 million within

1 meter of sea level) will have to relocate to higher elevations, resulting in a massive number of climate refugees to be cared for. They will have to move or else build expensive dikes to keep the water out.

Ocean rise is only one calamity that awaits us on this current road. More frequent and intensive storms will occur; food production will be complicated by droughts on one hand, or excessive flooding of cropland on the other; the spread of disease will occur more easily; energy requirements will skyrocket causing yet more CO_2 emissions; conflicts between people, both local and international, will become commonplace between people fighting for the necessities of life.

The net result of going down this road and over the cliff is an unsustainable society in chaos, one in which our children and their children will suffer much lower standards of living than we hope for them, their lives will be insecure and they will inevitably be forced to deviate from the values that mark a civilized society.

We need to take an alternate road, one different from the one paved with deregulated for-profit constant growth with its excessive reliance on burning fossil fuels to meet its insatiable appetite for energy. We have to cut back on our dependence on energy from fossil fuels and this means reducing our consumption of energy. We have to ramp up existing technologies which are based on renewable energy sources. And we must do this quickly. Each year we do not act hurls us closer to the cliff.

What do we require for changes to happen? One central need is for leadership. Such leadership cannot be the result of simply occupying a position that exists, but rather is the result of a person who acts with conviction and dedication toward an unselfish goal and on behalf of the common good. Leadership in climate change requires intelligence and imagination, both of which are necessary for proper vision. A leader must be a visionary, seeing clearly how people can get from point A to point B, and articulating this in terms that are understandable and suitable for the values held by the people being led. A leader is able to explain the "why" and the "how" of the needed changes and inspires others to work for the stated goal.

We know from past examples of leaders that they are people who have charisma. We mean by this that the leader has the strength of character, integrity and a deep and obvious dedication to do what is right. Like all human activities, however, there will be some people who view the leader as too aggressive in his/her desire for change. We do not need to look very hard for examples like Jesus and Gandhi, who were opposed because they were devoted to making changes certain people could not accept. The response to climate change will not be immune to such potential conflict. The changes needed for our society to turn away from systems and beliefs that have permeated virtually every aspect of our society will be significant; there will be groups of people, often powerful and entrenched in the current paradigm, who will be unwilling to follow a new road. And that means that the leader of society's response to climate change will have to have courage, and must be able to stand with resolve as others try to tear their vision down.

So where are such potential leaders today? I believe they exist in all levels and sectors of our society. They must be encouraged to step forward by the cries they hear from common people. When potential leaders appear, we must quickly evaluate their strengths of character and visions and, if found compelling, support them. Do we really have any other choice? Continuing the way we are headed is unsustainable and is doomed to chaos and extensive human suffering. Changing our path gives us the chance to create a new sustainable way of living.

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Mission: Foster Equitable Sustainable Futures

Accomplishing this mission requires a bedrock commitment to ensuring that humanity has the resources sustain its journey deep into time. All those on the journey ought to care for the disadvantaged, distant future generations and the global environment now and in the future. It requires the application of the full scope of human knowledge. It is a mission that should resonate with governments worldwide. It is also the mission statement for Three3, a non-profit research organization founded by Dr. Bruce Tonn and two colleagues, Erin Rose, MSSW, and Beth Hawkins, MSLA.

The statement also expresses the theme underpinning Tonn's exceptionally interdisciplinary research, which is essentially driven by two overarching concerns and an opportunity. To begin, Tonn, along with numerous philosophers and futurists, is concerned with meeting obligations to future generations. It is no small undertaking to embed concerns for future generations into everyday policy making. This is because sustainability policies with respect to future generations must embrace time frames that extend way beyond election cycles to hundreds of years and even thousands of millennia. Thus, a fundamental component of the concept of sustainability is concern about human survival. In recognition for his contributions to futures studies, he is now an Associate Editor of Futures, an Elsevier journal based in the UK.

Tonn's is also concerned about factors that prevent societies and their governments from implementing effective long-term policies to foster equitable sustainable futures. His graduate urban planning education at Harvard and Northwestern Universities impressed upon him the numerous barriers that prevent the achievement of this goal. Tonn's research with respect to this concern addresses institutional barriers and decision-making.

At the local level, Tonn and colleagues at the University of Tennessee, Knoxville (UTK) have worked with many economically distressed communities in Appalachia to overcome institutional barriers to sustainable development planning. These proud communities really want to preserve their environments and ways of life but often lack the political leadership. Tonn and his UTK colleagues also recently worked with four major cities in Tennessee to overcome institutional barriers to the installation of rooftop solar (e.g., multiple time consuming and uncoordinated approval processes). To help overcome barriers in both contexts, Tonn and the UTK team acted as neutral and technical experts in facilitating meetings to bring together community residents in one case and local power companies and staff from numerous municipal units in the other to develop sustainable development plans and work to streamline approval processes, respectively.

Tonn's sustainability decision-making research follows two paths. One path falls under the rubric of program evaluation, an activity that can provide important information to policy makers. For the past five years, he has headed up Oak Ridge National Laboratory's (ORNL) evaluations of the U.S. Department of Energy's low-income Weatherization Assistance Program (WAP). These rigorous and comprehensive evaluations indicate that the program saves energy, reduces low-income households' energy burdens, and yields a range of significant non-energy benefits (e.g., emissions reductions, improved occupant health). With respect to the evaluation of sustainability-related programs, Tonn offers these two observations: 1) policy makers need to value evaluation more highly; and 2) evaluations need to move well beyond desk audits of program outputs to go into the field to collect data to actually measure program outcomes.

'Tool development' is a catchall term to describe the second path, which encompasses methods, frameworks, and quantitative approaches needed to assist sustainability policy analysis. This area of research, maybe surprisingly, has offered Tonn numerous opportunities for innovation and creativity. With respect to climate change, Tonn is known for his equity-first approach to global carbon emissions and a multi-criteria method developed with a colleague at ORNL to attribute credit to countries for sequestering carbon in hardwood products. He has explored ways to better represent the huge uncertainties that plague long-term policy analyses. He and a UTK colleague developed a framework to help the Tennessee Valley Authority to strategically think about potential future environmental regulations and one for the New York State Energy Research and Development Authority to quantify the synergistic benefits accruing from their 40+ efficiency programs. For the U.S. Environmental Protection Agency, he developed a method to quantify the results of environmental scanning exercises and an innovative method to estimate the costs of remediating all of the hazardous waste sites in the U.S.

Given the lack of progress governments have made in meeting a host of global problems, including climate change, Tonn believes new technology is necessary for achieving long-term sustainability goals. Immersion in Silicon Valley as an undergraduate student in civil engineering at Stanford University and reflections upon the achievements of various tech savvy Stanford alumni, who founded Hewlett-Packard, Yahoo, and Google among many highly successful and transformative companies, inspires his technological optimism. His experience as a co-chair of a U.S. National Science Foundation panel on the convergence of science, knowledge and technology was quite uplifting. He visited IMEC in Leuven, Belgium, as well as to Korea and China, to meet with science and technology leaders. He was encouraged by the innovations shown to him during these trips and by progress being made to reshape research institutions, teams and careers to foster convergence.

To further his understanding of convergence and long-term sustainable futures, Tonn and colleagues have created innovative, convergent designs for sustainable communities, industrial ecosystems, national energy systems, and even a judicial system designed to be resilient to environmental catastrophes. One of the designs, called Willow Pond, which is a scenario of a totally sustainable American subdivision, appeared in a special issue on low-carbon futures of Futures that featured several papers from like-minded EU researchers.

Going forward, Tonn and his Three3 colleagues intend to expand their evaluation of the health benefits of low-income weatherization and work with communities around the world on resilience and sustainability issues. With respect to technology, they are interested in designing an integrated system of advanced and extremely affordable technologies to promote the self-sufficiency of low-income homes. Finally, they are working on integrating the concept of unintended consequences into their ethical frameworks related to obligations to future generations.

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The value of time

Olivier Lateltin, Head of the Swiss Geological Survey at swisstopo explains how time can impact our ever changing environment...

A quote made by the British statesman and author, Lord Chesterfield in the 1700s said – "I recommend that you take care of the minutes, for the hours will take care of themselves." Even in those days, man was occupied with the loss of time.

Nowadays, what counts is that which is digital, minimalistic and above all fast. We do not infrequently replace minutes with seconds and measure in thousands of seconds for example, when it comes to precision in sport or science. Nevertheless, what is the meaning of fast and what is slow?

Scientists have discovered that man does not recognise a millisecond gap between 2 notes as a pause – our detection limit is 3 milliseconds. That is equivalent to the wing beat of a house fly.

However, it also functions another way: the existence of time and space started 14 billion years ago. Initially, energy was concentrated in an infinitesimally small space, which has in the past been described by astronomers using various terms, in some models also as a single point. Then there was an explosion – the Big Bang – and the universe was born. The cause of this explosion is till today still unknown. There was neither light nor sound up until the time of this event. The Big Bang, which was indescribably short with its initial phase of 10^{-43} seconds, evades our powers of imagination. 10^{-43} seconds – that is a span of time which no human being can envisage, not even an astrophysicist. The physicists call this hint of nothingness Planck-time. It is the shortest possible duration according to our current understanding.

Geologists readily look back to the beginning of time. At that time, a period began in which the changes of the world lasted millions of years. The age of visible life started 542 million years ago. Hundreds of millions of years is therefore behind this geological evolution. The relatively short daytime and night time cycle divided up the immediate time scale, other changes occurred in an unimaginable time span of millions of years.

The Alps are still rising after millions of years – currently at a rate of approximately 1 to 2 millimeters per annum. This is about 10 times slower than the rate at which a tree trunk grows in diameter. Over the span of a million years, the Alps grow assuming a steady growth rate – by 1000 to 2000 meters. At the same time, they are being eroded at a similar rate by wind, water and ice. This would for example equate to a one to two meter thick layer of rock falling from each mountain peak over a period of a 1000 years.

Are the hours of the distant past the minutes of today? What is a second worth these days? That which we nowadays accomplish in minutes, often took our forefathers hours to achieve. Today we write letters in a short space of time using a computer and send them in a fraction of the time by email to the recipient. What happens to the time that we save as a result of this? Lord Chesterfield would today advise us to mind our seconds rather than our minutes in keeping with the spirit of modern times. ■

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Sustainable soil management: a global effort

Effective action is required to tackle soil degradation for our food security and sustainable development. Moujahed Achouri, Director of FAO Land and Water Division hosting the Global Soil Partnership sheds light on the efforts being made on an international scale on addressing sustainable soil management...

Soils constitute the foundation for healthy food production and thus contribute to food security globally and locally. There is an urgent need to address soils' sustainable management for feeding a growing population that is expected to reach 9.5 billion people by 2050.

In response to these challenges, a new body, the Global Soil Partnership (GSP) was put in place in 2012 by FAO and its members. It acts as a major vehicle to catalyse effective and concerted actions against soil degradation and promote sustainable soil management as a priority in relation to food security.

The mandate of the GSP is to improve governance of the planet's limited soil resources to guarantee healthy and productive soils for a food secure world and boost the provision of other essential ecosystem services, in accordance with the sovereign right of each State over its natural resources.

Why the Global Soil Partnership?

Soils constitute the foundation for food production and thus contribute to food security locally and globally. Despite the critical role that soil plays in people's lives, there is an alarming increasing degradation of soil resources due to inappropriate management practices. Recent findings show that one third of our global soils are facing moderate to severe degradation, affecting the productivity of one billion smallholders whose livelihoods depend on natural resources.

There is an urgent need for concerted efforts to ensure worldwide sustainable soils management, key to food security but also in order to face the challenges of climate change and competing demands over this resource. FAO's "State of the Land and Water Resources for Food and Agriculture" (SOLAW, 2012) estimates that on average only a 0.20 ha of arable and productive land will be available per person in 2020 compared to 0.43 ha in 1960. By 2050, only 0.10 ha may be available

if soil degradation is not significantly reduced.

It's exactly why, to address these concerns and respond to these challenges, that in 2012 FAO established the Global Soil Partnership, with the aim to advocate and promote sustainable soil management at all levels.

Sustainable Soil Management and GSP

The area of productive soil is limited and under increasing pressure from intensification and competing uses to satisfy demands of growing populations for diverse products: from croplands, to forests and pastures/rangeland, from settlement and infrastructure to raw materials. If soils are degraded, they are very difficult and costly to restore or rehabilitate within a human time frame. Therefore, sustainable soil management is simply a must.

Sustainable use of soils has been defined by the new World Soil Charter as: "Soil management is sustainable if the supporting, provisioning, regulating, and cultural services provided by soil are maintained or enhanced without significantly impairing either the soil functions that enable those services or biodiversity".

In this respect, the GSP is designed to raise awareness, contribute to the development of capacities, build on best available science, and facilitate the exchange of knowledge and technologies among stakeholders for the sustainable management and use of soil resources.

While there have been numerous regional and international projects, initiatives and actions in the past, the GSP aims to provide an international governance body to advocate for soils with a unified voice, coordinate soils' related initiatives among partners, and ensure that knowledge and soil's recognition are appropriately represented in the global dialogues and decision making processes.

The GSP is organised around 5 main pillars of action:

1. Promote sustainable management of soil resources;

2. Encourage investment, technical cooperation, policy, education awareness and extension in soils;

3. Promote targeted soil research and development focusing on identified gaps and priorities;

4. Enhance the quantity and quality of soil data and information; and

5. Support harmonization of methods, measurements and indicators for sustainable soil management, with a national validation that takes into account the differences of production systems and ecosystems.

The GSP's 5 pillars of action "strive to achieve a land degradation neutral world in the context of sustainable development" as agreed by the Rio+20 outcome document, as well as the "zero hunger challenge" proposed by the United Nations. Sustainable management of soil resources contributes directly and indirectly to all 3 Rio Conventions (UNFCCC, CBD and UNCCD) in terms of sustainable soil management, soil fertility and productivity, soil carbon fluxes, and soil biodiversity.

Opportunities to embrace

Soils, which have been overlooked for some time, are now under discussion in global agendas and are being given greater attention. The 5th December has been recently declared by the United Nations General Assembly as "World Soil Day" (WSD) while 2015 has been designated "International Year of Soils" (IYS2015) under the framework of the Global Soil Partnership. There is therefore, real momentum for a collaborative and effective action towards achieving sustainable soil management at country, regional and global levels, thus improving food security.

The IYS is to be a major platform for awareness raising. Its key objectives are:

- To achieve full recognition of the prominent contributions of soils to food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development;

- To promote effective policies and actions for the sustainable management and protection of soil resources;

"Sustainable use of soils has been defined by the new World Soil Charter as: "Soil management is sustainable if the supporting, provisioning, regulating, and cultural services provided by soil are maintained or enhanced without significantly impairing either the soil functions that enable those services or biodiversity."

- To sensitise decision-makers about the need for robust investment in sustainable soil management activities, to ensure healthy soils for different land users and population groups;

- To catalyse initiatives in connection with the Sustainable Development Goal (SDG) process and Post-2015 agenda;

- To advocate rapid enhancement of capacities and systems for soil information collection and monitoring at all levels (global, regional and national); and finally

- To create full awareness of all stakeholders about the fundamental roles of soils for human life.

Every activity that national governments, international organisations, academic institutions, NGOs, civil society and general public will carry out in connection with the WSD and IYS will play a role in mobilising the global community to take action towards sustainable soil management. A formal launch event of the IYS will be organised during the 69th session of the UN General Assembly on 5th December 2014 in New York to coincide with the first official World Soil Day. ■

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Experimental Poultry Centre

The Experimental Poultry Centre (Proefbedrijf Pluimveehouderij) is the provincial research institute for applied poultry research in Belgium.

The Experimental Poultry Centre performs open and neutral research in the same conditions as are used in commercial practice to keep laying hens and broilers. Theoretical knowledge is tested and demonstrated under field circumstances. There is a focus on poultry industry's efficiency and economic sustainability next to solutions for public concerns on animal welfare, both for laying hens and broilers.

Through direct communication with the poultry farmers, current topics can be investigated to address the present and upcoming questions and needs from the field. The Experimental Poultry Centre has all the necessary facilities for this purpose. We even cooperate with other research centres and poultry farmers. Besides we collaborate with experimental research for the biological poultry farm.

The Experimental Poultry Centre became an internationally respected centre for expertise that works closely with Flemish universities and other important national and international research centres. A team of experienced experts (6 researchers and 10 animal caretakers) can guarantee state-of-the-art practical poultry research.

In 2014, the Experimental Poultry Centre has opened its new laying hen and broiler houses. The complex now has a capacity for 37,600 broilers and 31,000 laying hens. This investment means the Experimental Centre is ready to play its role in Europe with future-oriented practical research.

Manager Johan Zoons says: 'The opening of these new stalls means we are ready to play our European role. We now have the infrastructure to research parameters which are revolutionary for poultry farming. These ultra-modern houses also enable us to look for answers relevant to today's sector, but also to anticipate future legislation and challenges. Together with new European partners, we hope to raise our research to even higher levels.'

The new broiler houses have space for 18,000 extra broilers. This raises the capacity of Experimental Poultry Centre to 37,600 broilers. The new stall consists of eight completely separate climate sections for 2,250 broilers in each case. Each section has a separate climate regulator, which also registers all climate data. Outdoor air comes in via openings in the house side wall. The air passes first through a conditioner zone where it can be heated or cooled. The outgoing air is sucked into two exhaust towers by means of ventilators. These towers have a space where it will be possible in the future to analyse techniques for air purification.

The new layer house has a capacity of 31,000 laying hens. They are accommodated in the most modern systems and are subdivided into 12 experimental departments:

- 4 departments with an aviary where the laying hens can move upwards within the system;
- 4 departments with an aviary where the laying hens can move upwards outside the system;
- 4 departments with furnished cages.

Each department has a separate climate control. Part of the incoming air can be heated by a heat exchanger. Outgoing air is sucked away via a central channel to an exhaust tower. This is a computerised system which provides enough fresh air with minimal energy consumption. This makes it possible to recycle the heat, dry fertiliser more efficiently, and research techniques to reduce the emission of fine dust, ammonia, and other harmful substances.

Eggs are collected automatically for each experimental group. This means the eggs in the various experimental groups can be compared to each other. They are transported via the central spindle belt to a brand new sorting and packing machine. This machine uses camera-technology to determine the quality of the eggs and it records this information for further analysis. After that, the eggs are sorted automatically and packed by one and the same machine. In 2014 the Experimental Poultry Centre opened new sheds for both laying hens and broilers at its location in Geel. The construction and use of the experimental sheds will be completely in line with the new European legislation.

The Experimental Poultry Centre invest in a strong dialog with the poultry farmers, in Flanders and abroad. Yearly lectures are given, newsletters and announcements are spread. They are your point of contact for every question about poultry farming.

The province of Antwerp

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Soil matters in Scotland

The Scottish Environment Protection Agency (SEPA) highlights the reason why soil is so crucial to society...

Soil is an integral part of our environmental, social and economic systems. It stores carbon, helps maintain the balance of gases in the air, protects water environments from contamination, and provides us with the basis for food and forestry production. Soil also regulates water flow and therefore influences flooding risks, preserves our cultural heritage and supports habitats and biodiversity. Despite these many functions, there is no over-arching Scottish or European legislation in place to protect it.

While soils are partly protected through other environmental legislation, (such as emission controls of air pollutants, which help control soil acidification), the importance of soil as a non-renewable resource needs to be more fully recognised by soil policy measures.

Soil organic matter is vitally important in terms of soil quality. This is because it increases the ability of soil to hold and supply nutrients and water, enhances soil structure and supports biodiversity.

Crucially, organic matter also acts as a significant carbon store, thus helping to mediate climate change. Scotland's soils are estimated to contain around 3,000 million tonnes (Mt) of carbon (C), of which peatlands contain about 1,600 Mt C. Loss of soil organic carbon in Scotland would therefore increase greenhouse gas emissions and further contribute to global warming.

Soil management also impacts on water quality. In the Scotland river basin district, a large number of water-courses have been identified as at risk of not meeting Water Framework Directive requirements due to diffuse pollution from agriculture. Annual losses from agriculture have been estimated to be around 46,000 tonnes of nitrogen, 2,800 tonnes of phosphorus and 774,000 tonnes of soils.

In May 2009, the Scottish government announced the first ever Scottish Soil Framework. Bringing together policy makers, regulators, soil scientists and land managers, the Framework has been formed specifically to "promote the sustainable management and protection of soils, consistent with the economic, social and environmental needs of Scotland".

The Scottish Soil Framework acts as an overview for soil protection in Scotland and while it does not set

out new policy measures, it does raise awareness of the need to improve policy integration across organisations. It identifies 13 'soil outcomes' to mitigate these risks and lists a wide range of actions which will contribute to achieving them.

In Scotland we have a strong track record in soil protection. Research shows our soils are generally in good shape, and this is due largely to the sustainable techniques employed by land managers. However, rising pressures on the land, such as the drive for higher agricultural output; more developments on soil including buildings; and the conversion of sensitive land areas for renewable energy, pose a growing risk to soil quality.

Climate change and loss of organic matter have been recognised as the most significant threats to Scottish soil quality, while other threats such as soil erosion, compaction and loss of biodiversity, may themselves be exacerbated by climate change.

The importance of protecting and enhancing Scotland's soils for the future is reinforced by the 2011 State of Scotland's soil report. It highlights the need for policy integration, the identification of gaps in knowledge and data and the role of environmental monitoring in trying to help fill in some of those gaps. It also describes how soil can be part of the solution to a number of challenges that the world faces, and describes a range of potential options for sustainable soil use and management. One of the key findings of the report is the need for a comprehensive soil monitoring programme in Scotland to provide us with a coherent view of the true condition of Scotland's soil. ■

SEPA
Scottish Environment Protection Agency

Scottish Environment Protection Agency (SEPA)
www.sepa.org.uk

Farmer ownership beyond the farm gate

The pig farming industry in Denmark is longstanding with 90% of pork produced exported worldwide. The Danish Agriculture & Food Council provides insight to how Danish pig farming has evolved over the years...

Since 1887, farmer ownership of the processing industry has been the bedrock in success of Danish pig production

Today Danish pork and bacon is enjoyed the world over. It is reckoned that Denmark, a comparatively small country with just 5 million inhabitants, produces enough food for a population of 15 million. Over 90% of the pork produced in Denmark today is exported to over 140 different countries.

Britain has a longstanding association with the Danish food industry and the first recorded shipment of Danish Bacon took place in 1847 and, apart from the inevitable interruption of the war years, Danish Bacon has been sizzling away in Britain every year since then. Danish Bacon was one of the first food products to be advertised on TV when commercial television was launched in Britain during the 1950s, and the famous strapline 'Good bacon has Danish written all over it' entered into advertising folklore.

It is recognised that the Danish co-operative model has been the bedrock in the long-term success of Danish agriculture. The first pig farmers' co-operative was established in Horsens in Jutland in 1887 and it quickly became the industry standard, where pig farmers are stakeholders in the production and processing of meat from their animals. Around 90% of pigs produced in Denmark still go to market via the co-operative system and, today, just 2 large co-operative organisations remain – Danish Crown and Tican.

For a pig farmer, being a member of a co-operative extends his interest 'beyond the farm gate' and the transparency inherent in the system allows trust to develop between the primary producer and the organisation to which he delivers his pigs. The co-operative ethos in Denmark has also encouraged the common funding of world-class research and development to make sure that the country's pig farmers remain at the leading edge of global competition.

The closer links between the farmer and his market-place means that Danish farmers are well placed to respond to new customer and consumer demands. New quality initiatives can be easily assimilated rapidly across the whole industry, once it has been decided that these are necessary. Good examples are the Danish industry programmes to control zoonotic bacteria, such as salmonella, and the many practical steps taken in recent years to eliminate unnecessary use of antibiotic medicines in pig production, as public concerns about the spread of antibiotic resistance have emerged. In both areas, Danish farmers have provided a template that other countries now seek to follow.

The Danish co-operative system operates comprehensive documentation throughout the production chain and is well placed to meet current requirements for more robust standards of traceability. The vast majority of farmers in Denmark deliver finished pigs to their local co-operative slaughterhouse on a weekly basis.

Concerns about the welfare of livestock have grown significantly in recent years, and the Danish pig industry has given priority to maintaining the high health status of its pig herd in order to produce thriving animals in systems, which deliver good welfare standards. All Danish pigs are produced within independently monitored assurance schemes, requiring a monthly visit by the local veterinarian. The Danish authorities also run an annual programme of 'unannounced' visits to ensure compliance with all welfare legislation.

The Danish industry runs a huge programme of farm-based research and development, which has a major focus on improving many aspects of the welfare of pigs reared in indoor systems. A good example is the testing of new systems for freedom farrowing. Traditional farrowing pens restricted the movement of sows during the period of lactation, but significantly reduced the risk of the sows crushing her young. The aim of the Danish research is to develop practicable systems, which allow the sows total freedom of movement without compromising the welfare of her piglets.

All livestock producers are facing increased pressures to limit the environmental impact of their production. The Danish pig industry has been subject to some of the strictest environmental legislation in Europe since the mid-1980s. These rules have included rigid limits on the number of animals that may be kept in relation to the land available for the spreading of manures, as well as detailed rules on its storage and application in the fields.

"Concerns about the welfare of livestock have grown significantly in recent years, and the Danish pig industry has given major priority to maintaining the high health status of its pig herd in order to produce thriving animals in systems, which deliver good welfare standards."

The Danish pig farmers can document significant improvements in achieving more sustainable production. They produce a kilogram of pork today with approximately half the environmental impact as that of 1985. Danish farmers lead the way in the application of new eco-efficient technologies to reduce the environmental impact of modern pig production and are committed to targets for further reduction in the years ahead.

As for the future, the Danes are confident about their bacon and pork industry. A shared commitment to achieve the highest standards 'across the board', founded on the Danish cooperative model, will continue to be at the heart of the Danish approach. ■

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Exporting Danish agricultural skills and turn-key solutions

Reputable Danish Agricultural College in potential and innovating partnership Exporting Danish Agricultural Education & total solutions

Old but still up front

Dalum Landbrugsskole – Dalum Academy of Agricultural Business Denmark – is Denmark's largest and oldest agricultural college – today a modern international college for further agricultural education with proud traditions and a historical atmosphere.

20% of Danish Ag-production is performed abroad

For more than 150 years vocational skills have been rooted in the Danish folk high school movement educating farmers for the future. The College situated in Odense, the heart of Denmark, provides all levels of Agricultural – management education. The fact that 20% of all agricultural production performed by Danish farmers and staff takes place abroad, calls for a strong international profile. It is likely that students, through study trips and international projects, become more confident working abroad and seeking management positions around the world for an Agricultural /Ag- business career.

Throughout the past 4-5 decades agriculture has developed considerably, constructing highly efficient, large scale production units based on excellent breeding material and technology, but also causing increasing impact to the environment.

Exporting experience and knowledge

The valuable knowledge and experience gained, has today become an export article in great demand from all over the world, expressed as a need for:

- Advanced technology
- Animal welfare systems
- Food safety systems
- Traceability certification
- Sustainability in all productions
- Environmental considerations
- Farm waste management and technology.

Dalum has developed its international profile through a broad global network of farm enterprises, colleges, politicians and organisations. Dalum has helped develop vocational training systems in the Baltics and Eastern Europe.

The Danish "Sandwich Model" alternating school education and farm apprentice, building up production and management skills gradually, has been transferred successfully to many countries.

Asian and African students

Throughout the year students from China, Korea, Japan, Nepal etc. interact with Danish and African students creating new and prosperous collaborations across borders and languages.

Lately Dalum, being a semi-public Vocational College, has joined forces with private enterprises promoting the "DANISH FARM CONCEPT".

International customers, governments and agricultural organisations are looking for turnkey solutions providing "All you need" to investors, including the education, follow up, mentoring, audits and progression set up through initial target settings and contracts.

Exporting valuable genetics, advanced technology, ventilation, storage, handling- and feeding systems as well as waste management calls for thorough and targeted education for the investment to be profitable.

The KZN-model

Currently a group of South African students from Kwa Zulu Natal province are taking part in a 10 month management program including 10 weeks on farms, exchanging valuable production and management tips from experienced Danish farmers.

The college hope that merging the best from both cultures, these students will be able to generate higher agricultural production and jobs in primary and secondary food chains on their return.

The ideal scenario could be a future pork or dairy production set up by a young South African farmer partnering with a senior Danish agricultural student and Danish/international investor. The Dalum College serves as a reach back and extension facility ensuring that the achieved knowledge, the genetics and technology brought back home will be used for a sustainable and environment-friendly production.

So far the initiative and export concept has gained a lot of political attention from countries like China and other South African provinces. The Danish and South African Ministers of Agriculture recently praised the model, at a seminar in Pretoria SA, as "an example to be followed", and support the program by governmental funding.

Model farm

Dalum Vice-president Mr Eric Wanscher is strengthening the international profile through the new partnership. Bringing international students to Denmark for inspiration and education is a valuable experience to be brought back, but it should never be left as the only initiative, he points out. It is absolutely necessary that this transfer of knowledge is used and maintained through cooperation with partner schools or by establishing model farms in collaboration with local organisations supporting these initiatives.

As the demand for food, sustainability and food safety grows, Dalum will continue exploring new opportunities around the world to share knowledge and know-how – but will always be founded in Denmark gaining experience from the world's best agricultural businesses and productions.

dalum landbrugsskole

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Animal nutrition in the company of physiology

The Kielanowski Institute of Animal Physiology and Nutrition (KIAP&N) of the Polish Academy of Sciences is one of the leading research centers, whose mission is to conduct fundamental and applied research in the fields of farm animal nutrition and physiology. Pigs and ruminants, as well as poultry and laboratory animals are the main subjects of interest. Studies are carried out by a staff that includes 9 professors and 25 researchers with doctoral and doctor habilitated degrees, working in five departments and two interdepartmental laboratories.

The Kielanowski Institute of Animal Physiology and Nutrition (KIAP&N) in Jablonna administrative and laboratory building

The studies related to animal nutrition encompass both physiological fundamentals and elements of feed science. Their objective is to determine the nutritional requirements of animals, which change as the result of genetic improvement and consumer expectations as to the health-promoting qualities of animal products. To reach these goals it is necessary to understand the metabolism of particular nutrients in the digestive tracts of animals, including the involvement of microorganisms colonizing its various sections, and the role of these nutrients in the metabolism of the animal itself. As the digestive tract is formed at an early age, the influence of various feed components on its development and functions is investigated, including the quality and quantity of protein, fiber and biologically active supplements.

A well-developed stream of research concerns modifying diets in order to obtain a functional product with health-promoting characteristics. This applies to supplementation of diets with vegetable and/or fish oil, as well as antioxidants protecting against oxidation of unsaturated fatty acids. The final meat product is to have a balanced omega-3 and omega-6 fatty acids ratio and a high nutritional value, thus playing a role in prevention of cardiovascular disease. It is also important that these health parameters could be maintained after food processing, since numerous treatments may reduce the health promoting traits.

An important social problem is the lack of acceptance for using feed containing genetically modified crops (GMO) for livestock. The results obtained at the KIAP&N showed the safety of GMO materials used in animal feeding, however it is possible to partially replace them with non-GMO legumes which meet expectations of substantial group of consumers. If we do not want humans to consume GMOs directly, the discussion on GMOs must include their favorable role in animal nutrition.

The main research areas on animal physiology are those related to the mechanisms regulating growth, maturation, and reproduction of animals, as well as the development of the structure and function of the digestive tract. The topics of studies include the activity of neural tracts at the central nervous system level and secretory activity of the pituitary gland and other endocrine tissues (gonads, adrenals, pineal gland, thyroid, and pancreas) in various physiological states.

Laboratory of Molecular Biology: mRNA isolation (top) and tissue sectioning (bottom)

The KIAP&N is a recognised entity in the study on the functioning of the hypothalamic-pituitary neuroendocrine axes of sheep and rats.

Much attention is being paid to environmental factors, especially those that disrupt the normal functioning of organism (nutritional deficit, stress, inflammation). Biologically active substances that are ingested with feeds and interact with endogenous regulatory compounds are also an important research topic. Modern research techniques, especially from the field of molecular biology and confocal microscopy make it possible to study cellular signalling pathways and the genes activated by them. Detailed knowledge about regulatory mechanisms may enable better control over important life functions and may also have a bearing on human physiology and be of value in the treatment of diseases stemming from the disordering of these mechanisms.

The KIAP&N conducts studies within the framework of projects financed by the Polish Ministry of Science and Higher Education, the National Research and Development Center, and the National Science Center. Some of the resources used to finance the Institute's research come from EU structural funds. Broad co-operation with scientific institutions in the country and abroad allows for the exchange of scientific ideas and experience in the implementation of those objectives.

The KIAP&N publishes its own quarterly international scientific journal, The Journal of Animal and Feed Sciences (IF = 0.591 for 2013), in which papers on animal nutrition, breeding and physiology, and feed science, submitted from Poland and abroad, are published. It has also authorised to confer the academic degree of PhD in agricultural sciences.

The KIAP&N is open to co-operation with scientific institutions, feed and food producers, as well as the pharmaceutical industry in terms of participating in research and implementation.

In 2016, The KIAP&N will be a co-organiser of the scientific conference 'The 5th EAAP International Symposium on Energy and Metabolism and Nutrition' to be held in Krakow, the former capital of Poland.

The Kielanowski Institute of Animal Physiology and Nutrition
Polish Academy of Sciences

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MORE for LESS regarding ammonia reduction

Very strict ammonia regulation will lead to few new jobs, compared to the wide range of jobs which will be moved to countries outside the European Union. The ventilation company Munters and the Danish Research Center for Pig Production have shown how optimal regulation with partial air cleaning instead of 100% air cleaning will create and maintain jobs in the livestock industry.

In a world-first, Munters has developed a relatively maintenance-free air cleaner for both poultry and swine. Many companies have solutions for pigs, however no companies have a relative maintenance-free solution for poultry. Normally, the greasy dust in a poultry facility can block the filters in the air cleaners. However, Munters has developed an air cleaner without filters. Once exhausted air from the poultry or pig house has passed through the air cleaner, the ammonia concentration is reduced by 80-90%.

Partial air cleaning

It is not necessary to clean all the air from a poultry house. In colder climates you will still get a huge ammonia reduction, even if you just clean part of the exhausted air.

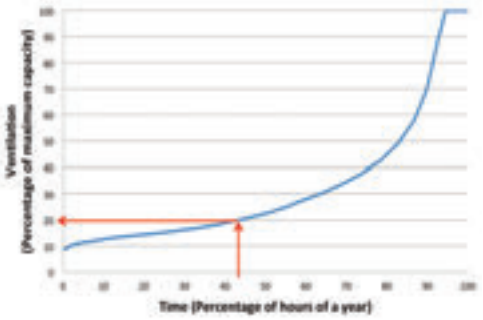
But what exactly is partial air cleaning and why do we get a huge reduction when we only clean a part of the air? Well, as previously stated – only a portion of the exhausted air is cleaned during partial cleaning. This means, when it is cold outside all air from the house is exhausted through the air

cleaner, but as the outside temperature gets warmer and the animals get bigger the fan in the air cleaner does not have sufficient capacity to maintain the desired temperature in the room, then the other fans in the house will start to run.

Let's take a layer house in northern Europe as an example. If the desired room temperature inside a house is 21°C and the total ventilation capacity is 10m³/h per bird, the ventilation will be running under 20% of full ventilation capacity for 40% of the yearly running time (see figure). This means that if you install an air cleaner to this house, which cleans the first 20% of the exhausted air, all air in the building will pass through the air cleaner for 40% of the yearly running time.

More for less

For farmers it is not economically viable to clean 100% of the air. Both the installation and running cost will be high. If the requirements to meet production get unrealistic the production of meat will move to areas in the world with less restrictions, therefore costing jobs in Europe, not to mention the fact that the green technology will not be used. Partly cleaning air, where the first part of the exhausted air



passes an air cleaner will be more economically realistic, and from an environmental point of view you will get cost efficient ammonia reduction without increased energy consumption.

Ammonia reduction

Let's again take the example from north Europe. Passing the first 20% of exhaust air from the layer house through the air cleaner with a cleaning efficiency of 80%, around 58% of the total amount of nitrogen that is normally discharged through the chimney is collected. For example, if the annual ammonia emission from the chimney is 3560kg from 13,000 birds, the air cleaner can thus collect 2060kg of ammonia.

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Agriculture and biodiversity – the importance of sustainable productivity

Gavin Whitmore, Biodiversity Manager at European Crop Protection Association (ECPA) sheds light on the global challenges that face the agriculture sector...

Farmers and an impressive array of agri food-chain actors provide us with a plentiful supply of safe, healthy and affordable food. European consumers, who are accustomed to this ready and steady availability of food are often unaware of the global challenges facing agriculture.

Agriculture has to produce more raw materials to satisfy the increasing and diversifying demands of a growing world population, which is expected to grow by more than a third (around 2.3 billion people) between 2009 and 2050; these figures are often repeated, and for good reason – the challenge they present to global food production is enormous. Projections show that feeding a world population of 9.1 billion people in 2050 will require raising overall food production by some 70% between 2005 and 2050.

Our demands on agriculture don't stop at production, the sector must also contribute to economic prosperity and the social wellbeing of rural areas, and help preserve natural resources such as land, water and biodiversity – in the face of pressures from urban expansion, industrialisation and a changing climate. There is also a pressing need to protect and restore the quality of existing farmland.

Highly productive and resource efficient agriculture mitigates the problems associated with all of these challenges, because it enables us to have more of everything – more crops, and more biodiversity and natural habitats.

Protect habitats, conserve biodiversity

Agriculture is a major contributor to land use change, which often implies the destruction of natural habitats – the single most important driver of biodiversity loss.

By protecting crops from pests and disease, farmers can optimise yields on the existing agricultural land base, make efficient use of resources (inc. fuel, time, and capital) and prevent the loss of natural habitat that occurs when agricultural land expands to compensate for crop losses.

Without crop protection, losses for certain crops can exceed 80% of potential yield, and low input farming – as typified by organic agriculture – is estimated as averaging up to 34% lower yields than productive agriculture within the EU.

If we wish to maintain and improve yields and make efficient use of natural resources, the use of plant protection products must continue; there are currently no viable alternatives to pesticide use in either conventional or organic farming. Efficient production technologies are imperative to allow us to close yield gaps; however, society must use these technologies in an appropriate way to ensure that agriculture plays a central role in delivering sustainable solutions.

No unacceptable affects on the environment

Pesticides are formulated to protect crops by discouraging, confusing, altering the behaviour, or killing target pests, diseases and pathogens. When we consider biodiversity protection, this raises questions about the impact on non-target species that may be unintentionally exposed to pesticides.

Modern pesticides are characterised by their high efficacy and targeted modes of action; the biologically active characteristics of pesticides that pose risk to non-target species are acknowledged and accommodated in European pesticide regulations. Pesticides are one of the most regulated product classes on the

European market, and the real drivers of the large-scale loss of biodiversity (including land use change) are not subject to regulation as rigorous as that applied to pesticides.

Science, research and development have given us sophisticated crop protection solutions. While their use is certainly not without risk, a sensible, risk-based approach to EU legislation ensures farmers have access to products that when used correctly have no unacceptable effects on their health or the environment. This same stringent legislation allows European consumers a high degree of confidence in the safety, availability and affordability of their food.

Supporting Best Management Practices for productivity and biodiversity protection

Our industry is committed to providing sustainable crop protection solutions; we believe that for agriculture to be sustainable, it must be efficient, productive and contribute to a resilient natural environment. We are acutely aware of society's demand that crops be produced with minimal environmental impact – and we know that this can only be achieved if farmers have access to appropriate tools and knowledge of best management practices.

The European crop protection industry is not directly engaged in the management of agricultural land, but industry led stewardship initiatives and outreach to key stakeholders see expertise in crop protection, risk management and biodiversity conservation come together to promote guidance on practices beneficial to both harvests and biodiversity.

Maintaining Europe's position as a world leader in agriculture

As society embraces the challenge of sustainable agriculture, there is growing consensus on the need to combine high agricultural productivity with well considered environmental protection; however, Europe's full potential will only be realised with ambitious science-based policy and political support for innovation. The combined challenges of agricultural production and biodiversity protection require that we exploit proven technologies whilst continuing to invest in the research and development of solutions for tomorrow.

Strong public support for biodiversity protection, a knowledgeable and passionate community of famers, and the engaged expertise of industry can be combined to make the rural environmental more biodiversity friendly and more productive.

We are always working to make things better; and believe that solution-oriented dialogue with farmers, public, and policy makers, is critical for a sustainable productive future and maintaining Europe's position as a world leader in agriculture. ■

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NC STATE UNIVERSITY

THE EVOLUTION OF YIELD IN CORN

Dr. Ronnie Heiniger
North Carolina State University

Why is Corn Yield so Important?

The key to feeding a growing world with less demand on scare resources and lower environmental impacts lies in increasing yield. Research has shown that increasing corn yield results in better efficiencies in nutrient and water use thanks to the fact that corn plants that yield more also have bigger root systems and more effective leaf area. The challenge for corn producers is to find management practices that allow them to maximize yield given the soil and environmental constraints they are operating with. Among the many management options that corn producers have what practices will provide the best return on investment in terms of increasing yield with the lowest cost and risk. This publication discusses some of the key principles and practices corn growers should consider when seeking to increase yield in corn.

It is All About Intercepting Light

At the most basic level corn is a starch factory that depends in turning light energy into starch. Therefore the most critical practice in managing for higher yield is maximizing light interception. There are three management practices that can be used to increase light interception. These are growing longer season hybrids, increasing seeding rate and plant population, and decreasing row spacing. Of these three the most effective practice is increasing seeding rate and plant population. While growing hybrids that require a longer growing period increases the amount of light intercepted it also increases water requirements and does not improve root mass or leaf efficiency. Using narrow rows only increases light interception for a short period of time. In contrast high plant populations increase light interception across the entire growing period, result in improved efficiency in light interception, and along with other key management practices increase root mass in the field. Figure 1 shows the impact of increasing plant density on the morphology of corn plants. As plant population increases the corn plant grows taller resulting in more effective placement of leaf area to intercept sunlight. This results in optimum yield potential. However, there is a limit to this response. As plant density increases so does the need for water and nutrients. When the demand for water and nutrients exceeds the ability of the environment to provide these to the plant the corn plant responds by reducing its height and yield potential is reduced. Note that in Figure 1 there is a narrow range of plant densities over which the plant reaches maximum height and productivity. Corn producers must precisely match plant population to the environment of the field.

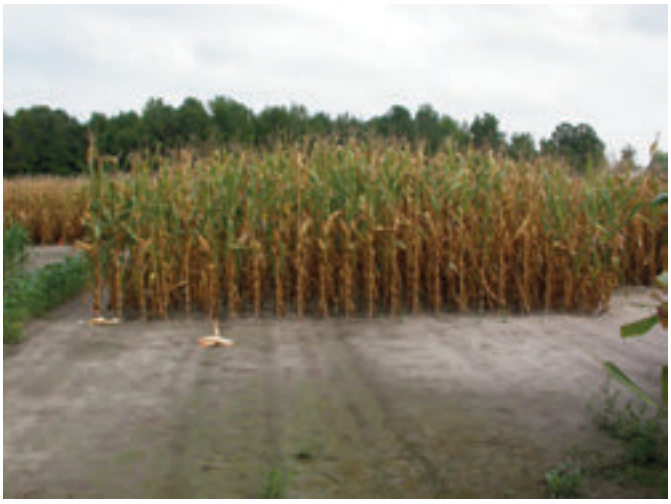

Figure 1. Change in plant density from 29,343 plants ha-1 on the left to 107,593 plants ha-1 on the right.

Supporting Plant Density with the Right Management Practices

As is apparent in Figure 1 planting at a higher seeding rate is not the only step producers should use to achieve higher yield. Higher plant densities result in individual plants that have smaller root systems and thinner stalks.

These negative effects must be compensated for. There are two key practices that must be used in a systems approach along with higher seeding rates to make higher corn yield possible. These two key practices are starter fertilizer and multiple applications of nitrogen. The root is the first plant part to be developed in the growth cycle of the corn plant. The faster the corn plant growers from germination to flowering the more root mass will be produced. Since the root system is the key to better nutrient and water use efficiency this is a critical component of a high yield corn plant. Starter fertilizer which contains small amounts of nitrogen and phosphorus increases the early growth of the corn plant (Figure 2). Research shows that increasing early growth by using starter fertilizer results in a plant with more root mass and thicker stalks overcoming the negative effects of higher plant populations.

Figure 2. No planting or starter fertilizer was used on the four-row plot on the left while 22.5 L ha-1 of 11-37-0 was applied in a 2 x 2 band at planting to the four-row plot on the right.

Likewise, a corn plant depends on nitrogen to maintain leaf chlorophyll levels and efficient conversion of light into starch. Unfortunately, most growers only apply nitrogen at the beginning of the season or, at most, twice at planting and again at canopy closure. Since nitrogen is mobile in the soil and subject to loss these applications often donít cover the full season nitrogen demands of the plant (Figure 3). Growers often apply more nitrogen than the plant actually needs to cover the fact that some nitrogen will be lost by the time the plant reaches the reproductive stages. A better system for producing high yield corn is to apply small Oamounts of nitrogen throughout the season. This approach allows growers to just meet the needs of the plant at a given time resulting in little or no waste while ensuring optimum growth and yield. Furthermore, nitrogen rates can be adjusted as the growing season progress to match changes in weather (particularly rainfall) resulting in maximum nitrogen use efficiency.

Figure 3. Nitrogen was applied at four different times during the growth cycle of the corn plant to the four-row plot on the right while nitrogen was only applied at planting to the four-row plot on the left.

In Summary – A High Yield Corn System

Capturing more light while increasing root mass and light use efficiency requires a systems approach to corn production. The future of high-yield corn production lies in precisely matching plant population with the environment of the field and then supporting that population with starter fertilizer and regular feeding with small amounts of nitrogen. This approach has the potential to increase yield resulting in less demand on land resources. Research at the Vernon G. James Research and Extension Center at North Carolina State University over the past three years documents that this systems approach consistently produced maximum corn yield ranging from 21.1 to 23.7 mt ha^{-1}. Only by using a systems approach can growers increase water and nutrient use efficiency in corn production resulting in better utilization of scarce resources and improving the amount of carbon fixed in a corn field resulting in less climate impacts.

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PANTHEON Farming is a complete farm management information system for all your record-keeping needs and with tools for fast and efficient decisions about daily tasks on your farm.

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Agricultural consulting

PANTHEON Farming opens new opportunities for agricultural consultants regarding the services they provide. They are no longer location-bound and can provide a whole range of new services.

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Modelling climate extremes

Prof Dr Henk W Broer and Dr Alef E Sterk from the Johann Bernoulli Institute for Mathematics and Computer Science, University of Groningen explain how mathematical modelling can be used to understand extreme weather events...

Extreme weather events cause severe damage. Examples are hurricane Sandy, windstorm Xynthia, and, more recently, the floods in southern England. Insurance companies need to reserve a sufficient amount of money to cover claims following an extreme weather event. Estimates of expected losses are determined by the tail width of the probability distribution describing the likelihood of extremes. Hence, computing accurate estimates of the tail width is an important challenge.

Mathematical modelling offers a fruitful approach towards an understanding of meteo-climatic extremes. Models for the atmospheric and oceanic circulation are typically derived from first principles, such as Newton's laws, conservation of energy, global balances, etc. This approach leads to a set of equations describing the temporal evolution of quantities like pressure, temperature, and wind speed. Often these equations can only be solved numerically using high performance computers. Subsequently the output of the model can be studied using statistical techniques.

The so-called Generalised Extreme Value (GEV) distribution describes the distribution of the large values observed in a time series. The GEV distribution is a universal model for the statistics of extremes in the sense that the underlying distribution of the data is irrelevant. Using the GEV one can compute the probability of the occurrence of future large values of a quantity, given a sample of past measurements. For that purpose, one must first estimate the parameters of the distribution. Of particular importance is the so-called tail index because it determines the tail width of the distribution and therefore the frequency and intensity of extreme events.

Estimates for the tail index are often obtained by the so-called block maximum method. In this method one divides a time series, either obtained from data or numerical simulations, in sufficiently long blocks. Under the assumption that the block maxima form a random sample drawn from a GEV distribution the parameters can be estimated using standard statistical methods. It is an open question how much data is needed in order to obtain an accurate estimate. Research has shown that already for very simple models the computation of the tail index requires prohibitively long time series. If this is also the case for state of the art climate models, then quantifying the extreme behaviour in such models might be a serious problem.

Future research could be aimed at developing novel techniques for estimating the tail index that do not rely on computing long time series. The first preliminary, but promising, results in this direction have already been obtained. The challenge is to extend their applicability to more complicated models eventually also including state of the art climate models. ■

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Iceland: their road to a low-carbon future

Climate change is one of humankind's greatest challenges in the coming decades and beyond. Sigurður Ingi Jóhannsson, Minister for the Environment and Natural Resources in Iceland highlights how the country is working towards combating it...

We are already seeing many changes in the natural environment caused by global warming. The latest IPCC assessment gives little comfort to those who hope that we may see global warming halting soon. We will have to adapt to the changes ahead, and we must try to halt the rate of change. The world is looking towards a new climate change agreement in Paris in 2015 to guide us in this.

How can we halt human-induced climate change? First and foremost by reducing the use of fossil fuels – and replace them with clean and renewable energy, because global demand for energy is not going down. A second priority is to halt deforestation and soil erosion, and reclaim vegetation where this is possible. Iceland is making progress on both these fronts, and we think we have a story to tell and expertise to share.

Almost all stationary energy – for electricity and heating – in Iceland comes from renewable sources, hydro and geothermal. This is mostly due to ample resources of renewable energy, but the government has also made it a priority to find ways to locate and utilise geothermal energy in rural areas in Iceland. This has resulted in the development of great expertise in this field; in science, engineering and utilisation of geothermal. Globally, Iceland is now amongst the leading contributors of expertise on geothermal energy. The United Nations University Geothermal Training Program has for over 3 decades strengthened geothermal development capacity in more than 40 countries.

Iceland's most recent initiative in this field is an Open Compact with the World Bank, which aims to enhance

Sigurður Ingi Jóhannsson
Minister for the Environment and Natural Resources

geothermal development in East Africa, along the Great African Rift Valley. There is much less focus on geothermal than for example wind and solar energy in the global discussion on clean and renewable energy. Indeed, accessible geothermal resources are not found everywhere. There is, however, huge potential globally, and the technology is tried and tested. Untapped geothermal capacity can benefit hundreds of millions of people around the world, much of it in the world's energy poorest regions.

Another area where Iceland has expertise to share is in the field of land restoration. Iceland's volcanic soil is very prone to erosion, and deforestation triggered a large-scale land erosion problem after settlement some 1100 years ago. Official government bodies have been fighting and reversing soil erosion and conducting reafforestation for over a century, with considerable success. A new United Nations University Land Restoration Training Programme in Iceland shares that expertise with trainees from developing countries. Afforestation and revegetation are important parts of Iceland's climate mitigation programme. Iceland has also brought the issue of wetlands to the global climate negotiations. Draining of peat-rich wetlands results in carbon emissions to the atmosphere, and reclaiming such wetlands reverses this process. Iceland is now formulating an initiative to reclaim wetlands in Iceland, which will benefit both the climate and biodiversity.

Iceland is at the edge of the Arctic, and feels the impact of climate change in the northernmost regions of the world. We can even see the effects, as our glaciers are retreating. Other effects are less visible, but perhaps more profound. Ocean acidification is of great concern for Iceland. We still know too little about the likely impacts of acidification on marine life, but there are clear reasons to worry. There is no known remedy for ocean acidification except to limit carbon emissions.

The sea ice north of Iceland, and in the Arctic as a whole, is also retreating. This is a worrying trend, but also a development we must adapt to. Shipping is increasing in the Arctic, and it is possible that we will see an opening of shipping lanes for large-scale transport at some point in the coming decades. We must prepare for such possibilities. The risk of accidents and oil-spills must be addressed, as well as other threats to the fragile ecosystems of the Arctic. Iceland is an active participant in the Arctic Council and works with other countries in the region to prepare for changes ahead, and to minimise adverse impacts of increased economic activity.

Iceland's greenhouse gas emissions are only 0,01% of global emissions. Even if Iceland would cease its emissions altogether tomorrow it would matter little in the global context. Iceland can, however, have an impact by championing climate-friendly technologies where it has expertise, like in geothermal energy and land restoration. Iceland will of course shoulder its responsibility in the UN Climate Convention, in the Paris conference in 2015 and beyond. We will continue on our road towards a low-carbon future, and seek for practical ways to reach that goal soon, by learning from others and by sharing our experience. ■

Sigurður Ingi Jóhannsson
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United Nations University Fisheries Training Programme

Institutional Capacity Building in Fisheries

The UNU-FTP was established in Iceland in 1998 and is managed as a collaborative effort among research institutes and universities in Iceland. Through its training activities, the UNU-FTP works to enhance institutional and individual capacity in developing countries to achieve their developmental goals in fisheries and use living aquatic resources in a sustainable way. The UNU-FTP aims to serve as a global competency center for applied, post-graduate level academic training which addresses real-world challenges in fisheries development. The six month training, as described here: www.unuftp.is/en/programme-structure, is an opportunity for practicing professionals from developing countries to gain a global understanding of fisheries and work toward solving pressing issues from home.

Poor handling and preservation of fish can lead to food borne illnesses and diminish nutritional benefits usually gained from eating fish. Seen here are women drying small pelagic fish in the sand of the beaches of Lake Victoria in Tanzania. Post-harvest losses are high and the fish contaminated by dirt and fecal bacteria.

Among the largest challenges in fisheries in less developed countries are significant post-harvest losses. These can be direct losses due to birds, rodents and insects, but more important are nutritional and economic losses attributable to poor fish handling and preservation practices. Some estimates are as high as 30% of the potential value of fisheries is lost post-harvest.

Fish is critical for nutritional security and livelihoods in many impoverished nations. FAO estimates that fish constitutes roughly 20% of the animal protein consumed in developing countries. The proportion is even higher in LIFDCs, where an estimated 25% of animal protein comes from fish. Sustainable fisheries development is a path to improve the livelihoods and incomes of poor communities. It is estimated that roughly 10% of the global population depends to a large extent on fisheries and aquaculture for its livelihood.

Beyond protein, fish provides vital micronutrients such as iron, Omega 3 fatty acids, and vitamin A. Micronutrient deficiencies and malnutrition are particularly devastating for pregnant women and young children as it may compromise their ability to develop to their full mental and physical potential. The societal costs of illnesses associated with micronutrient deficiency are high, and in recent years, international agencies like the FAO have emphasised food-based solutions, including fish.

Given the urgent need to improve nutritional security, food safety and develop export earnings in developing countries, the Quality Management in Fish Handling and Processing line of specialisation offered through the UNU-FTP has run every year since the programme began in 1998. This work is undertaken in cooperation with the Matís Food and Biotechnology Research laboratory in Iceland.

A total of 96 fellows from 30 countries have undertaken specialist studies

Matís is a governmentally owned, independent research company, founded in 2007 following the merger of three former public research institutes. The company focuses on research and development in the food and biotechnology industries and provides consultation all over the globe to companies in the food industry, especially in the marine sector. For more, visit www.matis.is/english

This combined solar smoking and drying unit was designed through collaboration with Matís. It requires far less wood than conventional smoking and drying methods and improves the quality and safety of the product. Demonstration units have been constructed and tested in short courses held in Kenya and Tanzania as seen in this video: http://www.youtube.com/watch?v=WZE64ssYgjY

relating to quality management in fish handling and processing. These fellows have produced a variety of individual research projects. As building access to export markets is an important part of fisheries development strategies in many countries, it is common for fellows to carry out research related to fisheries inspection with a focus on pathways to meet standards for high value export markets like the EU, US, and Japan. Increasingly, fellows choose to research safety, improved handling technologies and value addition potential. Through its scholarship programme for former fellows, the UNU-FTP aims to develop research capacity in our partner countries. To date, the UNU-FTP has funded five Master's and six PhD studies in the area of food science.

The UNU-FTP has together with partners in developing countries and international partners developed and delivered a large number of short courses in partner countries. Though the UNU-FTP is primarily financed through the Icelandic ODA budget, many activities are co-financed by others. The UNU-FTP has conducted eight courses on topics of quality management in fish handling and processing and inspection in five partner countries, training more than 260 people.

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Fisheries Training Programme

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Blue Growth – A better future

The oceans can play an important role in global food security. Elisabeth Aspaker, Minister of Fisheries in Norway explains how the nation is contributing to this...

Norway is a country with a small population, located in the far northern corner of Europe. However, the ocean area of Norway is vast, more than 6 times the land area and in terms of living marine resources Norway is one of the most productive countries in the world. Norway has a long tradition for harvesting from our seas and oceans, and over the last 40 years we have also developed a successful aquaculture industry and a high level of expertise within the marine sector and biotechnology.

The oceans role in food security

The oceans cover 70% of the earth's surface, and will become increasingly more important in food production. According to a United Nations report, the current world population of about 7.3 billion is projected to reach 8.1 billion in 2025, and 9.6 billion in 2050, with most of the population growth occurring in developing regions. Ensuring adequate food and nutrition security to this growing population is a daunting challenge.

The oceans can play an important role in global food security. This was highlighted in the UN Declaration "The Future We Want" in Rio de Janeiro in 2012. The term food security has been defined as "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO 2014). The fisheries

and aquaculture sector already plays a prominent role in global food security, and offers a valuable and nutritious contribution to diversified and healthy diets.

The oceans are an important source for food production, and coastal regions already account for 40% of the gross domestic productions of Europe, but a sustainable use of ocean resources will only be successful if conducted within a framework of international cooperation.

"The oceans can play an important role in global food security. This was highlighted in the UN Declaration "The Future We Want" in Rio de Janeiro in 2012."

The challenges are also substantial. The environmental status of our oceans, climate change, ecosystem management, and sustainability are some of the challenges that need to be addressed. Improving the understanding of causes and effects in these systems is so demanding that they call for concerted efforts.

New blue growth in Europe

Norway is part of the internal market through the European Economic Area agreement, and we have been involved in the development of the maritime policy of the European Union. EUs integrated marine and maritime policies put wealth creation from the seas and oceans at its heart, whilst at the same time addressing challenges caused by pollution, overexploitation and climate change.

European governments and institutions must contribute by providing the necessary regulatory framework as well as the funding for projects. In Norway we are considering to develop a new centre for maritime research and education – Ocean Space Centre. The project will support the objectives of Horizon 2020 and increase the volume and quality of RDI in ocean space technology in Europe.

The EU's new programme Horizon2020 facilitates international marine and maritime research. Norway supports and partakes in this new research programme. The Norwegian government has decided that Norway will take an active role in the joint programming initiative on "Healthy and Productive Seas and Oceans".

The great potential of our oceans require great responsibility, and the management of our seas and oceans needs to be based on sound science and international cooperation.

The oceans have potential for producing more food and other products from renewable resource, but I think the future holds promises for an increased blue growth and we must harvest the opportunities. ■

Elisabeth Aspaker
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Super Chilling is forward thinking

A revolutionary technique by Icelandic pioneers of Skaginn welcomed by the seafood industry

Super Chilling is a fish processing technique developed by the Icelandic pioneers of Skaginn. Tests have confirmed that by using the Super Chilling technique the shelf life of products can be up to doubled. An environmentally friendly solution, Skaginn's mission is also to minimise, even eliminate, the use of ice for cooling. Currently undergoing a patenting process, the revolutionary technique has already thrust Skaginn into the limelight as one of the seafood industry's brightest innovators of the modern era.

The quality challenge

The quality of seafood caught in the pristine waters around Iceland has been well documented for decades. Adequate on board chilling methods immediately after catch – the importance of which has been outlined by various Icelandic scientists and their counterparts the world over – is now a pivotal element in the catching process. Through the Super Chilling technique the initial quality loss, mainly explained by autolytic changes, is significantly slowed down.

While temperature mapping of chilled supply chains has underlined the importance of thermal protection of packaging during transport and storage, especially in air transportation chains, a rising demand for fresh seafood products has presented local seafood processing companies with a challenge. The sheer distance from Iceland to its most important markets presents a major logistical hurdle. Acknowledging the importance of the initial cooling process at sea in maintaining product quality, this was a challenge eagerly embraced by Skaginn's team of specialists. The result is the company's Super Chilling technique that is now taking the seafood industry by storm.

Added product value

Driven by the ingenuity and innovational vision of its co-founder and now pioneer CEO, Skaginn's Super Chilling solutions offer a range of benefits. Through highly automated features, Super Chilling increases yield, preserves quality and adds to product value. The efficient processing – now with a revolutionary high speed, gentle handling, quality controlled weighing and packing system – eliminates all unnecessary product transport.

Reduced carbon footprint

Skaginn's Super Chilling technique makes a significant contribution to product quality and shelf life. As a consequence, the rigor process onboard is slowed down resulting in firmer flesh. By using the Super Chilling technique, the desired temperature of -1°C is reached in just one hour, whereas chilling down to 0°C by traditional cooling methods with ice can take up to 48 hours.

Moreover, the technique reduces carbon footprint through various benficial factors. With the Super Chilling technique on board, vessels do not need to store ice for cooling. A lighter vessel subsequently saves fuel. The technique also means fishing vessels can extend their stay at sea up to 72 hours and double their catch. Fewer trips to the fishing grounds contribute to a significant reduction in

A line of hi-tech freezers from Skaginn and affiliates at a modern pelagic processing plant in Eastern Iceland.

the use of fuel while optimising the investment in the vessel and the equipment on board.

The Super Chilling technique

Through a patented technology, the Super Chilling technique on land involves superchilling the skin side of fillets through a freezer tunnel on a Teflon coated aluminium conveyor belt at a temperature of approximately -8°C and simultaneously blasting cold air over the fillets, allowing for a rapid lowering of fillet temperature down to -1°C.

Prior to Super Chilling the fillet goes through fluid-ice with about 2.5% salt content to avoid freezing of the flesh in the tunnel. This process facilitates further handling of the fillets, in particular deskinning and effective cooling prior to packaging. A report by Matís, Icelandic Fisheries Laboratories, confirms tests have reveleaed that the Super Chilling treatment of fillets contributes to a slower quality degradation rate at early stage, extending the freshness period of the product and its shelf life.*

Tailor made solutions

Already an industry leader in Iceland when it comes to efficient pelagic processing, freezing and chilling solutions, Skaginn's growing reputation for its adaptability to tailor make solutions to individual assignments if needed, is fast establishing the company as a key player in a fiercely competitive international environment. Skaginn's recent acquisition of an 80% stake in 3X Technology – another leader in its field in Iceland – has further fortified its position, coupled with an 1800 square metre expansion of its manufacturing facilities. The two companies, established in traditional Icelandic fishing towns, have a history of co-operation on a range of projects, making closer ties between them a logical progression.

Volumes replaced by values

Iceland's fishing industry has been through some tough years, emerging as not only one of the most modern in existence, but also one of the most progressive. When quotas are tight, values replace volumes. In an industry where there are no state subsidies and no safety net to fall back on, you have to push hard, break with convention, sometimes forgo tradition and break new ground. These are exactly the values that have driven Skaginn's innovative approach.

About Skaginn

Founded in 1998, the company's roots lie in the fishing industry, initially as a specialised department of the local shipyard in Akranes in West Iceland. Goundwork for the the development of sophisticated hi-tech solutions within the seafood industry simultaneously opened up channels into the meat and poultry industries. Skaginn's products include Pelagic Processing Solutions, IQF Freezers, Automatic Box Freezers, Fluid Ice Systems, Tup Tippers, Ice Clean cleaning systems and more.

Skaginn's co-founder and now principal owner and CEO is Ingólfur Árnason. The company and its affiliates currently employ a staff of around 170.

* Matís: Overview on fish quality research. Impact of fish handling, processing, storage and logistics on fish quality deterioration. (Matís Report 39-10)

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Arctic Frontiers, a channel for cooperation

As the relationship between Russia and the West is growing colder, Norwegian research company Akvaplan-niva and the Russian Geographical Society are keeping the dialogue warm. With the signing of an agreement to collaborate on further development of the two arctic conferences Arctic Frontiers and the Arctic – Territory for Dialogue the scene is set for a long lasting channel between Russia and the West.

Let us go back 22 years

Late July 1992, the Akvaplan-niva researchers left Norway for a voyage to the eastern Barents Sea and the Kara Sea. For 70 years this kind of voyage with participants from the neighboring countries Norway and Russia had been impossible. With our scientific colleagues from the Academy of Science, Murmansk Marine Biological Institute, we set off to study the marine life in the Russian arctic seas for 4 weeks. We visited seas and islands where Norwegian trappers and fishermen used to travel before the First World War. We landed on Novaya Zemlya, and visited the infamous testing ground for nuclear weapons during the Cold War for joint studies of radioactivity. Later the same year our Russian colleagues went with us to Svalbard to study the environmental situation at the Norwegian and Russian settlements on this northern Norwegian archipelago.

Pomor Trade

Before the Russian Revolution closed the border, the social and business contact between Norway and Russia in the north had been very important for both parties for several hundred years. It was named the "Pomor Trade" after the Russian settlements at the White Sea. The expedition in 1992 was later to be copied by many, and is an example of the re-opening of a closed border.

Ukraine crises

In the spring of 2014 the world watched in surprise as the Ukraine crisis developed very quickly – apparently from nothing. Soon the two closely related countries, Ukraine and Russia were almost at a state of war. Russia annexed the Crimea peninsula, and backed the separatists in eastern Ukraine politically; equipment and volunteers crossed the border. As a result the west boycotted Russia, and Russia launched a contra boycott towards the western countries. Very rapidly much of the business and research cooperation came to a standstill. This was also the case across the Norwegian-Russian border.

A need for dialogue

Akvaplan-niva and the Russian Geographical Society entered an agreement the 9th of September this year aimed at keeping up the dialogue. One of the measures is strengthening the two most important Arctic conferences, Arctic Frontiers taking place in Tromsø, Norway, and Arctic – Territory of Dialogue arranged in Russia.

Climate and Energy

Arctic Frontiers has ran annually since 2007. Every year, the Russian delegation of businessmen, politicians and scientists and NGO's has been the second largest after the Norwegian event. The theme for January 2015 is "Climate and Energy", and will discuss main issues and challenges presented by the IPCC, including how to achieve the necessary cuts in emissions of climate gasses as well as energy security. The aim is to be a stepping stone towards the COP 21 meeting in Paris in the autumn 2015.

A channel for cooperation

The Arctic is facing increased interest from a growing number of actors. Some have an arctic history, and some are new to the region. Some call for industrial development and exploitation of the vast arctic resources, and some call for preservation. Both Arctic Frontiers and the Arctic – Territory for Dialogue are arenas where these interests meet and different views on arctic development are discussed. It is in the interest of both Europe and Russia to continue the cooperation. Europe needs Russia and Russia needs Europe. The Arctic is an arena of interest to many countries; Arctic Frontiers is a channel for cooperation.

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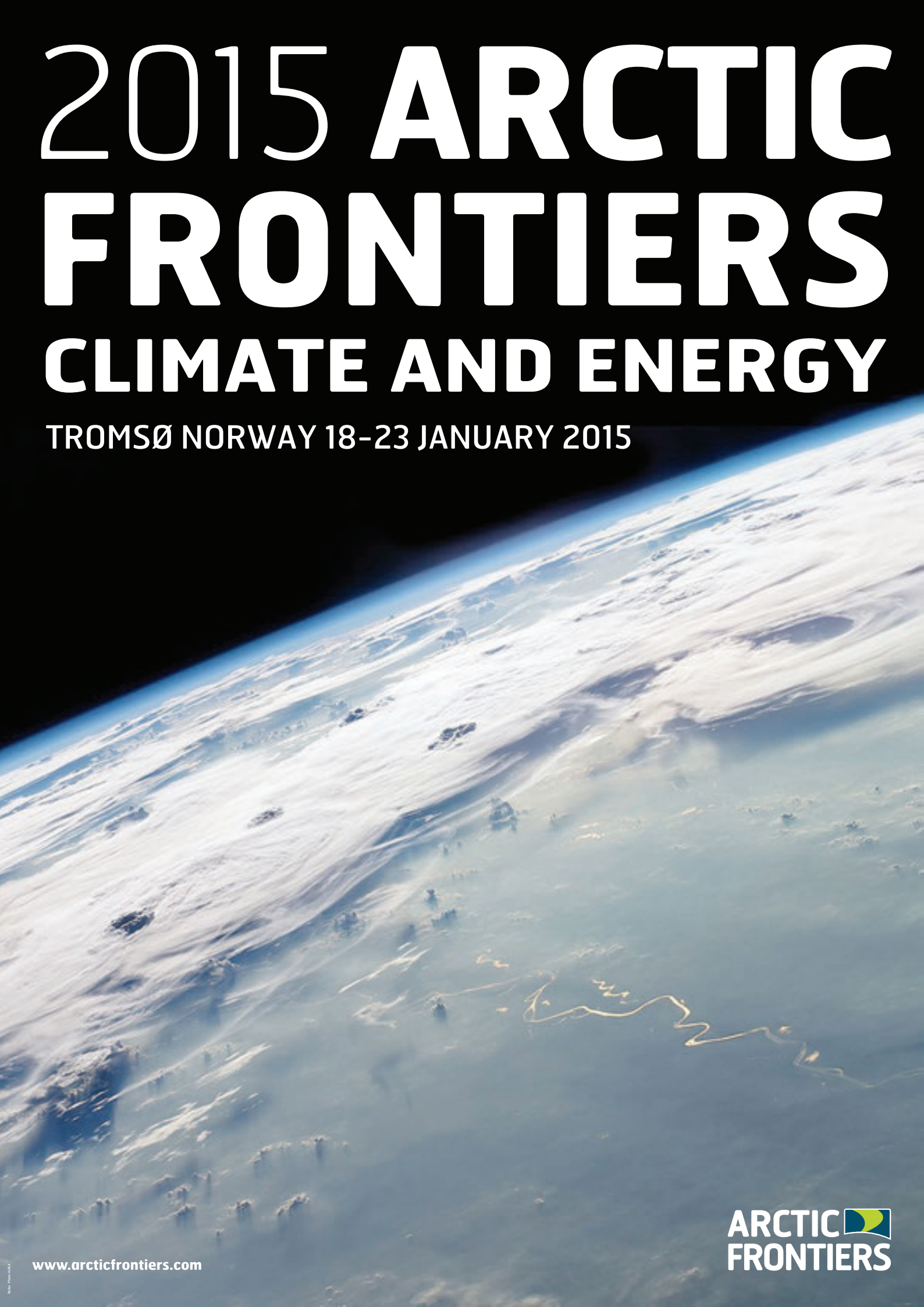

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ARCTIC FRONTIERS

LNG plant in Hammerfest, Norway. Installations process the natural gas from the Barents Sea shelf. The plant is considered to be one of the most technologically advanced installation of its kind in operation

Image: © GettyImages

Understanding extractives in the Arctic: reality check

Adam Stępień, a Researcher at the Arctic Centre, University of Lapland discusses how changes in the Arctic environment have impacted on extractives...

Over the last years much has been said about the extractive industries bonanza emerging in the Arctic as a result of climate change. Indeed, the changes in sea-ice, terrestrial snow and ice cover, thawing permafrost, and shifts in ecosystems amount to profound transformation of region's landscape. Against this background, media, policy-makers and some researchers claim that the melting Arctic Ocean sea ice is opening the Arctic to intensive resource extraction, especially in unexplored offshore areas within Arctic states' exclusive economic zones.

The 2008 estimates produced by the US Geological Survey[1] suggested that the Arctic holds 13% of the world's undiscovered but recoverable oil reserves and 30% of the natural gas reserves. It is rarely remembered that this landmark, albeit dated study was based on statistical probability rather than field data. Nevertheless, together with consecutive September sea ice minima and the process of defining extent of Arctic states' continental shelves, it has resulted in an increased interest in Arctic resources. The "Arctic boom" was supposed to be just round the corner. However, the reality has not matched the enthusiastic or grievous – depending on the point of view – narratives.

"While climate change is seen by many as a key factor shaping Arctic extractive industries, so far its role has been chiefly symbolic. One exception is the predicted increase in Arctic marine shipping, facilitating the transport of Arctic resources."

First, and rather obvious, any analysis needs to distinguish between onshore and offshore activities, oil, gas and particular minerals, as well as between Arctic regions. The Arctic is not a uniform space and each activity has specific dynamics and impacts. Second, the pace of developments and expectations for the future are generally moderate. Low gas prices derailed major schemes such as Stockman offshore gas project in the Russian Barents waters. Oil exploration off the

Greenlandic coast or in the Barents Sea has been so far disappointing, even if these areas have high potential. Shell has encountered numerous technical problems during exploration activities in Alaskan waters. In Fennoscandia and Greenland, the earlier notion of approaching mining boom is now replaced by the perception of crisis due to falling prices of minerals.

The exploration and exploitation in the Arctic are relatively costly and connected with major environmental risks. Environmental organisations and local, especially indigenous, communities are often terrified with the prospect of a major oil spill or a mining accident occurring in the fragile Arctic environment. Despite the technological progress, the companies have had limited success in convincingly responding to these concerns. In terms of offshore oil extraction, the industry itself appears to be very cautious and following a step-by-step approach.

While climate change is seen by many as a key factor shaping Arctic extractive industries, so far its role has been chiefly symbolic. One exception is the predicted increase in Arctic marine shipping, facilitating the transport of Arctic resources. For terrestrial activities climate change may be a challenge rather than an opportunity as the winter roads – dependent on snow and ice conditions – are crucial for accessibility in remote Arctic locations.

Therefore, not climate change but the demand for Arctic resources constitutes the key driver for developments. That has practical consequences: the boom and bust character of extractive industries as well as disadvantaged position of local actors in relation to powerful market forces.

Demand is not an omnipotent force, as political decision and regulatory frameworks prove critical. For example, the opening of new areas for hydrocarbon exploration (e.g., in the Barents Sea or Alaskan waters) is always a political choice. Arctic states have made much effort to create regulatory frameworks conducive to extractive activities. This has been for instance the case in Sweden and Finland, which, as a result, ranked top among mining jurisdictions in an industry survey by the Canadian Fraser Institute.[2]

Despite the perception of Arctic regions as remote, sparsely populated and underdeveloped, and despite numerous environmental risks, it is the social issues rather than environmental considerations that are usually pivotal for decision-making. Resource developments are often seen as an answer to social ills troubling northern communities, including unemployment, poor quality of social services and dependence on governmental transfers. Those involved in nature-based activities, such as reindeer herders or fishermen, are usually far less enthusiastic. Although the Arctic is in general free from volatile conflicts fueled by resources, extractive developments exacerbate tensions, often dividing northern communities. Even for offshore activities, the community context needs to be taken into account due to onshore installations and interactions with livelihoods such as fishing or subsistence game harvesting.

Increasingly, it would seem, the long-term perspective is taken into account. Boom and bust cycles, the socio-economic role of nature-based activities, the economic and intrinsic value of Arctic nature become again a part of the equation. The Arctic will see numerous extractive projects in the future, but not without challenges for the companies, Arctic environment and northern communities. ■

The article is based on the European Commission-funded report 'Strategic Assessment of Development of the Arctic' (www.arcticinfo.eu/sada).

[1] http://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf

[2] http://www.fraserinstitute.org/uploadedFiles/fraser-ca/Content/research-news/research/publications/mining-survey-2013.pdf

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Breaking the ice

Arctech Helsinki Shipyard Inc. specialises in building icebreakers and other arctic offshore and special vessels. The shipyard is a forerunner in developing and applying technological innovations and has 150 years' experience in shipbuilding. The first vessel classified as an icebreaker was delivered more than a century ago. Today about 60% of the world's icebreakers have been built by Helsinki Shipyards.

The growing interest towards Arctic oil and gas resources has increased demand of all types of vessels capable of operating in ice. Arctech's building dock accomodates the building of vessels up to panama size, however Arctech's main focus is on smaller vessels eg. icebreakers and icebreaking offshore vessels, supply vessels, stand-by vessels, and construction vessels. These can be built with any ice class, from 'low' Finnish-Swedish ice classes to the 'highest' polar classes.

PSV and SBV for Sovcomflot

Arctech delivered two icebreaking platform supply vessels Vitus Bering and Alexey Chirikov to Sovcomflot, the biggest Russian shipping company, in 2012 and 2013. Earlier this year Arctech signed four new contracts with Sovcomflot. First Arctech were awarded a contract concerning one platform supply vessel based on a further developed design of Vitus Bering and Alexey Chirikov. Then Arctech signed three more contracts for stand by vessels. These are based on a concept design developed by Aker Arctic Technology Oy.

PSV for Sovcomflot

The new vessel will be built for the North East Sakhalin Offshore region oil and gas field where she will be used as a platform supply vessel for Sakhalin Energy Investment Company Ltd. (SEIC). The vessel (delivered in June 2016) brings together the very latest innovations in arctic shipbuilding. The new icebreaking supply vessel measures 104m in length and 21m in breadth. The six main diesel generator sets have the total power of about 20,000kW and the propulsion power of 13,000kW.

The vessel is designed for extreme environmental conditions in the Sakhalin area. The main duty of the vessel is to supply between land bases and the offshore drilling and production sites, and will be able to safely convoy and transfer cargo on deck and bulk cargo underdeck in all seasons.

SBV for Sovcomflot

The series of 3 state-of-the-art icebreaking stand-by vessels will be delivered to Sovcomflot between September 2016 and March 2017. The vessels are designed for stand-by and rescue duties and for oil spill recovery. They can also be used as supply vessels for cargo transfer e.g. for low-flashpoint fuels. The vessels measure 95m in length and 22m in breadth and are based on Aker Arctic concept Aker ARC 121. The four diesel generator engines have the total power of about 20,000kW and the propulsion power of the vessel is 13,000kW. The design fulfils demanding requirements set forth by SEIC with a total capacity of 98 persons onboard.

The PSV and the SBV vessels will be operating in thick drifting ice for ice management and icebreaking in temperatures as cold as -35°C. The icebreaking capability of the stand-by vessels is extremely high; the vessels are able to proceed independently in 1.5m thick ice. The vessels will be outfitted for emergency evacuation,

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firefighting operations and helicopter operations, and can also act as diving support vessels, as they are all fitted with a moon pool.

Oil Spill Response

All the new vessels for Sovcomflot will be equipped for oil spill response both in open water and winter conditions. They will also be equipped with systems capable to detect an oil slick on a sea surface as well as oil in ice, mainly using radars and thermal cameras.

The vessels will be equipped with 800m of ocean type oil booms stored on reels with quick deployment mechanism. Booms deployment may be assisted by the Fast Rescue Daughter Crafts, which most of the vessels are equipped with. The two different types of oil skimmers will provide the ability to operate in both open water as well as icy conditions for light crude oil spill. The total capacity for recovered oil will be about 1500m^3. The 20 tons onboard dispersant can be spread by means of erectable spray booms. When needed the vessels can receive additional oil spill response equipment in containers.

Emergency evacuation capabilities

All the vessels are designed to meet the Oil & Gas UK 'Emergency Evacuation and Response' requirements for group B vessels. The vessels will have the ability to temporarily accommodate up to 150 evacuees.

For platform evacuation purposes the production platforms are fitted with enclosed survival crafts as well as 'Skyscape' chutes. Both can be used to for evacuating the platform to the sea. If ice conditions would not allow evacuation into sea the survival craft may also be lowered directly onto the deck of the assisting vessel. The 'Skyscape' chutes are designed for use in icy conditions to allow them to be lowered directly onto the evacuation chute landing area on the bow of the vessels.

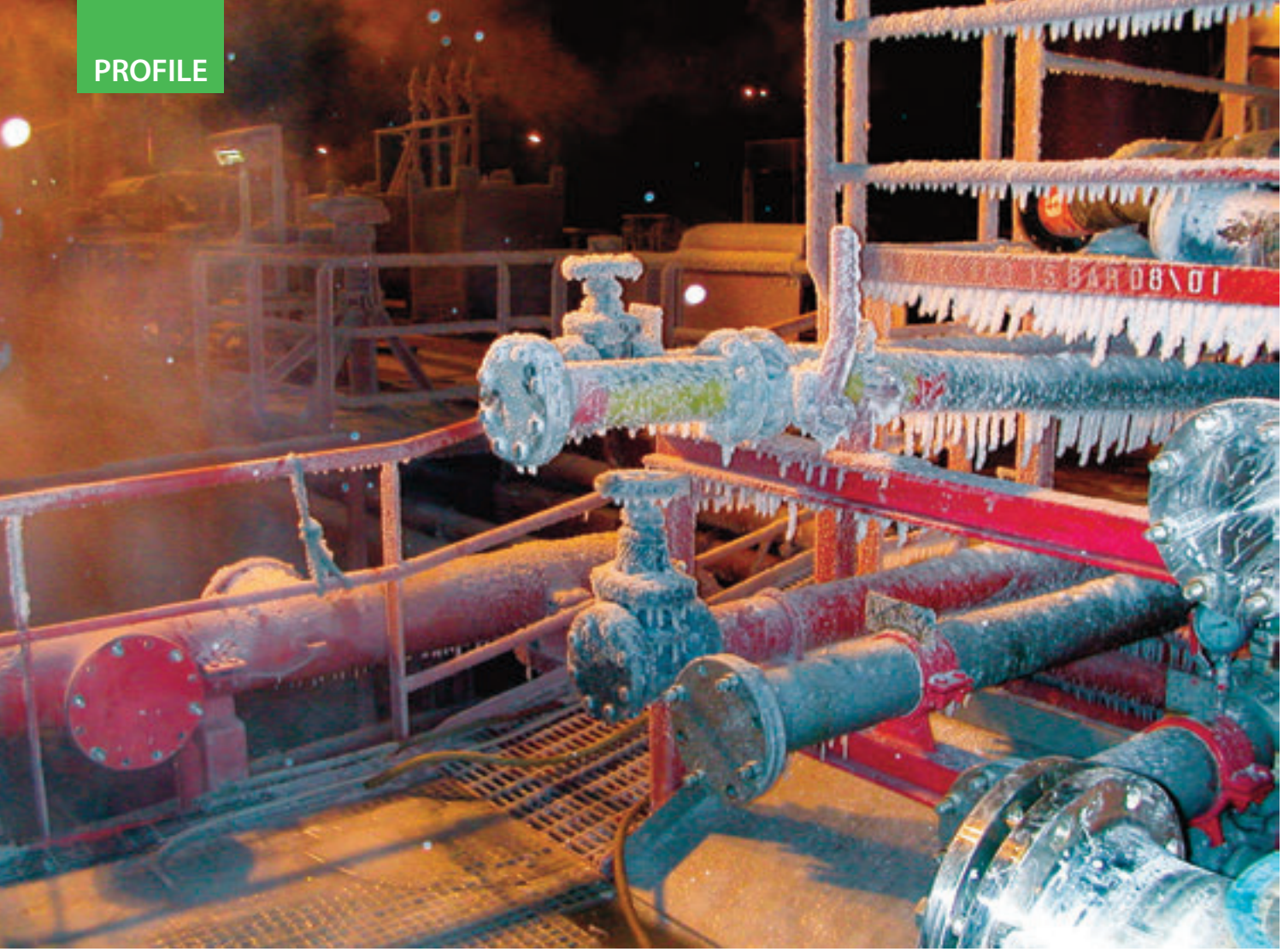
Environmental impacts

The design criteria for the vessels requires environmental certification, encompassing not only full compliance with all applicable Rules and Regulations but also a policy of design and construction in accordance with a special notation issued by the Classification Society. In addition, the vessels will comply with the forthcoming IAPP (International Air Pollution Prevention) requirement, including the NO_x regulation set out by IMO (Tier III).

The design and layout of the vessels will be made to reduce the risk of harmful pollution in case of emergencies, this means e.g., that no pollutant or waste liquids will be in direct contact with the outer hull of the vessels. Special attention will also be given to limit the sonic footprint of the vessels – reducing the impact of harmful underwater noise on marine life.

When in operation 2016-2017 these vessels will bring a significant boost to the region's transportation capacity of both cargo and crew. But these vessels are not only bringing a solution to transportation needs, they also increase both the oil spill response capacity as well as the emergency evacuation capacity to a new level. Both personal and environmental safety are a high priority in this Sovcomflot and SEIC project.

arctech
HELSINKI SHIPYARD



Arctic advances

Awareness is growing of the complexity, sensitivies, risks and expense of developing large, undiscovered oil and gas resources in the Arctic region. However, the reality of such a hostile, and volatile, terrain is driving the need for innovation and collaboration to overcome extreme technical, and natural, challenges as Olga Shiplova, senior researcher, with DNV GL explains...

DNV GL has been a pioneer in risk management in the Arctic, dating back to vessel classification during the early days of scientific exploration. Though the risks associated with oil and gas exploration in the polar regions have been well documented, experience has also revealed gaps in expertise. Much of the current practical knowledge is localised and limited to a relatively small number of specialists. Companies with an interest in the region have an obligation to educate employees of the operational and practical realities involved in any Arctic activity and share those learnings.

Arctic Risk

The Arctic is not a monolithic area and the risk picture varies accordingly. Whilst declining sea ice is creating new possibilities for industrial activities in the Arctic, the region is highly variable in its resources and conditions, creating a complex risk picture.

There are visibly increased activities related to industry, population and transport in the exposed Arctic waters. Large parts of the Barents Sea, Chukchi Sea and the Russian Kara Sea – which are most likely to hold significant oil deposits – experience similar operating conditions to fields in the Norwegian Sea. However, they bear witness to severe Arctic conditions for several months of the year. In order to source solutions to unique technical and environmental challenges across all areas and under all arduous conditions, R&D activity must be a united, and to some extent, transparent endeavour for the industry as a whole. Joint industry projects (JIPs) are effective working platforms in which industry players are brought together in a neutral environment to facilitate speedy innovations and the develop-

ment of products, practices and standards that set the industry benchmark.

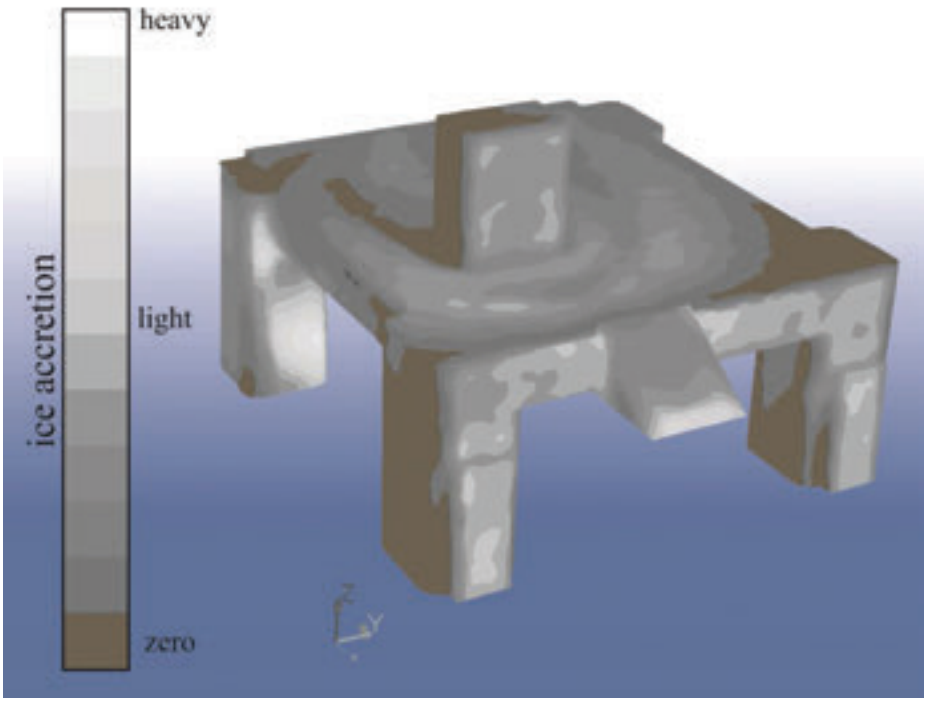
Winterisation

Sea spray icing is one of the many challenges when operating in Arctic conditions. It poses a threat on multiple levels, from blocking the operation of essential components to jeopardising stability and integrity and in extreme circumstances, such as a capsized vessel, a heightened risk to life.

A number of standards, for example DNV GL's offshore standard 'Winterisation for Cold Climate Operations (DNV-OS-A201)', currently provides guidance on mitigating ice accumulation using specified anti and de-icing procedures. However, the standards available today are performance based, so they give requirements to safety functions and to some extent describe mitigation solutions, but do not give a specific answer to how and where they should be implemented.

DNV GL is initiating a JIP called 'RigSpray' to provide a methodology which would link requirements for structural design and the actual environmental conditions leading to icing. The methodology is to be used during design and winterisation giving the basis for the procedural implementation of the requirements when icing risk is acknowledged.

Despite making headway in addressing the challenge through the 'MarIce' JIP last year, where DNV GL worked together with the Norwegian University of Science and Technology (NTNU) and Statoil to create the world's most advanced marine-icing model, further innovation is required to present an accurate representation of sea spray. The 'RigSpray' JIP will firstly develop a software tool to further understand sea spray icing using mathematical modelling and measurements and will undertake more experimental and modelling studies. This will provide a solid basis for extending local ice estimations to a wider spectrum of metocean and structural conditions, which in turn will lead to safer and more cost-efficient winterisation solutions for drilling rigs, production platforms and vessels operating in cold climate areas.



Currently, the Norwegian regulation NORSOK N-003 is being updated and ISO (International Organisation for Standardisation) is developing a new standard on the collection and analysis of data for design and planning of operations in the Arctic. One of the goals for these activities is to make regulations and standards more specific and provide more information to be used during design and operation of the Arctic vessels and offshore installations. As an independent body, DNV GL takes an active role to ensure that regulations, technologies and standards are harmonised and adapted to the harsh Arctic conditions and that any increase in industrial activity has a strong focus on safeguarding life, property and the environment.

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Investing in sustainable transport in Ireland

The Minister for Transport, Tourism & Sport in the Republic of Ireland, Paschal Donohoe explains how investment in transport is essential to the economy...

A well-functioning transport system is essential to a well-functioning economy. If we fail to invest in, and facilitate, efficient transport, we impose a range of costs on society and create a barrier to future economic growth.

Due to our economic crisis in recent years, the scope to implement major investment programmes in areas, like transport, has been tightly constrained.

This government has, however, taken this opportunity to consider what the appropriate level of investment in our transport system should be as we seek to identify future needs, where demand will arise and how best to advance and manage Ireland's transport network. This is being done so that we can prioritise the projects that will offer the greatest economic and social return for the resources we can provide.

Ireland weathered a very difficult economic storm over the last number of years. Thankfully, due to a recovery plan implemented by the government and the sacrifices made by the Irish people, we have seen a considerable return to economic growth. With that comes a rise in the number of cars on our roads.

To address this, a high priority is being put on tackling urban congestion, principally through public transport, walking and cycling and a better integrated transport system. The need to rebalance transport policy in favour of public and sustainable transport is a key policy priority of mine and, despite the economic difficulties of recent years, this government has continued to invest in the appropriate sectors. We have targeted our investment where it will deliver the greatest return by providing options to encourage people to make smarter travel decisions.

Paschal Donohoe
Minister for Transport, Tourism & Sport

The allocation finalised by my Department in October in our Budget 2015 negotiations, allows for the maintenance and, where possible, expansion of capacity in our transport networks where projects such as the LUAS cross-city for Dublin are concerned. Targeted investment in our roads, the delivery of efficient public transport services and the promotion of safer and more sustainable transport options have all been prioritised.

A rolling programme of Public Service Obligation bus replacement will continue to be funded for Dublin Bus and Bus Eireann. In a bid to ensure that public transport remains an attractive option, a number of measures such as improvements to bus stops and shelters, on-going enhancement of the Leap card (which facilitates cheaper travel), upgrades to Real Time Passenger Information and journey planners will also continue. As our economy develops, it is essential that investment in our public transport system keeps pace. Ensuring that those who are returning to work are supported in their efforts to get there is key to enabling our future progress. Targeted investment in our national, regional and local roads; the maintenance of our rail network and upgrading of our bus fleet are all central to this.

Funding programmes to support the Smarter Travel Policy is also central to encouraging sustainable travel. There are 3 such policies being administered by my Department over the period 2012 to 2016; Smarter Travel Areas (STAs), Active Travel Towns (ATTs) and National Cycle Network (NCN).

My Department also funds and works closely with the National Transport Authority (NTA) to administer a range of behavioural change programmes, namely Smarter Travel Workplaces, Smarter Travel Campuses and Green Schools Travel, all of which are designed to raise awareness of more sustainable travel options, and to encourage a shift away from the car to more sustainable modes.

The NTA also supports the development of more sustainable travel through the provision of infrastructure under its Sustainable Transport Measures Grants (STMG) Programme and also manages the Dublin Bikes scheme, the success of which is facilitating the roll out of the scheme this year to the regional cities of Cork, Galway and Limerick.

A reduction in car use will benefit us economically by reducing congestion and our reliance on imported fuels. Improved facilities for cyclists and pedestrians will increase activity levels to make for a fitter and healthier population and also help to make Ireland an international destination for activity based tourism. Providing safe cycle routes is a key factor in encouraging more people to cycle for both transport purposes and leisure. I will continue to support this key policy.

The sustainable travel and transport agenda, and in particular cycling, is continuing to gain momentum. Given the economic benefits that sustainable travel and transport can confer, as well as the environmental ones, this is very welcome indeed and will continue to receive my support. ■

Paschal Donohoe
Minister for Transport, Tourism & Sport
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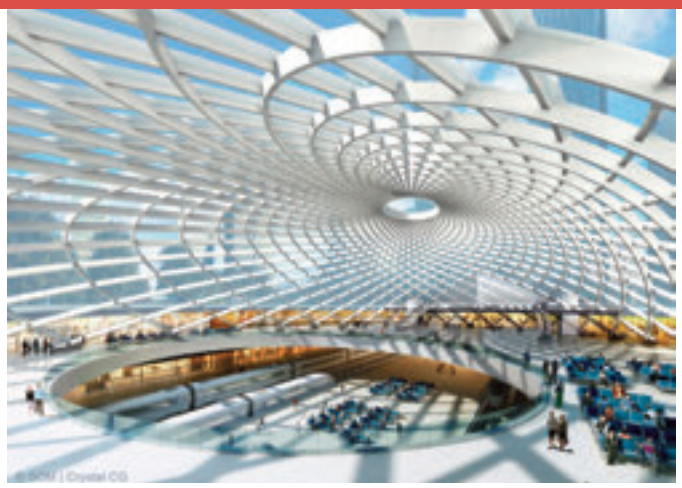
Rail and ISO 55000: An Overview



With the new dynamics in the Rail Industry Asset Management has become a very important topic. The leading European Rail companies are organising themselves to cover Asset Management as an integrated part of their operations. Several as guidance use ISO 55000. This article gives the outlines why it is used.

ISO 55000 is the new international standard for asset management, released in January 2014. Simply put, the essence of this standard is value realisation from your assets, which achieves the desired balance of risk, cost and performance. It will provide assurance that the right things are being done right, and that these activities support the achievement of the mission and objectives of your organisation.

ISO 55000 requires that an Asset Management System (AMS) be developed and documented which is the "Set of interrelated or interacting elements to establish asset management policy, asset management objectives and processes to achieve those objectives". Asset Management (AM) is defined as the "Coordinated activity of an organisation to realise value from assets". The organisation's assets, which are within the scope of the AMS, must be identified.

The standard calls out the following benefits that organisations will achieve from adopting ISO 55000:

Marcel van Velthoven is the managing director of ZNAPZ (www.znapz.com) an IBM partner that sells and supports Asset Management systems for Rail and other industries.

- ☐ Improved financial performance taking account of the short term and long term view
- ☐ Managed risk reducing financial losses and liabilities, improving safety, reputation and environmental impacts
- ☐ Improved services, e.g. punctuality and output through better asset performance
- ☐ Demonstrated social responsibility with respect to environmental and societal impacts
- ☐ Demonstrated compliance with legal, statutory and regulatory requirements
- ☐ Enhanced reputation through improved customer satisfaction and stakeholder confidence
- ☐ Improved organisational sustainability effectively managing short and long term effects
- ☐ Improved effectiveness and efficiency by improving the organisation's ability to reach their objectives ISO 55000 is a strategic approach as opposed to a tactical approach and encompasses the following aspects:
- ☐ Organisation: ensuring that asset management objectives are consistent and aligned to the organisational objectives, that the stakeholders are identified and satisfied, and the scope and boundaries of the AMS are defined.
- ☐ Leadership: ensuring that the asset management leadership is put in place by top management, the asset management policy has been defined and reviewed, and the AM leadership is given the authority, responsibility and resources to achieve the identified objectives.
- ☐ Planning: ensuring that risks and opportunities are identified and plans are put in place to address them and support the achievement of the organisational objectives. These integrated plans should address what will be done, when it will be done, by whom and how it will be undertaken and evaluated. These plans should address risks and opportunities and how

they change over time achieving a balance of risk, cost and performance.

- Support: ensuring that competent resources required to achieve the plans are made available, the information systems are available to support the process and the information is documented, controlled, communicated and auditable.

- Operation: ensuring that the plans, implementations and processes are reviewed and controlled, including any activities that are outsourced, and encompasses change management activities as well. Evidence that the organisation carried out the plans and processes is required.

- Performance evaluation: ensuring that the asset performance and the effectiveness of the AMS is monitored, measured, analysed, evaluated and auditable. Top management should review the AMS for suitability, adequacy and effectiveness.

Improvements: ensuring that non-conformities or incidents with respect to the assets, asset management or the AMS are documented and evaluated, and corrective action is taken. Asset management and the AMS should be continually improved.

Asset Investment Planning and Management (AIPM)

AIPM is focussed on solving the problem of how to realise the highest value from your assets while balancing cost, risk and performance. If you want assurance that the right things are being done right, and that these activities support the achievement of the mission and objectives of your organisation, then AIPM is a best practice to help you decide what are the right things to do.

In the case of ISO 55000, the right things to do are those that collectively create the most value for the corporation given the cost, risk and performance objectives. Investments must be evaluated based on how they contribute to the achievement of the corporate objectives. AIPM efficiently identifies the optimum mix and timing given a myriad of potential investments and their alternatives and any organisational constraints or timing requirements.

Realising value from your assets with AIPM starts with:

- Bringing all the knowledge within the organisation to bear on the decision-making process in an integrated manner: what risks you are facing and how will these risks evolve over time, the opportunities that are possible, and creating a risk-informed evidence-based approach to decision making

- Understanding the corporation's values, defining these items explicitly and adopting them as your decision-making criteria

- Identifying "the right things to do" with your scarce resources that will deliver the highest value

- Efficiently create, compare and contrast multiple what-if scenarios to understand the risk, value and benefits of various investment strategies

- Gaining organisational buy-in through collaboration and transparency in decision-making

- Arriving at defensible decisions using a rigorous, consistent, repeatable and auditable process

- Learning all along the way, to continually improve based on: evaluating how you are doing, and how you did, with respect to the value creation you planned to achieve and the actual cost to achieve it. AIPM supports every aspect of the process above and Copperleaf's C55 is an excellent example of how to realize that today.

ZNAPZ

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Investing in Buckinghamshire's transport system

Martin Tett, Leader of Buckinghamshire CC, tells why more investment is needed from central government to improve his county's transport system...

Buckinghamshire is on the road to economic recovery thanks to prudent government policies, but our desperately poor transport infrastructure is creating a real barrier to growth. Traffic congestion, unreliable journey times and poor connections to major employment centres make the need to invest in transport an absolute priority.

However, our County Council has been hit – like most of local government – by significant funding reductions, making it difficult to invest heavily beyond our major priorities of protecting vulnerable children and elderly residents.

Nevertheless, we have spent over £50m on capital upgrades to our existing roads over the past 4 years and are planning to invest another £65m over the next 4 years. We have also invested £15m in East-West Rail. But this is not enough. We need national investment in major new local schemes. For example, a new or upgraded junction on the M40 would make a significant difference to Wycombe area residents and businesses, reducing journey times, unlocking valuable employment land and creating jobs.

Some people may say that transport has to take a back seat in these austere times, but investing in roads and rail supports the entire economy of the country. To neglect transport, even in these dark financial times, would be a catastrophic error.

For those not familiar with our county, Buckinghamshire's road network is still largely composed of single carriageway roads, which are now struggling to cope with the rapid housing growth that is taking place. There are no major roads that run directly between the south and north of the county (e.g. between the economic centres of High Wycombe, Aylesbury and

Milton Keynes). This can present serious issues when people have to drive between these towns for work or to hospitals.

And yet, there is so much potential here, because our county is just a short trip by road and rail to both of the UK's largest cities, London and Birmingham. Many routes between these cities pass through Bucks, indeed the housing-led growth in Aylesbury is among the fastest in the country, demonstrating the potential that is there to be unlocked if we could only improve the infrastructure fabric of the county.

Last year, Buckinghamshire Thames Valley Local Enterprise Partnership ranked second among LEPs for housing completions. This, combined with the fact that Buckinghamshire is the second most 'porous' LEP in the country (with only 62.3% of residents working in the LEP area and 92,000 people out commuting) means congestion continues to be a significant constraint.

There is some good news as far as investment is concerned. Earlier this year, the Buckinghamshire Thames Valley LEP secured £44.2m from the government's Local Growth Fund to support mainly transport schemes – with £8.9m of new funding confirmed for 2015/16 and £27m for 2016/17 to 2021. This substantial investment from government will bring forward at least £28.8m of additional investment from local partners and the private sector. Combined together this will create a total new investment package of £73m for the Buckinghamshire Thames Valley LEP. By 2021, this deal will enable at least 4,000 jobs and allow an additional 600 homes to be built.

The investment allows progress to be made on new link roads in Aylesbury and delivery of the transport components of the High Wycombe 'Southern Quadrant' strategy to open up land for employment and improve access in our major towns.

Martin Tett
Leader
Buckinghamshire County Council

Meanwhile, North-South Connectivity will be improved by delivering the A355 Improvement Scheme that enables the redevelopment of former Ministry of Defence land, providing a new strategic link in Beaconsfield.

However, this can only be a start if such a key part of the UK is to grow and perform as it should. The South-East is seen by many as already prosperous, so we are often ignored when it comes to transport investment.

In Buckinghamshire we are doing our very best to improve our existing roads and rail. But we say it's time we stopped being taken for granted in this way, and it's time all governments recognise how vital it is to 'invest in success' in order to deliver the economic return to the Treasury that will fund future investment across all regions and bring success to all the UK. ■

Martin Tett
Leader
Buckinghamshire County Council
www.buckscc.gov.uk

Image: © Highways Agency

Driving change to our highways

The Highways Agency provides Adjacent Government with an insight into the changes in store for the organisation as they prepare to become a 'government company' tasked with delivering up to 3 times more investment...

England's most important roads are managed and operated by the Highways Agency. These are the motorways and major A roads that variously host holiday makers, commuters and the fleet of hundreds of thousands of trucks travelling between ports, businesses and homes. If you were to lose all 4,300 miles of the Agency's road network there are estimates it would cost £111bn to replace them.

"We've got no plans to do that," said Graham Dalton, Chief Executive of the Highways Agency. "Our minds are focused on £24bn of investment the government has asked us to deliver and how as an organisation we will change to meet that goal. This is going to lead to a transformation of the strategic road network, improving journeys on already well used roads and freeing up pinch points at busy junctions."

But it's not just the look of the roads that the Agency wants to change.

"What most of our customers want is a predictable journey that they can plan in advance and be sure as possible of traffic conditions," Dalton stressed. "What they really want is a smooth journey into work, for example, that isn't affected by frustrating stop-start traffic. This is about how drivers feel on the network and that's something we want to change soon after becoming a company."

The transformation of the Agency into a government company stemmed from recommendations in 'A fresh start for the Strategic Road Network', written by the former Chairman of the Agency Alan Cook and published in 2011. The report suggested that in order

to become a high performing company, the Agency needed reform that mirrored the flexibility and certainty given to utilities companies over the last 30 years – but, crucially, without privatisation.

The Infrastructure Bill will change the Agency into a government-owned company in April 2015, ready for the next financial year. In the meantime, the Department for Transport and the Agency are working hard to put everything in place to get the new company ready. In June, the Department published a set of documents that outline how the company would function. The next milestone is the publication of the Roads Investment Strategy (RIS).

"What most of our customers want is a predictable journey that they can plan in advance and be sure as possible of traffic conditions," Dalton stressed. "What they really want is a smooth journey into work, for example, that isn't affected by frustrating stop-start traffic."

"The strategy [RIS] is due to be published by the end of the year and will give the company a clear direction for the first 5 years in a similar fashion to other utilities companies," Graham said. "This, combined with the flexibility of being a company, allows us to plan a generation in advance to see where we can improve sections of motorways or particular pinch points on the roads."

But focusing on the immediate term, Dalton makes clear that the organisation is going to shift to becoming even more customer orientated. The Agency has recently become a member of the Institute of Customer Service and its 1,000 person strong customer panel is already providing feedback about how the Agency is performing now. The Agency is embracing this even though the Bill will mandate customer oversight with a new role for Passenger Focus. The Office of Rail Regulation will evaluate the effectiveness of the new company's spend.

"We already have a brilliant customer service function in our Traffic Officer Service as the recent documentary [which aired on BBC2 in September] showed," says Dalton. Between Christmas Eve and Boxing Day Highways Agency Traffic Officers dealt with more than 1,200 incidents across England while many of us were in front of a TV full on mince pies.

"While we are proud of our record there is more for us to do. We must continually strive to clear incidents more quickly and ensure that when there is construction we keep disruption to an absolute minimum. We can do this in partnership with our supply chain by innovating and working smarter."

The roads revolution must still gain approval from both Houses of Parliament but Dalton and colleagues remain focused on the task at hand – as well as the future.

"While I am excited about the future, we're already delivering major improvements on the M25, M1 and A1 as well as freeing up congestion at pinch points across the country. These improvements keep drivers moving and underpin growth in the economy." ■

HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

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Autonomous cars: the mobility revolution

Automatic cars are set to change the way we view driving, here Andrea Balluchi, President of Pure Power Control explains how and why automomous driving is the future...

Vehicles that drive themselves will start to be commercialised in 10 years. The introduction of autonomous cars is set to revolutionise mobility, increase transport safety, as well as fuel economy and improve the transport environmental footprint. Car sharing will spread out, due to the capability of cars able to pick passengers up when they ask for a ride. This will make autonomous cars convenient and cheap to use, resulting in fewer numbers of cars, but far more heavily used.

At the beginning of this century, autonomous driving was perceived as being years away, mainly due to the lack of technology. However, in the last few years we have seen advances in sensor technologies (i.e. camera, infrared imagers, radar, lidar, GPS, etc.) now available at competitive costs; exponentially increasing processing power of electronic control units, and break-through achievements in image processing and control software technologies.

Today top-class cars are equipped with navigation systems, adaptive cruise control, lane departure warning and automatic parking systems, which represent industrialised elementary functions of autonomous driving. Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications will be exploited for autonomous driving. V2V communication allows similarly equipped vehicles within a few hundred meters of each other to trade information about location, speed, and direction of travel. V2I communication can share information about traffic-signal timing, the number of lanes a highway has, whether a curve is coming up, surface conditions, and so forth. Places where much of the infrastructure is only now being put in (e.g. the Far East) may see a quicker implementation of autonomous driving.

All major car manufactures are working on autonomous driving, with. Nissan among the most committed to this – with the introduction of a line of automatic cars planned by 2020. Volvo's investment in automatic driving technology is significantly growing. The company is working in a 100-car test fleet that are already able to handle lane following, merging traffic all by themselves and follow in line behind a human driver truck. Intense programs on autonomous driving are also being carried out by Audi, Daimler AG-Mercedes Benz, Ford, Toyota and other companies.

The most aggressive initiatives for autonomous driving are led by Google – a non automotive company with huge business in map data management. Google's self-driving cars have made impressive progress in the past few years, logging over 700,000 accident-free miles without human intervention. Last September, the California Department of Motor Vehicles (DMV) handed out its first 29 permits for testing autonomous cars: 25 were won by Google, 2 by Audi and 2 by Daimler AG-Mercedes Benz. According to Jean Shiomoto, director of the California DMV: "Autonomous vehicles are the future of transportation. The potential safety and mobility benefits are enormous. Testing on public roads is one step to developing this technology, and the DMV is excited in facilitating the advancement of autonomous vehicles in California." ■

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Exterior of Foxhound Light Protected Patrol Vehicle – picture by Cpl Mike O'Neill RLC

Innovative technology for armoured vehicles for the frontline

Professor Bryn James, Senior Fellow from the Physical Protection Group at Defence Science and Technology Laboratory (DSTL) outlines how new technology is helping frontline troops stay protected...

The pace of delivery of new technology to frontline troops has increased significantly over the last few years. This acceleration of delivery is illustrated well in the provision of protection technology for armoured vehicles and for dismounted troops. Previously, it could take a decade to implement a new armour system on a vehicle and that system might be extant for several decades. Recently, some vehicles have had 4 or 5 protection upgrades over a period of 3 or 4 years in response to changes in threat, and as new and better protection has been developed. In some cases, the time from idea to fielding could be measured in weeks.

The pace of development of other types of technology for armoured vehicles has also increased significantly, resulting in the fitting of new, more capable sensors, communications and electronic countermeasures along with the protection upgrades.

Much of this new technology has been implemented on legacy platforms that were not designed initially to take advantage of such rapid developments. Consequently, many of our armoured vehicles are currently crowded with bespoke fittings of electronic equipment and have applique armour systems that are difficult and expensive to fit and maintain.

The answer to this predicament is to design armoured vehicles in such a way that upgrades, improvements and enhancements in capability may be most easily accommodated. We would like armour systems to

Interior of Foxhound Light Protected Patrol Vehicle – picture by Graeme Main

be modular and adaptable, so that layers can be added or removed dependent upon threat levels. We would like changes and additions to the electronic architecture to be "plug and play".

To facilitate this ideal, the UK Ministry of Defence (MOD) has developed the Land Open Systems Architecture. The part of this that refers to vehicles is the Generic Vehicle Architecture (GVA) standard (Def Stan 23-03) that specifies the mandatory standards to be used in the design and implementation of infrastructure and interfaces for Land platforms. The GVA has already achieved a lot. The Scout SV armoured vehicle, the latest platform under development for UK MOD, is GVA compliant, as in the Foxhound (pictured). However, GVA is a work in progress that will eventually allow us to specify all the interfaces of all the components that go to make up the integrated structure of an armoured vehicle.

It may not seem like rocket science, but the implications of the GVA are huge. The potential for even quite a basic concept such as a "quick-fit", common armour mounting configuration across multiple platforms carries with it some very attractive consequences: significant reductions in logistic complexity, ability to upgrade very quickly in response to a change in threat, ability to add layers (low threat: low weight, high threat: higher weight, more layers), ease of repair and replacement, addition of functionality (camouflage, sensors, etc.). Most of all though, such a concept would allow much more rapid, much easier implementation of new protection technology, as it is developed.

Eventually we may move away from having vehicle types all configured in the same way. With advances in modularity it is feasible that we might have a store of different protection technologies that could be fitted as required to a small number of platforms to make them ideally suited for a particular operation, or even for a single particular mission, taking advantage of developments, as they arise, to give vehicles the very best possible protection and capability.

This is already happening, it can only get better. ■

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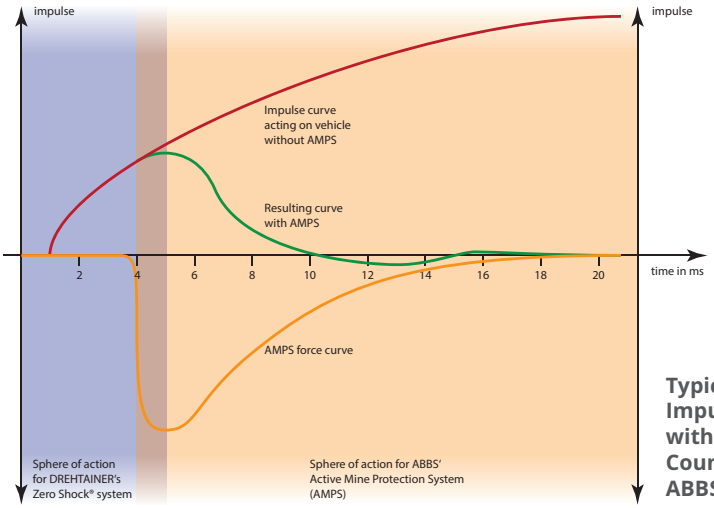
Zero Shock® + VGAM = 100% protection from mine blast effects

ABBS Joins Forces with Drehtainer to Beat IED's

Mines and IED's have become the weapon of choice for any terrorist or insurgent organisation worldwide, and over 70 countries currently suffer from the problem, with vehicles regularly being destroyed and people killed and injured.

To counter these threats ABBS and DREHTAINER have agreed to work together to take their respective Active Mine Protection Systems to the global market as a combined system. The two systems working together can provide complete protection against under-belly blast mines within the system specification.

The DREHTAINER Zero Shock® system consists of a suspended floor inside the vehicle on which the crew seats are located. This floor is held in position at a specified height above the vehicle floor by cables tensioned between the roof and floor. The cables have a link arrangement which is separated explosively as soon as a mine blast is detected, so that the Zero Shock® floor then drops downwards under gravity, completely isolating the occupants from the initial shock effects that can cause significant internal and lower limb injuries. The system also provides sufficient clearance from the vehicle floor to ensure that any floor deformation does not contact the platform on which the occupant's seats are located.



Typical Mine Blast Impulse Curves, with and without Counteraction by ABBS AMPS System.

This simple method of isolating the vehicle crew from the mine blast effects works well for the first 5 – 10ms of the event, and it is during this short period that the ABBS VGAM (Vehicle Global Acceleration Mitigation) system comes into play. The novel, exceptionally fast-acting, powerful rocket motors developed by ABBS push the vehicle down against the mine blast lifting forces and prevent its acceleration upwards.

As long as the vehicle belly plate can sustain the blast loads without being penetrated, and the vehicle floor design and the spacing between the floor and the DREHTAINER Zero Shock® floor is sufficient to prevent floor deformation effects becoming a problem, there is no theoretical limit to the mine blast specification that can be dealt with by the combined systems.

The DREHTAINER Zero Shock® system has been developed and fully tested by several European OEM's and is in service with the Swiss Army, and will shortly enter German Army service as well. The ABBS AMPS technology is currently undergoing full system testing and will be available for trial on customer vehicles early in 2015. Both systems can be retrofitted into existing vehicles to upgrade their mine blast capability and extend their service lives, helping to improve survivability and combat effectiveness within current budget levels.

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When minutes feels like hours

A traumatic scenario

"I'm sitting next to my severely wounded soldier comrade waiting impatiently for the field ambulance. A traumatic situation for all of us – what to do? We are in desperate need to do something for our friend and also for ourselves – it's horrible to just wait. It feels like an eternity".

Unfortunately this is not a unique scenario. Traumatic incidents affect everyone involved both the injured and bystanders. However, research has shown that 'eliminating' the feeling of uselessness by proceeding with determined actions minimises the risk of being severely traumatised.

Photo: Erik Skjerven Defence Media Archive

The last four decades the focus of casualty evacuation (CASEVAC) and medical evacuation (MEDEVAC) has increased as a result of nations being engaged in conflicts far away from their own countries, an increasing number of terrorist actions and large nature catastrophes. With an almost ever-present media transmitting images of people in distress or of seriously wounded or even deceased into our living rooms, it is vital for nations to have satisfactory routines, procedures and equipment. Authorities need to assure soldiers and citizens that they are able to take care of their own people when wounded abroad, and bring them home for treatment and recovery.

After more than 60 years developing the routines and procedures, both within each nation and within coalitions, one would assume that terms and abbreviations as well as equipment interfaces would be harmonised between nations to ensure interoperability, flexibility and cross training.

A lot has been done in the past 20 years to achieve this. NATO has developed standards for equipment as well as terminology; several yearly conferences – both military and civilian organised – contribute to the transfer of knowledge and experience between services and nations.

Nevertheless, most nations still have huge areas of improvement before they can claim perfection.

Standardisation and harmonisation between services and nations

While trying to ensure interoperability of services as well as national forces, we know that it is impossible to meet all interests. For example, the infantry soldiers want super-light and compact stretchers. For the vehicle operator it is vital that the stretcher fits into the actual stretcher support in the vehicle. The helicopter or aircraft operator needs a stretcher approved for aerial evacuation, while the wounded soldier has the best chances of survival and least pain if he is brought throughout the chain of evacuation on the same stretcher. Very often the result is different stretchers in different services, which arguably does not serve the patient.

Can the industry contribute to the process of harmonising, equipment, and assist armed forces in developing and maintaining flexible solutions with high capacity across services and nations?

Some potential CASEVAC-units:

There is a significant level of expertise and knowledge in the industry as well as in the medical services. NODIN Aviation suggests that this knowledge can catalyze the best solution for the customer and the industry can further improve their services to their customers by:

- Developing collaboration between companies to extend competence and capacity;
- Participating in arenas where the customers share their experience in field;
- Knowing, understanding and being loyal to applicable standards when designing solutions;
- Focusing on the patient and the medics, not the equipment, when doing innovative design solutions.

What can the customers do to make the suppliers better prepared to develop solutions, products and services that meet the needs of the patients?

NODIN suggests to:

- Improve the arenas where users share their experience in patient evacuation;
- Allow and encourage informal discussions between users and industry, enabling industry to fully understand the need;
- Describe the issue and/or the need, not the solution. The best solutions may not yet have been invented.

There is a significant effort in many nations to improve their CASEVAC and MEDEVAC capability and if these activities are fairly coordinated the international community will see a huge increase in the total capacity to bring injured people out of disaster areas.

Back to the introductory traumatised scenario

As a company focusing on products and concepts for CASEVAC and MEDEVAC in wars and catastrophes we are obliged to support with solutions focusing on the patient, the medics and everyone involved when developing innovative and first class solutions.

Our new CASEVAC KIT was developed to change the role of any vehicle and mobile platforms in the battlefield or catastrophe area. The KIT consists of a four-folded Field Stretcher and a Shock and Vibration Damped Stretcher Suspension System, all packed in a handbag. Using this kit, a vehicle or any mobile platform will be converted into a CASEVAC-Unit in 1 to 2 minutes.

The MEDEVAC Field Stretcher is designed and manufactured in accordance to military and civilian requirements for all platforms on land, at sea and in air.

In addition to increase the evacuation capacity this solution enables the comrades of the wounded soldier to contribute in a positive way and the action itself make the soldiers handle the traumatic situation better.

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A strong focus on internationalisation

Studying abroad can have great benefits to students, and here the Danish Agency for Higher Education details how the Danish government has launched an action plan to increase internationalisation...

More and more Danish students are choosing to participate in an exchange or internship programme in Europe. In the 2012/13 academic year 31% more Danish students went abroad to study or undertake an intership in an international company compared to 2010/11 and the positive trend continues in 2014. By 2020, the Danish government has a target of at least 50% of all students studying or working abroad as part of their education. Thus, in 2013 the government launched an ambitious action plan for increased internationalisation.

Europe is becoming more and more appealing to Danish students – so much that a record high number of students decided to study abroad or undertake an internship with an international company as part of their education with support from the EU Erasmus programme in 2013. The Erasmus programme was replaced by EU's new education programme Erasmus+: Higher Education in January 2014.

In the academic year 2012/2013, 3646 students received support from Erasmus to study abroad or undertake an internship in Europe. According to the European Commission's Erasmus statistics that is more than a 10% increase on the previous year. And the increase in Danish students taking part in the Erasmus programme is greater than the European average which saw 6% more Erasmus students in 2012/2013 than the previous year. The University of Copenhagen, which is the largest higher education institution in Denmark, is also the institution that contributed to most Erasmus students in 2012/2013. Whereas University College VIA in 2012/2013 received more Erasmus students from other European countries than any other Danish institutions.

Encourage students to go abroad

The positive trend continues in the academic year 2014/2015 where more than 4800 higher education students are going abroad on either an exchange or internship with the Erasmus+ programme. That is an increase of 34% compared to the previous year.

The new programme has been very well received by Danish higher education institutions and students. The Danish National Agency for Erasmus+ strongly encourages students to study in another European country or to undertake an internship with an international company as part of their education, seeing that it enhances not only language skills but also cross national understanding. A new Erasmus Impact Study carried out by the European Commission shows that young people with international experience have much better chances on the job market and are less likely to experience long term unemployment. That is a good argument for going abroad.

Enhanced insight through global outlook

By 2020, the Danish Government has a target of at least 50% of all students studying or working abroad as part of their education. In 2013 15% of the Danish higher education students went abroad in order to study or undertake an internship. In order to reach the 2020 target the Danish government has launched a two-part action plan for increased internationalisation of the higher education institutions in Denmark.

Student mobility in Danish Higher Education Institutions (exchange students)

	2010/11	2011/12	2012/13
Danish students studying abroad	7,174	8,044	9,367
International students in Denmark	9,860	9,155	9,015

Note; The number of higher education students in Denmark has increased by 13% from 2010/11 to 2012/13

The first part of the action plan was launched in June 2013 and focuses primarily on the effort to strengthen the international competences of Danish students and on the international learning environments that Danish institutions are involved in. In order to realise the vision of strengthening the internationalisation of Danish higher education, the first part of the action plan comprises 31 concrete initiatives aimed at accomplishing the following 3 objectives: more students studying abroad, stronger international learning environments and better foreign language skills. [1]

In order to motivate students to study abroad, the Ministry of Higher Education, among other things, launched the website gribverden.dk (meaning seize the world) in 2013. The website serves as an information portal to confront the notion that it is difficult to organise studying abroad. The aim of the website and the accompanying Facebook page is to facilitate student debate and to provide students with knowledge of and inspiration to studying abroad via contributions from higher education institutions, private organisations and other students.

Denmark – an attractive study destination

The second part of the action plan was launched in April 2014 and focuses on how Denmark can attract and also retain talented international students in the future. Read more about the action plan for attracting and retaining international students: [2]

Denmark actively promotes its Higher Education Institutions and their programmes by way of the study portal, studyindenmark.dk and its affiliated social media platforms. The portal aims at supplying potential future students with relevant information about e.g. what to study and where, whom to contact, where to live and how to thrive, student careers, job futures, rights and regulations.

An ongoing active dialogue with Danish Higher Education Institutions, international students, Danish Embassies and the Danish Innovation Centers keeps the information concurrent, and relevant for international markets. Each year about 900,000 users visit the webpage in order to find information about studying in Denmark.

In 2015 the studyindenmark.dk site plans to increase its current reach by investing one million Danish kroner in an expanded content and marketing strategy. The strategy will primarily be aimed at new and growing markets, but also European markets will benefit from the strategy. ■

For more information, please visit the website www.gribverden.dk and studyindenmark.dk

[1] http://ufm.dk/en/publications/2013/files-2013/enhanced-insight-through-global-outlook.pdf

[2] http://ufm.dk/en/publications/2014/files-2014-1/denmark-an-attractive-study-destination.pdf

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Food for thought: tackling the nation's obesity crisis

Chair of the Royal College of Paediatrics and Child Health Nutrition Committee, Dr Colin Michie explains why collective action must be taken to tackle obesity in children...

With nearly one in 5 secondary school age children and a quarter of adults obese, the Royal College of Paediatrics and Child Health calls for prevention, early intervention – and collective action.

It's certainly one of the biggest public health threats facing the UK, and was recently dubbed by new NHS England Chief Executive Simon Stevens as 'the new smoking'. A quarter of adults and one in 5 school children are now obese, up from 15% just 20 years ago. It's no surprise that diabetes and other obesity related conditions are on the up too. The result of this increase is costing the NHS – a service severely under strain – an estimated £5bn a year.

What's most concerning is that these conditions are increasingly developing earlier in life. So what was once expected to occur in adulthood, now actually become apparent at a much younger age. In fact, it was announced last year that hospitals in England and Wales had seen a four-fold increase in the number of children being admitted with conditions linked to their weight.

Collective action

Action must be taken, and it must be taken soon if we are to win the race against this ever increasing problem. Overweight or obese children are much more likely to become overweight or obese adults, so getting it right in childhood is essential if the UK is to shake off its title as the 'fat man of Europe.' This is by no means an easy task though – if it was, it would have been solved many years ago.

What's needed is collective action from many groups of people including healthcare professionals, the government, parents, food manufacturers, supermarkets and advertisers. There are role models in the community such as pharmacists, school nurses and midwives who are advocates for healthy living by promoting healthy eating. By contrast, in Brussels, legislators work hard to regulate the sugar contents of toddler milks. The question is – what steps can be taken to make a real difference on a wider scale?

Food and politics

The RCPCH, as part of the Academy of Medical Royal Colleges (AoMRC), made a series of recommendations as part of the Academy's 'Measuring up' Report, which launched back in February 2013.

Many of these recommendations begin in the classroom – educating children early on what constitutes a healthy meal and teaching them how to cook at a younger age. There is also an emphasis on supporting parents to make healthier food choices. Policies we stand by today and policies still needing to be incorporated in all school syllabuses.

Alongside the Academy's report, the call for improvement in schools accelerated from the classroom to the canteen, with initiatives launching such as 'The School Food Plan,' led by the Children's Food Trust, and supported by a number of organisations including the RCPCH.

Over the last year, the number of children eating school dinners has also dropped. So whilst school meals have become healthier – thanks to campaigns like Jamie Oliver's 'Food Foundation' and the School Food Plan – it's clear that more work needs to be done to make them more appealing for the children who eat them. Menus don't necessarily have to drop

burgers in favour of salads and couscous, but the ingredients used in these 'attractive' meals could be adapted so they are healthier and more nutritious.

But it's not that simple. Families' lives are busier than ever before so cooking from scratch is becoming a thing of the past. The price of food has also rocketed over the years making buying fresh food much more difficult for families living on lower incomes.

The healthy option must be the easy option, and we can only do that with support from the government, food manufacturers and supermarkets.

That's why, as part of the 'Measuring up' report, we ask all supermarkets to provide clear labelling on products and to ensure deals on fresh food are as prominent as those on confectionary.

We would recommend a one-year pilot of a 20% tax on sugary drinks. Despite further evidence confirming this measure would be beneficial, together with backing from the Chief Medical Officer, Professor Dame Sally Davies, there remains reluctance to make this a reality. But bold strategies are required if there is serious intent to make an impact.

Food promotion – especially that of fast food – affects children's food choices, parents' purchase behaviour and ultimately consumption. This is why we want to see a ban on fast food advertising before the 9pm watershed and a restriction on new takeaway restaurants being established within short distance of schools and colleges.

The Marathon

A combination of measures need to be put in place to begin tackling obesity effectively, and at the heart of any overarching plan must be tackling the problem in pregnancy and childhood. If healthy eating and active lifestyles become a part of this country's culture – and people whatever their income and whatever their background are supported to make that real – we're much more likely to make inroads. As with all marathons, there will be challenges. But a collective effort with direct support from a range of organisations and individuals can improve the health for children and young people. This campaign demands greater collaboration in changing times. Truly, food for thought. ■

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Halting the rise in obesity

Obesity is a worldwide problem that can lead to other healthcare challenges. João Breda and Margarida Moreira dos Santos from the World Health Organization (WHO) detail how they are helping to tackle the problem...

The core mission of the World Health Organization (WHO) is to address public health on a global scale. This is tackled by monitoring health trends, providing leadership on matters critical to health, articulating policy options for health and shaping the health research agenda. In September 2011, the United Nations held a Summit Meeting on non-communicable diseases (NCDs), the second high-level meeting of its kind ever held to focus on a global disease issue. Two years later, in the 66th World Health Assembly, the WHO Member States have agreed on 9 voluntary global NCD targets, one of which is to "halt the rise on diabetes and obesity" by 2025 [1].

Over 50% of the adult population in Europe is over-weight, and at least half of those adults are obese. Obesity prevalence has tripled in many countries since the 1980s. It is already responsible for 2–8% of health costs and 10–13% of deaths in different parts of the region, and the numbers of those affected continue to rise at an alarming rate, particularly among children. Excess weight drastically increases a person's risk of developing a number of NCDs, including cardiovascular disease, cancer and diabetes. Together with chronic respiratory diseases and mental disorders, these 5 health conditions are responsible for a large part of the disease burden in Europe, accounting for an estimated 86% of the deaths and 77% of the diseases burden in the 53 countries covered by the WHO European Region. The risk of developing more than one of these diseases (co-morbidity) also increases with increasing body weight.

Obesity became a primary focus of current worldwide efforts to tackle the increasing epidemic of NCDs, which are worldwide severe public health problems. Obesity can be attributed by large to social changes, since obesity has been related to diet and physical inactivity. Both societies and governments need to act to curb the epidemic. National policies should encourage and provide opportunities for greater physical activity, and improve the affordability, availability and accessibility of healthy foods. They should also encourage the involvement of different government sectors, civil society, the private sector and other stakeholders.

To assist on these matters, the Nutrition, Physical Activity and Obesity Program at the WHO Regional Office for Europe in Copenhagen develops norms and standards, provides technical support and building capacity, guidance and public health tools to help countries implement effective programs and address risk factors, amongst other actions. Highlights on the ongoing work at the region level include establishing the world–leading Childhood Obesity Surveillance Initiative (for primary school children) and providing innovative technical advice to Member States in the full range of policy areas (including recent work on nutrient profile models that countries can use as a tool to implement the recommendations on restrictions on marketing of unhealthy food to children) and producing guiding documents on governance.

In September of the current year, the Food and Nutrition Action Plan was endorsed by the WHO Regional Committee for Europe [2]. This was a major breakthrough towards the promotion of healthy food environments for everybody and throughout life. It should be used by Member States to adopt specific measures related to the coordination of trade, food and agricultural policies with the protection and promotion of public health, encourage consumers to

demand for healthy foods and meals and promote healthy nutrition of infants and young children.

Tailored to each country, measures on both increasing public awareness and facilitating healthy choices needs to be adopted. Policy makers may consider: creating healthy food and drink environments and encouraging physical activity for all population groups, promoting healthy diets throughout life, especially for the most vulnerable (e.g. promoting, protecting and supporting exclusive breastfeeding in the first months and introducing healthy school meals and school fruit schemes as standard), reinforcing health systems to promote healthy diets (nutritional counselling and obesity management should be available) and engage everyone in making change (e.g. engaging governmental departments outside the health sector and identifying joint goals and actions, in a health-in-all-policies approach). National recommendations should support a diet that is healthy, affordable, accessible to all, culturally acceptable and environmentally sustainable.

The WHO recommends adults to walk, cycle or make sports 150 minutes per week, since this can significantly reduce the risk of hypertension, coronary heart disease, stroke, diabetes, breast and colon cancer and depression, keeps bones strong and helps weight control. However, 6 in 10 adults never or seldom exercise or play sport, and 3 in 10 never engage in any kind of physical activity at all (average for the European Union). Increasing physical activity is a societal, not just an individual responsibility. Promoting physical activity demands a population-based, multi-sectoral, multi-disciplinary and culturally relevant approach. A Physical Activity Strategy is under development, to be adopted next year.

Individuals should be supported in following the recommendations, through sustained political commitment and the collaboration of many public and private stakeholders; regular physical activity should be promoted and healthier dietary choices available, affordable and easily accessible to all – especially those of poor and disadvantage groups, who appear to be more exposed to at least some unhealthy food. Overweight and obesity are more common in low socioeconomic groups and, in some countries, the gap is widening, thereby contributing to growing inequalities in health [3]. The WHO considers health a fundamental human right, and directs all its efforts to assure that everyone has the highest possible level of health. ■

[1] Global Action Plan for The Prevention and Control of Non-communicable Diseases 2013-2020. WHO, 2013.

[2] The WHO Europe Food and Nutrition Action Plan 2015-2020. WHO Regional Office for Europe, 2014.

[3] Obesity and Inequities: Guiding for addressing inequities in overweight and obesity. WHO Regional Office for Europe, 2014.

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Creating healthy policies and environments are key to combatting cardiovascular disease

Oleg Chestnov, Assistant Director-General, Cluster for Non-Communicable Diseases and Mental Health at the World Health Organization (WHO) details the key interventions to help reduce the burden of cardiovascular diseases...

Cardiovascular disease (CVD) and other noncommunicable diseases (NCDs) – mainly diabetes, cancer and chronic respiratory disease are major threats to public health in the 21st Century. An estimated 36 million deaths, or 63% of all deaths globally in 2008, were due to NCDs [1].

Cardiovascular disease (CVD) represent the largest percentage of these deaths and is consistently ranked as the number one cause of death in the world. Low and middle-income countries bear a higher burden, of deaths caused by CVD, than high-income countries that have better access to human and financial resources [2].

The impact that NCDs have on both a family level and an economic level is catastrophic and affects all of us. NCDs are associated with the extreme social burdens of prolonged disability, diminished resources, reduced productivity and tremendous demand on health systems. Cumulative economic losses to low- and middle-income countries due to NCDs are estimated to surpass USD $7tn over the period 2011-2025 (an average of nearly USD $500bn per year) [3]. This is mainly due to the fact that people are dying from NCDs, including CVD, in their most productive years.

Early detection is essential in fighting the growing trend of CVD. Often there are no symptoms or warning signs and a heart attack or stroke could be the first outward indication of underlying disease in the blood vessels. Fortunately, most CVD can be prevented by addressing risk factors such as tobacco use and harmful use of alcohol, unhealthy diet and obesity, physical inactivity, high blood pressure, diabetes and raised blood lipids. In addition access to affordable health care is critical for prevention and control of CVD.

At the 66th World Health Assembly last year the World Health Organization (WHO) endorsed the

Oleg Chestnov, Assistant Director-General, Cluster for Non-communicable Diseases and Mental Health

Global Action Plan for the Prevention and Control of NCDs 2013-2020. The main objectives are to reduce exposure to risk factors and to strengthen health systems capacity to address NCDs including CVD to improve early detection and equitable care of people with or at high risk of a NCD. It serves as a road map for governments to take coordinated actions to lower the risk NCDs by making evidence based policies.

Policies that create conducive environments for making healthy choices affordable and available are vital for motivating people to adopt and continue healthy behaviour. If a combination of cost-effective health-care interventions and population-wide interventions is implemented in a sustainable manner, a significant impact can be made on the burden of CVD. A population-based approach would target risk factors that CVD, diabetes and cancer have in common such as unhealthy diet, physical inactivity, harmful use of alcohol and tobacco use [2].

The aim is to reduce exposure to behavioural risk factors such as tobacco and alcohol use by increasing taxes and mandating warning labels on products. Implementing awareness campaigns around the harmful use of tobacco, alcohol and salt have also been shown to be effective. The regulation and reduction of marketing for tobacco products, alcohol, and foods high in salt, sugar and trans-fatty acids, especially to children, can help decrease CVD.

Maintaining at least 150 minutes of physical activity every week is another paramount factor in the prevention of CVD. Governments can do their part by creating public policies promoting physical activity and utilise cross sectoral collaboration in transport, education, workforce, sport, and urban design.

In addition to these population based measures, to reduce the cardiovascular disease burden individual interventions to reduce total cardiovascular risk need to be implemented through a primary health care approach. The WHO's Global Action Plan strives to reduce premature mortality from NCDs by 25% by 2025. WHO and other UN Organizations support national efforts with upstream policy advice and technical assistance, ranging from helping governments to set national targets and to implement cost effective interventions. ■

[1] Cardiovascular diseases (CVDs)Fact sheet N°317. Updated March, 2013 by WHO

[2] From Burden to "Best Buys": Reducing the Economic Impact of Non-Communicable Diseases in Low- and Middle-Income Countries. 2011 study by WHO and the World Economic Forum.

[3] Global status report on noncommunicable diseases 2010. WHO, 2011.

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A double-faced strategy

to prevent and improve the outcome in myocardial infarction

Over the last 50 years, the fight against cardiovascular disease has attained immense success, and improvements in medical and surgical care have been the main reason for the prolonged life expectancy in "western" countries. The main achievements – heart valve replacement, coronary bypass surgery, antihypertensive, lipid lowering, anti heart failure and antithrombotic treatments, pharmacological and mechanical reperfusion therapy for acute myocardial infarction, as well as electric therapy for cardiac arrhythmias have all been shown to reduce mortality in the most frequent cardiac diseases. Increased awareness of the negative effects of smoking and unhealthy lifestyle may have contributed to mitigate the detrimental effects of the contemporary urban society on the cardiovascular system. All these obvious improvements in care have resulted in increasing numbers of survivors with advanced cardiac disease, and in an aging population whose primary cause of inability and death will be cardiovascular.

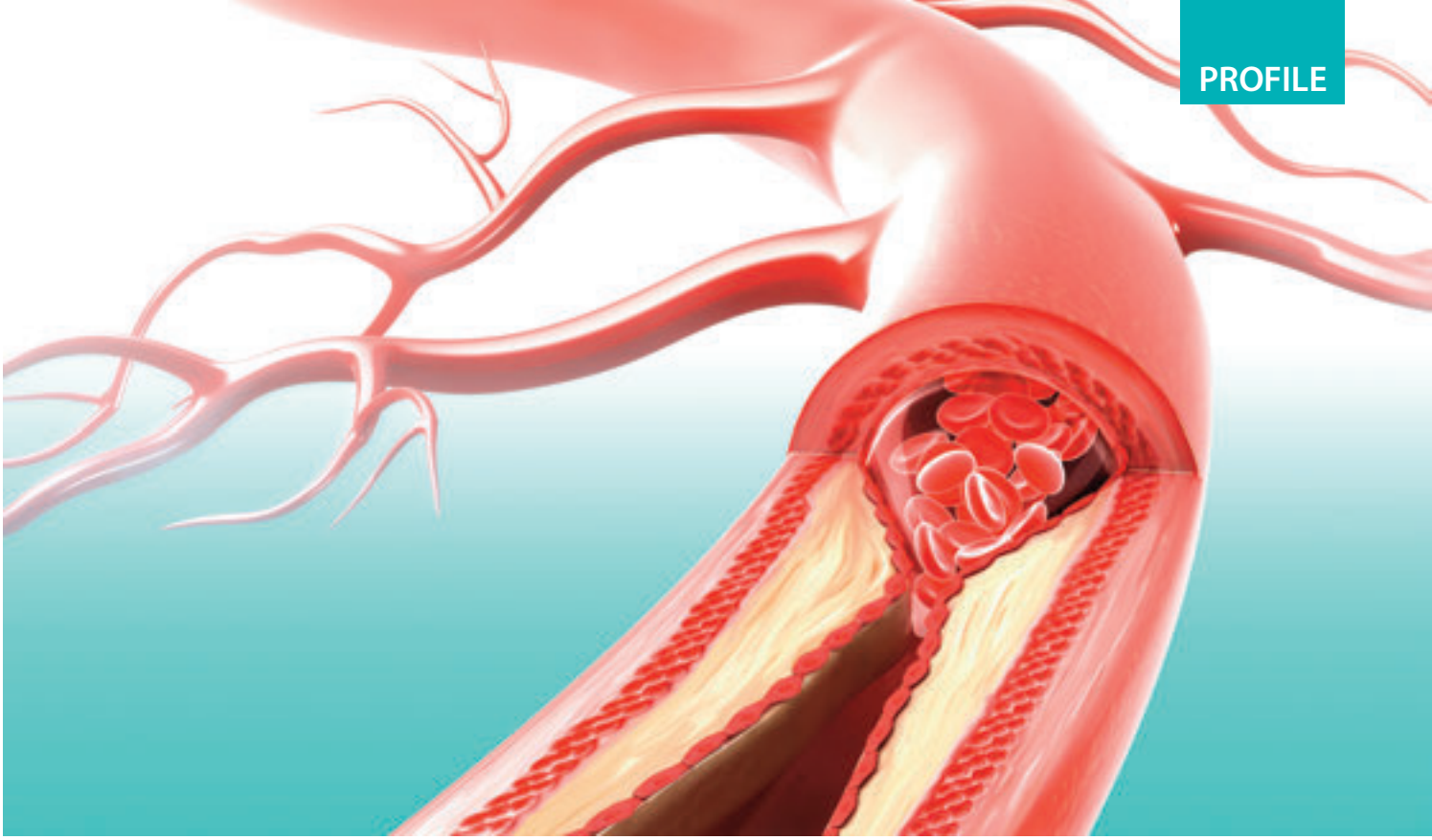
On the other hand, countries with an emerging economy are now experiencing the impact of an increasing burden of dismetabolic cardiovascular disease. Projections to 2030 predict doubling of the current global burden of diabetes, with its cardiovascular sequelae.

This fast changing landscape will need a drastic shift in strategy toward the management of cardiac disease, with reduced diagnostic but increased preventive and therapeutic commitment from the health care systems.

Prevention of cardiovascular disease (or promotion of cardiovascular health) is a task for political and social planning, as well as for primary medical care. Facilitation of physical activity, tight restrictions against smoking, and availability of low-cost drugs to treat hypertension, diabetes and dislipidemia should form the basis of sustainable primary prevention both in high income and lower income countries. In this area, high-tech expensive diagnostic examinations have almost no yield and no incremental value over the very basic clinical examination and first line diagnostics, such as the electrocardiogram and a handful of biochemistries. Widespread use of this simple approach and surveillance of patient compliance to first line treatments has the tremendous potential of reducing the global burden of cardiovascular complications, such as myocardial infarction, heart failure and stroke. A similar approach, but with more oriented treatment goals should be applied to secondary prevention.

However, the management of high-risk and complicated cases requires sound expertise, adequate technology and more clinical research in orphan areas. The high-tech care of high-risk cases is increasing with fast pace, due to industrial support. The types and numbers of sophisticated and expensive devices are expanding continuously, though the time required to prove long-term efficacy is longer than the time required to develop more efficient models. Therefore, once a device has been proven effective (or ineffective), it is also obsolete, being surpassed by new technology. Also, cost-effectiveness of new technologies remains in most cases disputable and restricted to high-income countries or patients.

Treatment strategies which do not necessarily involve high-tech, but require expertise and sound clinical judgement evolve more slowly. This field of research is seldom supported by any industrial budget, remains the playground for passionate clinical scientists, and should be funded by academical and political bodies. An example of this endeavour are the studies on the treatment of acute coronary syndromes in high-risk patients, such as the elderly, those with chronic kidney dysfunction and those with cardiogenic shock. This kind of independent front-line research is the mission pursued by some investigators, such as those working at the Cardiovascular Department of Manzoni Hospital in Lecco, Italy, with their many collaborators around the country and elsewhere. In the Italian Elderly ACS study, dr Stefano Savonitto (director of Cardiology at Manzoni Hospital) and 23 collaborating Centers of the Italian Society of Inteventional Cardiology (GISE) have investigated



treatment strategies for elderly patients with Acute Coronary Syndromes, showing that those at higher ischemic risk benefit from an almost 60 percent reduction in follow-up cardiac events when treated using an aggressive interventional approach. The ongoing Elderly ACS 2 trial is aimed at refining pharmacological strategies in elderly patients with an ACS undergoing urgent angioplasty.

Efforts to improve outcomes in patients with cardiogenic shock are also frustrating and only a few groups of investigators dare to undertake clinical trials in this condition still causing almost 50% mortality during hospital stay. The European Union is currently supporting the largest of these efforts, the Culprit-Shock study, chaired by Professor Holger Thiele at the University of Schleswig-Holstein in Lubeck and involving 10 European countries. Investigators at Manzoni Hospital in Lecco are coordinating the Italian contribution to this study.

Patients with advanced kidney dysfunction are also at particularly high risk in the event of an acute coronary syndrome, and should deserve more attention and tailored interventional strategies. This is also an area of particular expertise at Manzoni Hospital where a dedicated trial to improve outcome in these patients is currently under planning.

Finally, since life expectancy is continuously increasing, the study and prevention of coronary disease in women after menopause is a new area which has been undeserved. Hormone replacement therapy has been discarded after initial negative trials focussing on late treatment in secondary prevention, a fact that has discouraged further research. Coronary intervention in the acute phase is made more difficult, as compared to men, and there has been a lack of materials dedicated to women, who often have smaller coronary arteries. The ongoing Ladies ACS study is investigating the relationship between menopausal age, established cardiovascular risk factors and severity of coronary artery disease in the post-menopausal decades of women with acute myocardial infarction. The results of this study, a collaboration of Manzoni Hospital and 8 cardiology Centers in Italy analysed in the sophisticated Rome Imaging angiographic corelab, led by Professor Francesco Prati, will be presented in 2015 in a major medical congress.

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Tackling cardiovascular diseases

Simon Gillespie, Chief Executive of the British Heart Foundation (BHF) and President of the European Heart Network, highlights the effects of cardiovascular diseases and the progress made to drive down deaths as a result...

Cardiovascular disease (CVD) blights the lives of millions of people across Europe every year. From the tiniest newborn burdened with a congenital heart defect to a great grandmother fighting a daily battle against heart failure, it can affect anyone at any stage in their life.

The effects can be devastating, and in the worst cases fatal. Mending these broken hearts has been the mission of the British Heart Foundation (BHF) for more than 50 years and still the fight goes on.

Significant progress has been made to drive down the number of deaths from CVD across Europe in the last 10 years. In many countries death rates have more than halved since the early 1980s.

In the UK this has been driven by decades of research, much of which has been funded by the BHF. Thanks to years of ground-breaking science and our determination to push for more life-saving treatments, we are significantly better equipped to fight cardiovascular disease.

More people are surviving a heart attack because we now know that early stenting or thrombolysis to break down the blood clots and reopen an artery immediately is the most effective treatment.

Thanks to a scientific breakthrough in the genetics behind hypertrophic cardiomyopathy, pioneered by BHF researchers, we can now identify people at greater risk of sudden cardiac death.

Important legislative changes have also paved the way for a healthier nation, such as the banning of smoking in public places. But the work is not done yet. Although the news that CVD death rates are falling across Europe is encouraging, CVD remains a leading cause of death in Europe, claiming 4 million lives each year.

There also remains an unacceptable divide in survival rates between countries in Europe. In central and eastern Europe overall death rates are generally higher than elsewhere.

As the newly appointed President of the European Heart Network an early task will be to meet with members from these countries to share knowledge on how to reduce the number of people dying from CVD. But even for those countries that appear to be doing better, the challenge of tackling inequalities lies within their own borders.

For example, in the UK a person living in Glasgow is more than 4 times as likely to die prematurely from cardiovascular disease (CVD) than someone living in Hart in Hampshire.

We must do more to tackle this postcode lottery in the UK by understanding why these inequalities exist and helping prevent people from developing CVD in the first place.

But that's not the only challenge we are facing. Obesity levels are high and increasing across Europe in both children and adults, increasing the risk of people developing coronary heart disease, type 2 diabetes, high blood pressure and some cancers.

In the UK almost two thirds of adults are overweight or obese which paints a worrying picture. Leading an inactive lifestyle is also becoming increasingly common across Europe and smoking remains a serious health concern, with nearly 1 in 5 adults in the UK smoking.

We have the power to change our cardiovascular health for the better, to help protect against these devastating conditions, but unfortunately the message still isn't getting through.

In 2012, the World Health Organization (WHO) set targets to reduce preventable deaths from non-communicable diseases by 25% by 2025.

If the UK and other European countries are to meet this target then we need to do more to promote health prevention policies, engaging political leadership at all levels, communities and individuals in a shared endeavour to save lives.

Important steps have already been made to help people make healthier choices such as increasing the size of health warnings on cigarettes packets and introducing front-of-pack labelling to food and drink products.

We must keep building on our past successes if we are to save more lives.

That's why the BHF is pushing for the introduction of a 9pm watershed ban on junk food marketing to children in the UK, to help stop young people being tempted into making unhealthy choices.

We also want the UK government to finalise legislation that will strip tobacco products of their glitzy packaging to prevent more people taking up this dangerous addiction.

By working with colleagues from other heart patients' groups we can also push for changes beyond our own borders. The European Parliament has recently passed the EU Tobacco Products Directive – a law which aims to make cigarettes less attractive to children by enforcing tighter restrictions on the tobacco industry. These include new regulations on e-cigarettes and changes to health warnings.

This landmark legislation marks an extremely positive step but we must put the pressure on all European countries to bring their national law into line as soon as possible.

Research is key to winning our shared fight. So we are also closely following the proposed EU Data Protection Regulation which has the potential to seriously inhibit vital research involving patient data which is currently being conducted across Europe.

To protect potentially life-saving research we will be working with our European partners to make sure the proposed regulation is amended.

By working together in this way we can help drive down CVD deaths across Europe even further, bringing us ever closer to a world without heart disease. ■

Simon Gillespie
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Improving mental health services throughout Europe

John Bowis, President of Health First Europe details how community care can support better mental health services in Europe...

My first involvement with mental health on the European stage was working with the 1999 Finnish Presidency initiative on mental health promotion. Later, as the rapporteur of the European Parliamentary Report on improving the mental health of the population – towards a strategy on mental health for the EU, I had the opportunity to open the European debate on mental health and mental illness. Since then, several initiatives have been carried out at the European level to promote services for mental health, raise awareness and minimise the stigma of mental disease.

However, despite recent actions at European level, such as the Joint Action Plan on Mental Health and Well-being, many European countries continue to neglect mental health services by under-resourcing the sector. For example, between one-third and one-half of people with disorders do not receive treatment[1]. One of the major reasons behind the gap between the needs of citizens and the availability of mental health services is the lack, or inadequate provision of, community services.

Where we can improve mental health services

In 2006, Members of the European Parliament agreed with my Parliamentary report[2] that while health has continued to be prioritised on European and national agendas, European healthcare systems have not been able to overcome 5 key flaws elevating mental health as part of the public health agenda. Namely:

- the inadequacy of community services;
- the failure to listen to service users and their carers;
- the inability or unwillingness of different agencies to work together;
- serious underfunding; and
- a policy for mental health promotion that is in most countries notable by its almost complete absence.

To tackle these obstacles, there is a clear need for improved community care policies that are aimed at re-organising care around the patient. For mental healthcare, this is especially important because many common conditions such as depression and anxiety are often highly treatable, but too often patients must fit into a system that does not offer adequate funding for mental healthcare services, does not have the appropriate staffing to treat common mental health conditions, and does not provide easy access for patients to specialised services.

Strengthening mental healthcare services

Europe's role in promoting mental health services is often controversial, given the principle of subsidiarity on health related issues. However, the EU can play an important role in supporting the expansion of mental health services by sharing best practices in community care, strengthening anti-discrimination rules where applicable, and by supporting employment policies which incentivise private companies to adopt internal policies to support employees affected by mental-illness[3] and promote the mental wellbeing of all their workforce.

Additionally, the EU should continue to drive the shift of national health systems towards primary care by

incentivising care in the community. To achieve this, Health First Europe developed a model which provides a road map for Member States to the substantive changes required to release the value and power of community care services for all citizens, including those suffering from mental health conditions. As Honorary President of Health First Europe, I believe that this model provides a strong basis for generating EU action on mental health and supporting Member States to find ways to better support primary care professionals to diagnose, treat and manage mental illness.

The Health First Europe Model outlines 6 areas of needed reform, all applicable to the provision of mental health services:

1. **Community Care Policy:** Establishment of a dedicated community care policy and political leadership to implement the policy;

2. **Patient-Centric Care:** A system designed in response to citizen health needs;

3. **Innovation and Value:** Incentivising innovative solutions involving key actors (citizens, carers, technology) across the health system of value to improve health outcomes for the well-being of citizens and society;

4. **Access and Reimbursement:** Flexible funding to increase access to innovative community care solutions including community care products, treatments and services;

5. **Care and Treatment:** Creating a mobile and flexible health and social care workforce bound to the citizen, not the system;

6. **Quality Care and Standards:** Generating quality of care assurance in the community.

The implementation of needed reforms should begin at EU level under the new Commissioner-designate for Health, Vytenis Andriukaitis. By creating

John Bowis
President

a dedicated policy on community care at EU level, the EU can take the lead with Member States to develop best practices on community care services which better support mental health services.

After almost 15 years of closely following EU developments on mental health, I believe it is time to support significant changes to health organisation and help citizens receive the treatment they need and deserve for mental health conditions. ■

[1] Making Mental Health Count, Organisation for Economic Co-operation and Development (OECD), 8 July 2014

[2] European Parliament resolution on improving the mental health of the population. Towards a strategy on mental health for the European Union, http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2006-0341+0+DOC+XML+V0//EN&language=EN

[3] YouTube Video – John Bowis, MEP talks about discrimination and making people with a mental disability more included in society.

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Independence in old age – a training in practice

Science and humans have always been intrigued by the idea of finding a formula for eternal youth or at least for aging in fully physical and mental health.

Even Platon (423-374 BC), in his work called "Politeia", makes age a subject of discussion focusing, however, on the aspects of experiencing age. He underlines the individuality of age and describes the phase of aging as being determined by one's lifestyle in youth and mid-adulthood (cf. Schubert & Zyzik, 1968).

Lehr (2003) establishes that here is historical evidence for the widespread assumption that gero-prophylaxis starts in early life.

According to the saying "You made your bed, now sleep in it", everybody would be responsible for his aging? Unfortunately or perhaps fortunately, it is not that easy. Just imagine the pressure that would arise if this was the case.

In truth, aging is a multidimensional, multifactorial and multidirectional scenario, and with "pattern of aging" (Lowton, 1999; Thomae 1979) it was even given a specific technical term.

Meanwhile, the proportion of older people in the overall population has risen worldwide. Thus, the question now increasingly being asked is – to what degree and under what circumstances can older people maintain their independence? Since 1991 Prof. Dr. Oswald and his employees have studied this question in a longitudinal study. On the one hand, the aim was to identify factors being significantly correlated with the maintenance of independence; on the other hand, investigations should reveal how far intervention approaches fostering mental and physical performances on several levels could help to maintain independence in old age.

In intervention gerontology, there are 3 approaches of particular importance:

- Medical perspective: prevention – health education and promotion of health
- Gerontological psychological perspective: measures to foster cognitive performance and to psychologically handle emerging crises.
- Sports science perspective: measures to foster physical performance, prevention and therapy measures.

Additionally, in his 2002-2003 research project "Rehabilitation in Nursing Homes for the Elderly", Prof. Dr. Oswald and his team examined the question whether the remaining independence of people living in nursing homes could be maintained and fostered on a cognitive and functional level.

In the following, results gained from the studies and lessons learned from working with the training program are presented.

1. The prevention study "Independence in Old Age" (SimA®-50+)

At the beginning of the study in 1991, the 375 participants were aged 75 to 93 years. The training phase lasted almost one year. The participants met once a week and trained for a total of 90 minutes. Each session comprised 45 minutes of cognitive training and 45 minutes of psychomotor training. Between 1992 and 1996 extensive medical and psychological follow-up assessments were conducted annually.

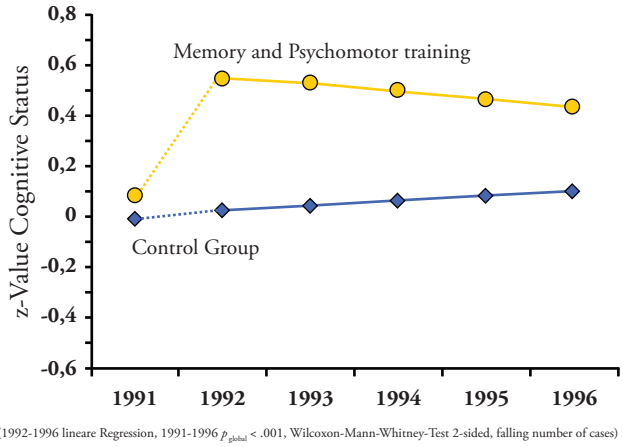


Fig. 1. Cognitive performances, Oswald, 2012 SimA® 50+ in keywords

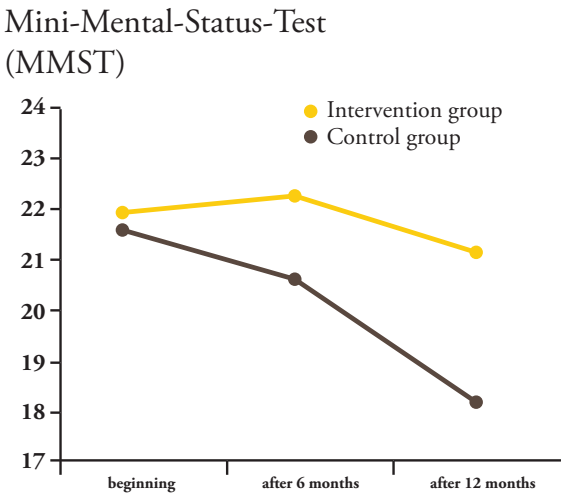


Fig. 2. Results of the therapy study, SIMA®-Akademie 2014

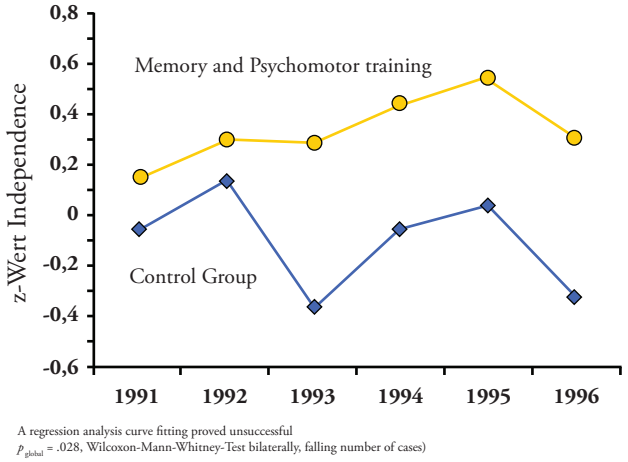


Fig. 3. Independence Oswald, 2012 SimA® 50+ in keywords

When examining the aspects "cognitive performances", "health" and "independence" it was noted that in all aspects the participants of the intervention group had important advantages over the participants of the control group. In all aspects, the participants of the intervention group were able to achieve a growth which they could maintain over the years in comparison to the control group.

Up to 2005, the participants were also tested for dementia in line with the World Health Organization criteria. Altogether, even almost 15 years after the start of the study, a significantly smaller number of cases of dementia was found than might have been expected from the participants' age. Only 10% of the participants suffered from dementia even though the youngest participant in 2005 was already 89 years old.

2. The intervention study – SimA®-P Rehabilitation in Nursing Homes for the Elderly

At the beginning of the study in 2002, 294 participants were aged 70 to 90 years. All participants of the geriatric facility were in need of care, i.e. they were classified accordingly by the care insurance.

Two days a week, the participants of the intervention groups underwent a 60 minute training, respectively, in the inpatient facility. The training session consisted of 20 minutes of psychomotor activation, 30 minutes of cognitive activation and 10 minutes of relaxation.

Regularly, several abilities of the participants of the intervention groups and the control groups were examined.

Among them were: general cognitive performance, memory functions, the aspects of the activities of daily life (ADL) such as mobility, food/clothes, furthermore hygiene, emotional state, depressiveness, quality of life, functional performance, strength, mobility, falls and frequency of falls.

In all aspects besides hygiene, a significant positive change could be achieved.

The quality of life of all participants of the intervention groups was sustainably increased, memory functions and cognitive performance could be improved and due to an improvement of strength and mobility the frequency of falls could be reduced.

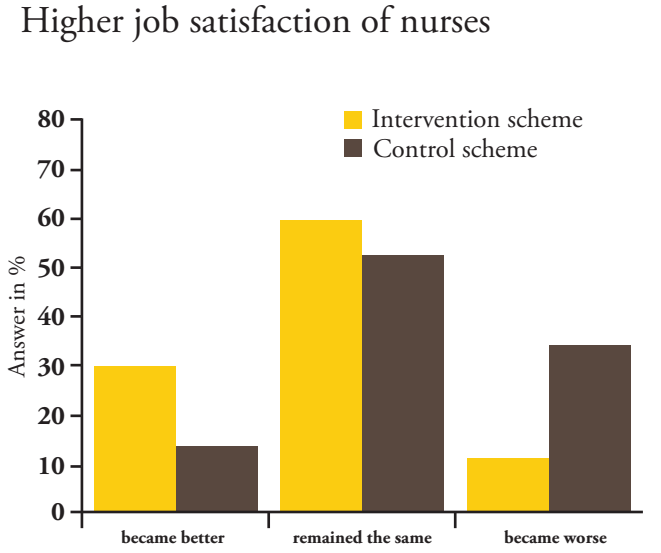
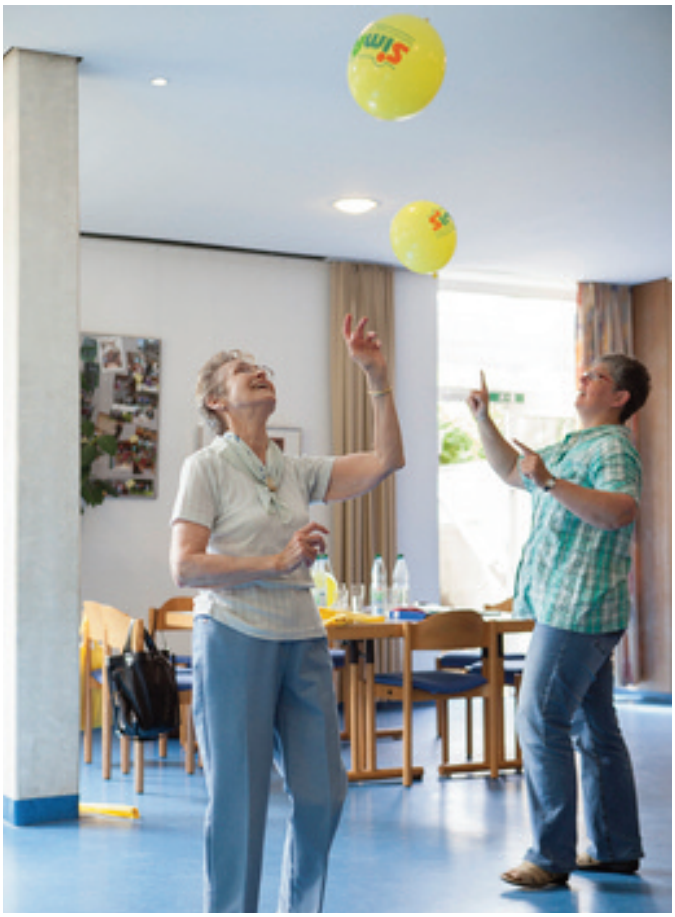


Fig. 4. Results of the therapy study, SIMA®-Akademie 2014



It must be emphasized that by participating this training dementia and its course could also be influenced. The Mini-Mental Status Test is used as a diagnostic tool for dementia. Here evidence was provided that all participants improved their abilities, and the process of decline could also be decelerated considerably.

Additionally, the training had a positive side-effect on the staff of the participating facilities. Their job satisfaction improved.

3. Conclusion – SimA® in Practice

We use this program in day-care centers for senior citizens with a focus on dementia and, additionally, we offer SimA® courses in cooperation with local facilities (Senior Citizens' Office, Adult Education Center).

At the beginning of 2012, we only worked with the book material to check if we, as day-care facility, can work with it.

Several female employees were educated as SimA® trainers and we have extended our work with this program.

Since our guests visit us between 1 to 5 days a week, the extent they benefit from the training varies.

Every day, we offer one training group. The training contents can be adjusted to the individual physical and mental abilities. Even in case of advanced dementia it is still possible to experience a feeling of success.

In the training groups in cooperation with Senior Citizens' Offices and Adult Education Centers, we offer this program as a prevention service. The side effect of social activity in a group additionally supports the success of the training program.

In summary, not only the results of the conducted studies are positive, but also the lessons learned from our practice of implementation.

Especially the possibility to have a preventive effect on one's independence distinguishes this program from others. Particularly impressive is the observation that, thus, the deficit-orientated way of looking at man can be changed. This holds true for female employees, female team leaders, relatives of persons suffering from dementia, patients with dementia themselves and the aging human as such. Abilities you have not been aware of are discovered, lost abilities are found and other abilities are saved from being lost.

Last but not least the myth that you cannot teach an old dog new tricks is broken. You can learn at any age, just the method and the speed are different.

Author: Rita Becker-Scharwatz, Dipl. Gerontology, Dipl. Care Education. Since 2012, Rita is the head of a day-care center of Pfalzklinikum that focusses on dementia. Additionally, she cooperates with the institute of Gerontology at the Heidelberg university in the project DEMIAN in order to evaluate and foster the well-being and the quality of life of humans with dementia in an advanced state.

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Delivering high food standards in hospitals

Good quality, high standard catering in hospitals and healthcare establishments is crucial. Hospital Caterers Association (HCA) National Chair, Andy Jones outlines how the Association consistently promotes, develops and implements standards throughout the 4 Nations to ensure they are adhered to...

Food is the best form of medicine when you are ill. Whether it is in hospital, in care or in your own home, you look for food that will assist in your recovery, and make you feel better. As the recovery progresses you look for more nutritious foods which assists in your recuperation.

The standard of catering in hospitals is one of the highest priorities. As such, it is key that menus and beverage choice meet and are suitable for the patient groups as well as being flexible in both their offering and adaptability.

Good nutritious food helps patients to recover quicker, which means caterers have just as important role to play as the clinicians. Therefore it is important for all members of the clinical care team, as well as caterers, to recognise the role that it can play to improving the patient's clinical outcome.

As part of a wide-ranging drive to raise standards of hospital food across the UK, the NHS now has a Food Standards Plan for England. Plus we have the 'Food in Hospitals, National Catering and Specification for Food and Fluid Provision in Hospitals in Scotland' [1]; 'The All Wales Catering and Nutrition Standards for Food and Fluid Provision for Hospital Inpatients' [2], and 'Promoting Good Nutrition – the '10 A Day' strategy for good nutritional care for adults in all care settings in Northern Ireland' [3]. Hospitals will be ranked on food quality for NHS patients and staff.

The recent PLACE in England results have once again highlighted the disparity in spend in patient food across the NHS. The Association has shown by caterers leading that costs need not rise, so the HCA is still calling for a mandatory minimum expenditure on all patient meals to be introduced in ALL Trusts across the UK.

However until this happens, HCA Members are tasked with getting their CEOs and Directors of Nursing on-side to make their Trust/Organisation's Food and drink Plan a Board issue and to embed food and drink as part of the patient's recovery plan. With a better protocol in place for every single patient which can be followed by all members of the team – from ward to kitchen and throughout a patient's stay – patients will then receive the optimum nutritional care they expect and deserve.

For staff and visitors the emphasis is on healthy eating. Their wellbeing also impacts the patient's recovery, so ensuring that we offer a balance of healthy choices foremost is something that caterers must lead upon. To assist in this aim we are ensuring the healthy dishes/options are more cost effective and we are encouraging our Members to put the calorie content on the menus for staff and visitors, making it easier for them to choose a healthier diet.

The new Hospital Food Plan for NHS England goes a long way in helping to achieve this. We know there are people who want nutritional standards made mandatory, however these are already in place with the British Dietetic Association 'Food Counts Digest'. These are the standards which every caterer in the UK has to achieve in all the menus they provide; and when I say the UK, for the HCA that means the 4 Nations.

As England welcomes the introduction of the new

Andy Jones, National Chair, Hospital Caterers Association

standards, Scotland, Northern Ireland and Wales have been working to standards for several years. We don't need to re-invent the wheel; we just need to ensure that people adhere to them.

By working with and listening to the patients we serve, we can provide menus and dishes they want to eat. That can vary according to the patient group as one size does not fit all. We not only have to cover the different age groups, we are now into an ageing population and obesity is on the rise. We are also mindful of rising malnutrition, which we believe costs the NHS more than obesity, and which will grow with the ageing population as the challenges in social care become more prevalent.

There needs to be far greater recognition of the nutritional value of food in the treatment of patients. This is why we support and work with one of our fellow organisations, the National Association of Care Catering (NACC) to raise awareness and improve understanding of good nutrition and hydration and to protect the NHS from the burden malnutrition of the elderly patients will undoubtedly place on the budget.

For patients, the emphasis is on eating for good health, and for staff and visitors as already mentioned, healthy eating and we need to focus on that. This is something that has been driven through in the various guides we have published, and indeed utilise, and in the campaigns we are running, and we are very proud that our Ward Guide is in England's Hospital Food Plan.

One of the key elements to the HCA is ensuring that we have seasonal menus; the 'Buy British' idea is part of the government's buying standards mandate which could be easily met as we introduce seasonal menus. These are the things we need to get back to; strawberries for the patients in summer, English apples in the autumn, thinking about what is suitable for the patients at the same time.

Whether it's from Protected Meal Times, which ensure that patients can eat their meals undisturbed, giving them the dignity they deserve, to making sure the area is well-lit; while ensuring that the meal is presented correctly on the plate with a little garnish; to providing assistance in opening the packaging, it is essential that our menus and beverage choices are suitable for the patient groups we serve.

To improve the quality of all aspects of continuous patient food and drink provision, the caterer should be allowed to take responsibility for the whole of the ward service to ensure consistency and support for a patient's total food and drink provision. The HCA is constantly looking at our service offering, and exploring how improvements can be made, with equal focus on the ward end - referred to as the 'last nine yards'. It's not just about meeting their food needs, it's also about customer care, how you speak to patients, not just the smile that you give, and just as important, it's how you treat them and give them time.

For instance, hydration is extremely important for patients to assist in the absorption of any prescribed drugs, so we must also look at our mealtimes. Twelve noon is not a suitable mealtime if that is when hospitals have the drugs round. And that is one of the great things this Association is doing; we are challenging the status quo and changing the way we serve the meals to patients.

Working with fellow associations and like minded partners we listen to what patients want, and this is the ethos I want to foster. We don't want to see patients coming back into hospital, so going back to our partnership with the NACC, we are tackling the problem of why they are coming back into hospital, especially elderly people.

We are part of the PS100[4] group, looking at the whole aspect of public sector catering.

We are also looking at what we offer to patients. We need to ensure that we use natural sugars and natural salts more, working with the clinicians to ensure we achieve a true balance, meeting both the medical needs and patients' needs. The benefits of the 'Food Standards Plans' across the 4 Nations are universal, so we're asking all caterers to lead and drive the Plans to ensure this standard of service is accepted as an integral part of the patient's recovery plan and staff and visitors' wellbeing.

Food is a critical part of a patient's hospital experience. It needs to be nutritious, appetising and accessible to patients, their visitors and NHS staff. I am proud to lead the Association as National Chair, ensuring that the patients are at the core of all we do and that they are involved in their food service offer. But above all, our mission is to see that food is embedded in all healthcare establishments, with CEO and Directors of Nursing buy-in, as part of the recovery plan.

Consequently the Plans are the beginning and not the end of the process and we as Caterers have to lead this. ■

[1] Scotland – The first standards to be implemented were in Scotland in 2008.

[2] Wales – 'The All Wales Catering and Nutrition Standards for Food and Fluid Provision for Hospital Inpatients' were launched in 2011 following a Welsh Audit Office report.

[3] Northern Ireland – comply with 'Promoting Good Nutrition – The strategy for good nutritional care for adults in all care settings in Northern Ireland'.

[4] PS100 Source: http://costsectorcatering.co.uk/ps100

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Induced energy – the induction specialist

It only takes a minute for chefs to appreciate the advantages of choosing induction equipment over gas or electric. Induced Energy has spent eighteen years as the UKs only manufacturer specialising in high-quality induction equipment for professional kitchens.

The hobs are designed and manufactured at IEs factory in Brackley, Northamptonshire from where a team of engineers are on hand to provide a personal product support service. All IE products carry a two year parts and labour warranty.

Catering units switching to induction have seen significant savings on energy bills – minimum power input producing maximum heat output.

Induced Energy can supply single, 2-ring and 4-ring induction hobs, all of which feature the unique 0-99 power control. The hobs can either be incorporated into the worktop (drop-in) or can stand alone. As well as being safe, clean and efficient in the kitchen, the IE 3kW table-top single ring hob is ideal for use in meeting rooms and marquees. The robust 4-ring hob can be used on a mobile cooking station with oven or storage cabinet underneath and provides a cooking area for up to 12 pans.

The innovative IE iPlate is the first full-sized hot plate that is powered by induction and is the winner of a CESA Sustainability award. With no need to switch on the unit before service, the

iPlate reacts instantly on contact with the dish. The serving area and staff can be kept cool and safe – there is no danger of customers touching a hot surface – while the food is kept fresh and served at optimum temperature. Food waste is also reduced.

Induced Energy has recently launched the induction Stockpot Trolley – a portable trolley which accommodates the IE single ring hob. Offering flexibility over where it is positioned in the kitchen, the trolley runs from a standard 13 amp plug. Unlike a gas stockpot, there is no need to position it under a ventilation hood.

Another product introduced by IE this year is the unique SLR (slimline remote) hob which will see a revolution in kitchen design. The engine is located away from the induction rings enabling designers to more easily incorporate ovens, hot cupboards and fridges or to utilise additional storage space underneath the cooking surface.

Contact INDUCED ENERGY for more information using the details below.

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Promoting a healthy Europe

Adjacent Government gives thought to how the European Commission are promoting sustainable health systems to create a healthier European population...

The new President-elect Jean-Claude Junker and his team assumed their new role in the European Commission on November 1st. Following approval from MEP's at the end of October, the new Commissioners-designate will now follow on from where their predecessors left off.

The new Commissioner for Health & Food Safety, Vytenis Andriukatis, will be following in the footsteps of Commissioner Tonio Borg. During his years as Commissioner for Health, Commissioner Borg has shown he fully supports and understands the importance of a healthy population, constantly striving for the most efficient healthcare for Europe.

In the speech on sustainable health systems in Malta, Commissioner Borg said he understood that in recent years health systems in some EU member states came under pressure due to the economic crisis.

He said: "No health system in the EU is sustainable unless it is reformed. In the absences of reforms, health spending will increase sharply due to factors such as population ageing, ever growing citizens' expectations, and the availability of better but costly technology.

"Therefore, and at the request of the Member States, the Commission has put the issue of sustainability of healthcare systems under the microscope."

In 2014 the European Commission recommended that 16 EU countries reform their healthcare systems and were encouraged to make more cost-effective use of public resources.

"Such reforms may have high upfront costs, but in the medium to long-term they will lead to more cost-effective use of public resources, including through better coordinated delivery of health services," said Borg.

In the speech, Commissioner Borg also discussed how e-health can have a positive impact on healthcare systems, explaining that e-health can help deliver a more effective and personalised healthcare.

"It has the potential to reduce errors, and shorten hospitalisation," he explained. "When applied effectively, e-health can facilitate inclusion, quality of life and patient empowerment through greater transparency, access to health services and information.

"To help realise this potential and the deployment of interoperable solutions, the Commission has set up an effective cooperation body: the e-Health Network.

"Over the past 2 years, the e-Health Network has proved its worth in securing strategic and technical agreements, for example the Patient Summary Guidelines, the forthcoming guidelines in e-Prescriptions, and the Patient Registries." [1]

Promoting effective and quality health services is high on the agenda at the European Commission, and during his 2 year term Commissioner Borg made it his mission to ensure that all residents in Europe have access to the best possible healthcare.

The EU Commission's Health Strategy, 'Together for Health', aims to invest in sustainable health systems, in people's health as human capital, and in reducing health inequities.

The Health Strategy supports the overall Europe 2020 Strategy, which aims to turn the EU into a smart, sustainable and inclusive economy promoting growth for all. This includes a population in good health.

Speaking in September 2014 to The Parliament Magazine, Commissioner Borg discussed the importance of promoting health for economic prosperity. [2]

"As the outgoing European health commissioner, I am pleased with the progress made in the EU in promoting health both as a value in itself and as a pre-condition for economic prosperity and social cohesion.

"I am pleased that the values enshrined in the EU health strategy, such as universality, access to good quality care, equity and solidarity continue to be widely shared across Europe, in spite of the economic crisis."

The Commissioner also commented that identifying more innovative and sustainable ways of managing healthcare systems is a key concern.

He said: "In this respect, the commission has helped EU countries to tackle this challenge through the European semester – the EU's annual cycle of economic policy coordination.

"Each year, the commission analyses the EU's national economic and structural reforms and provides recommendation for the year ahead. This year, 15 EU countries received tailored recommendations linked to health systems reform."

Handing over the responsibilities to Vytenis Andriukaitis, Borg hopes that his successor will maintain the momentum in improving health systems throughout the EU. "As I pass the baton onto the next health commissioner, I am confident that solutions to today's healthcare and health systems related challenges are well underway. I would encourage my successor, as well as policymakers in member states to maintain the momentum in making EU health systems fit for purpose." [2]

In his introductory statement to the European Parliament, Andriukaitis said: "Health is a key element of social market economy. I believe we need 'a new boost for health in Europe'."

"Spending on health is not just 'expenditure'. Timely and universal access to care and medicines are investments in human capital and productivity. We must think beyond financial expenditure and gain. We must think about people's health as a key asset for society." [3] ■

[1] http://ec.europa.eu/commission_2010-2014/borg/docs/speech_20141013_en.pdf

[2] https://www.theparliamentmagazine.eu/articles/feature/europe-staying-true-values-enshrined-eu-health-strategy

[3] http://ec.europa.eu/about/juncker-commission/docs/2014-ep-hearings-statement-andriukaitis_en.pdf

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Chromatin remodelling and histone modifications in the brain

Cell function depends on many factors, some are specific for the process or the cell type, and others are general, required for all functions in the cells. Chromatin remodelling is one such general function, required for all processes that need access to the DNA. DNA in all eukaryotic cells is organised with protein in a structure called chromatin. The chromatin structure has emerged to be one of the most important contributors in maintaining genome stability and in regulating gene expression. The chromatin structure is dynamic and can adopt several different states; the compact heterochromatin structure to the more open euchromatin structure. Gene expression requires accessible DNA and actively transcribed genes are mainly found in the more loosely packed euchromatin. The chromatin structure is changed in several ways, by methylations of the DNA, post translational modifications of the specific DNA binding histone proteins, or by moving the histone proteins. Several enzyme complexes are involved and often work together. Changes in the chromatin structure are essential during the development of different tissues, and several types of chromatin remodelling have been associated with each step.

Chromatin remodelling

Each cell has several enzymes that are responsible for chromatin remodelling and histone modification and many of these complexes are redundant but in certain cases specificity for genes or processes have been demonstrated. Specific enzymes have also been associated with certain developmental transistions, such as the chromatin remodelling proteins ISWI and CHD have been associated with unpacking of the sperm chromosomes during fertilisation, in gastrulation and germ-layer formation. Other chromatin remodelling proteins, such as component of the SWI/SNF complexes, BRG1 (SMARCA4) and BAF155, as well as ISWI and INO80 complexes, are also important for early steps, since knock out mice never reach preimplantation. Similar results have been obtained with knock out of histone modification enzymes.

Chromatin remodelling and brain

One of the most complex tissues in the human body is the brain. It consists of several types of neurons and non-neuronal cells, all of which specifically respond to several environmental signals and neurotransmitters. The response in the brain is heavily relying on remodelling of the chromatin structure, and the different cell types exhibit different set up of chromatin remodelling and histone modifying enzymes. Many of the components are isoforms specifically expressed in the brain, either under the control of specific brain factors or by microRNAs. These complexes in turn recruited to brain specific genes by specific transcription factors to regulate the chromatin structure.

Chromatin remodelling and neuronal development

Embryogenesis is driven by environmental signalling pathways that induce the expression of specific genes at certain stages. During differentiation into different cells types, the chromatin landscape changes due to the activation of developmental transcription factors and chromatin remodelling complexes. This results in the induction or silencing of specific genes, and gives rise to the cell specific expression of the seen in different cell types.

Keeper of pluripotency

Cells early in development, referred to as embryonic stem cells (ES cells), have the capacity to divide and to develop into many different cell types. They are characterised by specific post translational modifications at developmental genes; they carry both active and silent marks (H3k4me3 and H3K27me3, respectively). This bivalent mark gives the opportunity to either close or open up the genes during differentiation. The self-renewal and pluropotent states are kept by activation of environmental signalling pathways, transcription factors, and chromatin remodelling complexes. The transcription factors involved are Oct4, Nanog and Sox2, all of which are important to regulate developmental genes. The expression of these genes also reprograms already differentiated

cells, such as fibroblasts, into induced pluripotent cells (iPS), less mature cells that can differentiate to different cell types. The core transcription factors require several chromatin remodelling complexes to function properly and keep the chromatin landscape in ES cells in the right state. Specific forms of SWI/SNF complex, the esSWI/SNF, with the subunits BRG1 (SMARCA4), BAF155, BAF53a and BAF 45a are required to activate pluripotency genes. A CHD containing complex, NURD and histone demethylases LSD1, are required to silence pluripotency genes and necessary in differentiation. Recently, it was shown that BRG1 and BAF250a interact with NURD, which suggests that the factors act in fine tuning the state of the pluripotency genes.

Driver of differentiation

Different signalling pathways induce differentiation genes, inducing specific lineages. Chromatin remodelling complexes are important contributors in different lineages, for gene activation or repression. Different CHD proteins have been shown to operate in the differentiation of spleen and in osteogenensis, while histone deacetylases are involved in the differentiation into oligodendrocytes. SWI/SNF complexes are involved in the development of neurons and the central nerve system. The neuron specific SWI/SNF complex contains specific isoforms of, such as BAF45c and BAF53b, BAF60c and a further protein, CREST. The switch in subunits depends on the expression of these subunits, but also on the expression of neuron specific mirRNA. The neuron specific SWI/SNF complex will then be recruitment to neuronal specific genes. Other subunits must also be changed, since a large study of expression of chromatin and epigenetic genes in cortical neurons compared to ES cells, demonstrated that the ATPase BRM (SMARCA2) in SWI/SNF is expressed instead of BRG1. In addition, the histone methylases SET7, responsible for H3K4 me3, and EZD1, for H3K27me3, are highly expressed in adult brain, together with the argenine methylase PRMT8.

"The chromatin structure has emerged to be one of the most important contributors in maintaining genome stability and in regulating gene expression."

Challenges

All the interactions in the gene expression network driving embryogenesis and development are not fully elusidated. Activating other pathways to activate the core stem cell transcription factors Oct4, Sox2, and Nanog has resulted in a different ES cells, with different DNA methylation pattern and expression pattern of key genes. This 2iES cells has been proposed to represent an earlier state in embryogenesis from the commonly used ES cells. These results raise new questions about the order of events in development. Furthermore, development of the neuronal tissue and the function in the adult brain are poorly understood. Studies of the molecular mechanism underlying disorders displaying intellectual disabilities and craniofacial dysmorphologies have shown that deficiencies in processes unrelated to the direct neuronal development pathway may contribute to the symptoms. Defects in ribosome biogenesis, a process required in all cells, result in intellectual disabilities and defects in haematopoiesis. We have isolated a chromatin remodelling complex involved in transcription of ribosomal RNA, the B-WICH, complex, whose components are deleted in Williams syndrome. It is tempting to speculate that some of the symptoms are related to a deficiency of the B-WICH complex in ribosomal transcription.

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The potential of the digital revolution and telehealth

Paul Rice, Head of Technology Strategy at NHS England outlines how innovative technologies are helping us to lead healthier and more independent lives...

Information technology is playing an increasingly pervasive and enabling role in many aspects of our lives, in a host of different ways. It keeps us connected to our loved ones as we video call on Skype or Facetime, blog, connect via social media or share the vivid highlights of our day via Facebook and Instagram. This coming Christmas is expected to see a boom in sales of wearable biometric devices as the new Apple Healthkit suite and Fitbugs, and Fitbits flood into the consumer market, providing detailed data to the user about their general health and fitness and more specific insights into such things as sleeping patterns, body mass index or resting heartbeat. When insight converts to ambition and commitment it is anticipated that more of us will adopt health seeking behaviours and alter our diet and exercise patterns.

For the engaged and connected the internet provides access to a huge amount of expert information from a multitude of professional disciplines. It also enables us, as individuals, to strike up conversations and establish relationships with people we identify with, and whom we share characteristics and experience. "Apps" provide a plethora of information and resource in handy bite-sized chunks extending our ability to personalise our support networks and build self-care competencies.

What is the relationship between these opportunities and capabilities, our health and care system, the NHS, and in particular the experience of the elderly or vulnerable?

The term telehealth has emerged over the last decade to describe a range of interventions and activities where the health and care system has actively engaged with the potential of information technology to eliminate some of the limitations of time and distance. It also encompasses the ability of the individual to capture, track and trend biometric information, about their health status and wellbeing, on the move or at home in a manner that previously wouldn't have been possible outside of the 4 walls of a hospital.

Why has this become so important?

Growing numbers of people with multiple conditions are living longer and resources to support their continued wellbeing are increasingly stretched. Health and social care professionals are expert resources that need to be targeted at those most vulnerable at precisely the right moment. The very experience of travelling for face to face consultation with a health or care professional can be burdensome for patients and their carers, particularly where underlying poor health or a specific feature of their condition (impairment, mobility, cognitive difficulties) makes travel challenging. Through innovative use of technology a consultation can be undertaken between clinician and patient via video link without either of them having to move location. The range of expertise that can be accessed is determined by the skills and experience of the available professional. Increasingly educational and rehabilitation content – for example pulmonary rehabilitation advice and support for patients with Chronic Obstructive Pulmonary Disease (COPD) can be offered remotely. The application of this technology is also not limited to physical ailment or disease. An increasing range of mental health services, covering psychological advice, support and treatment are being delivered by this method too.

In addition to connecting to professional or "expert patient" resources remotely, when an individual uses a biometric or telemonitoring device the clinician has continuous access to an extended range of key data – "vital signs" – and insights – how am I feeling today? Having determined, on the basis of this information, and their knowledge of the patient's history, whether they are stable or deteriorating, the clinician can intervene proactively, advise them to alter their medicines' regime. They can rapidly schedule a face-to-face contact where an immediate and severe need has been identified. The patient too, with appropriate education, can become more aware of the impact of the decisions that they make on their health and wellbeing; this may encourage them to modify their lifestyle decisions accordingly.

The common thread that joins these new models of care is that digital technologies are necessary but not sufficient. On each occasion they deliver the potential to organise services and engage patients and the wider population in a more personal and consistent way, both in managing disease and sustaining independence. For the individual to experience a greater level of control and self- determination the professional patient relationships has to be rooted in collaborating and co-creating health and wellbeing. The current generation of frail vulnerable elderly can benefit from being connected to the community around them, friends and family as well as health and care professionals, enabled as appropriate by technology. They may benefit from specific simple innovations based in the home that directly protect them from environmental risk, the threat of fire or flood, or alert others where they wander unsafely.

These telecare technologies, including simple pendant alarms, may provide much needed reassurance. With appropriate support and as user centred design and consumerism makes the technologies themselves increasingly intuitive and easy to use there is clear potential, as detailed earlier, for their introduction across the generations. As "digital natives" move into their mature middle years there is a building expectation that service models will be sufficiently flexible and designed around the needs of the individual. This is coupled with increased awareness that individuals and communities want and need to take a bigger stake in managing their own health and wellbeing. Information technology can play a huge part in releasing this untapped resource.

The NHS has signalled in its Five Year Forward View document that the NHS needs to evolve to meet new challenges and adapt to take advantage of the opportunities that science and technology offer. An engaged relationship with patients, carers and citizens promoting wellbeing and preventing ill health is a prerequisite for this and information technology and telehealth can play a crucial role in realising this ambition. ■

The National Information Board recently launched the Personalised Health and Care 2020 framework – more info can be found here https://www.gov.uk/government/news/introducing-personalised-health-and-care-2020-a-framework-for-action

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Technology and the Care Act

The Care Act 2014 has the potential to revolutionise the way social care is delivered. Lyn Duncan, CEO of cloudBuy argues that we must seize this opportunity to improve the lives of millions of people while making social care administration more sustainable...

The historical disconnect between health and social care systems has unfortunately seen many vulnerable people fall into the gaps between services. Consequently by the time individuals are admitted to hospital, or come to the attention of the local authority, many care options that deliver better outcomes and are more cost-effective are no longer available to them. What follows is a loss of independence and increased reliance on the state, leading to higher costs to the local authority and a significantly poorer quality of life for the individual. That is why I welcome the Care Act 2014 as a real opportunity to change things for the better.

There is no doubt that the Care Act creates new challenges for local authorities. It makes them responsible for early intervention, cutting the overall cost of care and facilitating access to preventative services that maintain people's health. It gives individuals greater power and choice over how their care is managed and their own personal budgets to decide where money is spent. Furthermore, without additional resources it requires them to provide a solution to the 90% of residents that are self-funders, leading to a tenfold increase in demand.

This situation seems daunting. However Adult Social Care is under increasing pressure and the current model is no longer sustainable. As the status quo is not a viable option, it is time to rethink our whole approach to helping councils become more efficient. In particular, new technology can play a key role here. Forward-thinking councils such as Northamptonshire, Hertfordshire and Staffordshire are already leading the way and demonstrating best practice. On paper a simple online directory can meet the basics of the Care Act. However, these 3 authorities have committed to something far more visionary in order to deliver on significant permanent improvements to care for the elderly and vulnerable.

Under the current system, most authorities are only able to provide financial support to the poorest 10% that they assess as having genuine care needs. The rest are required to source and pay for suitable care assistance themselves. Much of the council's budget is spent setting up and managing approved health and social care providers and keeping track of all the transactions that are taking place. On the supply side many of the best providers struggle to stay afloat as they must pay the cost of council procurement and accreditation. They also need to meet stringent cost controls simply to provide care services to residents who qualify for financial support.

An online directory does little to deliver key objectives underpinning the Care Act or statutory duty to secure best value. For example directories do not make administering care more affordable for the council. While directories may make the suppliers a little easier to find, they do not maximise choice, convenience, information or make it any easier for members of the public to actually do business with them. Most directories are unable to facilitate a dialogue between customers and suppliers, assemble a range of services against an individuals care plan manage transactions or handle secure multiple payments This is the reason that past attempts at personalisation have, although well intended, ultimately failed. Personal budgets can only work if there is a simple and well-signposted means of engaging with a broad range of quality providers 24x7, so residents can make effective choices.

Northampton County Council, in partnership with cloudBuy and Grassroots, has launched an innovative solution under the Breeze-e brand which changes the whole dynamic of how it (and other participating councils) can facilitate and administer social care. Self funders and recipients of direct or managed payments benefit along with their family, carers or other who provide personal support. It provides an engagement experience that customers have become familiar with in dealing with Amazon, Argos or other major retailers and enables citizens to find, rate and buy a broad range of care products and services with a cash card. It is intended that almost all of council commissioned services will be delivered directly through the platform This approach eliminates the majority of the on-going costs to councils of administering social care but just as important is the data that is being collected that alerts the authority to potential problems and helps to enact targeted interventions. For example, based on significant events, common searches and what users go on to buy it is possible to begin identifying recurring care pathways and target intervention ahead of time.

In implementing the Care Act local authorities have a choice. Commission a simple online directory that ticks the box, yet fails to meet the key objectives of the Care Act or deliver any significant benefits to residents. Or take the more innovative and imaginative step of creating a fully transactional marketplace that makes social care more sustainable, helps safeguard vulnerable citizens and paves the way for individuals to access appropriate care. ■

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Modernising healthcare the nuclear way

Adjacent Government spoke to Dr Arturo Chiti, President Elect of the European Association for Nuclear Medicine (EANM) about the role nuclear medicine plays in modern society, and its challenges...

In modern society there are a number of healthcare challenges that researchers are fighting against to find new prevention methods and treatments for. Diseases such as cancer can be treated more successfully if caught and diagnosis is made much earlier.

Nuclear medicine plays a pivotal role in this and can help give medical staff the early diagnosis for the patient, and a more localised point for treatment. The European Association of Nuclear Medicine (EANM) works to educate people in the method of nuclear medicine, and further advance methods to help with that all important early diagnosis. However, when people hear the word nuclear, it can generate a fear in some, and without the correct information patients don't understand how nuclear medicine can help prevent and treat some of those major health challenges.

In order to help give patients more information about molecular imaging and nuclear medicine techniques, The EANM have put together information for patients to remove the fear regarding this form of treatment, and set their minds at ease. Editor Laura Evans spoke to Doctor Arturo Chiti, President Elect of the EANM about how nuclear medicine fits into modern society, and the challenges that come with such a complicated field.

"One of the advantages is that nuclear medicine is able to see molecular alterations – what we call functional alterations in cancer," explains Doctor Chiti.

"From research we have learnt that these alterations normally proceed the multi-functional alterations that we see with a CT scan. This is important because when you suspect cancer is present it helps in giving a very early diagnosis compared to morphological imaging."

The method of nuclear medicine can be quite complicated, but it can help a number of healthcare problems from cancer to thyroid problems. Doctor Chiti explained the process, and the advantages this has with diseases such as cancer.

"Nuclear medicine or molecular imaging uses small probes that are called tracers, and these probes are able to localise particular tissues within the human body.

"These probes help to visualise diseases like cancer, or even evaluate how the blood flow goes into the heart. With this principle we are able to treat diseases like cancer, because these probes have radio-nuclides imbedded into the molecule, and radio-nuclides help you to localise exactly where the problem may be in order to treat it," he says.

"Nuclear medicine helps us to do what we call personalised or precise medicine, because we can visualise the target and we can treat accordingly to this."

Over the years nuclear medicine has evolved to keep up with modern medicine, and the constant health challenges faced throughout Europe. There are a number of ways in which this has happened, as explained by Doctor Chiti.

"We have 2 main tracks, the most important is the research of radiopharmaceuticals. These are the probes that are used in the process of nuclear medicine," he says.

"In an effort to get more specific molecules to visualise or treat specific targets, we are carrying out research of radiopharmaceuticals for diagnosis, biological characterisation, and therapy. We can also design

Image: © EANM

Doctor Arturo Chiti
President Elect
European Association of Nuclear Medicine (EANM)

molecules which are exactly the same or similar to drugs which are used – non radioactive drugs.

"So the key aim is to be able to visualise the targets of drugs, which are used in oncology. This means you can select those patients that are going to benefit from a particular treatment."

Technology also plays a vital role in molecular imaging, and one of the main challenges that Doctor Chiti pointed out was keeping up to date with sophisticated technology, as it evolves.

"We are using big hardware in order to track the radiopharmaceuticals which are injected into the patient, and this means that from that point of view we are aiming at having more and more sophisticated technology in order to visualise very small alterations in the human body," says Doctor Chiti.

"Of course the imaging we use is always multi-modality imaging, that means that you have the molecular imaging, but you always have a CT scan or an MR scan as a companion in order to be able to have morphological and functional imaging in the patient at the same time. This increases the accuracy of the diagnoses we can do."

Radiopharmaceuticals are the core of Doctor Chiti's discipline, and it is the regulations relating to this area that he believes are one of the main challenges that faces the nuclear medicine field, as he explains.

"Regulatory issues are challenging because every radiopharmaceutical has to be approved at a European level, and then at a national level. Sometimes this is cumbersome and quite slow.

"Another issue is that radiopharmaceuticals are not developed at the same level throughout Europe. There are some countries where they are further developed than others. So, for example, there might be in country A, radiopharmaceutical for diagnosis or therapy available, but in neighbouring country B it is not. What we are aiming for is harmonised regulations throughout Europe – at least for radiopharmaceuticals."

Looking ahead, Doctor Chiti would like to see nuclear medicine integrated with other clinical departments, in order to gain the best possible outcomes for patients.

"It will mean integrating nuclear medicine procedures with the other diagnostic imaging procedures – multi-modality imaging, and be more integrated in the oncological tracts, cardiological and neurological and also in those clinical tracts which are related to infection imaging," he concludes.

"In my mind there will be more clinical speciality within this field of medicine, with more technology specialists working with the medical doctors." ■

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Point of Care Pulmonary Ultrasound

From the Basics to Bedside Protocols

Ultrasound is named for the fact that this technology deals with waves traveling through a medium at frequencies above the threshold of human hearing. Within this article the term "sound waves" are used which are more accurately described as pressure waves produced by the transducer that travel through a medium. The commercially available ultrasound machines available for bedside and critical care applications utilise frequencies between 2 to 14 megaHertz. Several probes are often available for selection, depending on the application or procedure performed. Two important properties of the ultrasound wave important to probe selection are frequency and wavelength. Wavelength is the distance between successive crests of the sound wave. Frequency is the number of occurrences of a repeating event (for our purposes, the sound wave crest) over a unit of time. Frequency and wavelength are inversely related. The longer the wavelength, or greater the distance between the wave crests, the less frequent the crests occur over a unit of time. In other words, large wavelengths have low frequencies. Lungs are relatively superficial compared to intracavitary organs, so less distance is required to visualise the pleura. A higher frequency probe (5-14 MHz), with a shorter wavelength is required. In addition to ultrasound wave properties, the ultrasound transducer surface is also considered in probe selection for pulmonary ultrasound. Flat footprints of varying length and square or rectangular shape are available.

Various modes are utilised to visualise intrathoracic structures, including B mode, M mode, and Doppler assessment. B-mode stands for "brightness" mode and presents a 2 dimensional display in varying shades of gray (Figure 1). M-mode stands for "motion" mode, and selects an "ice pick" single dimension sample from pixels of the B mode image (Figure 2). The horizontal axis represents time and the vertical axis represents the motion of reflecting echoes. Many machines simultaneously display B and M mode imaging. Doppler assessment is obtained either through continuous, pulse wave, or color flow mapping. Continuous wave Doppler has the ability to measure high velocities without aliasing. Aliasing occurs when the pulse repetition frequency is too low, and the high frequency measured "wraps" back around the scale and is visually misrepresented in the negative direction. Continuous wave Doppler is also highly sensitive to low flow states. It is the simplest form of Doppler and uses a dedicated probe that has two crystals within the transducer. Once crystal configuration transmits ultrasound waves 100% of the time, and the other receives Doppler information returning from tissues

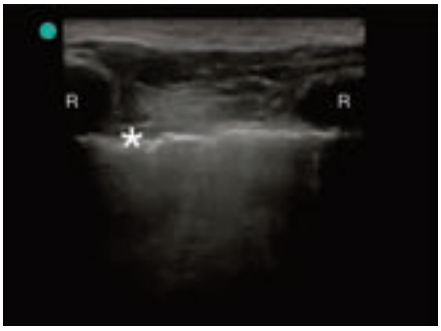

Figure 1: B mode imaging of normal lung. Acoustic shadowing of ribs (R) marks the pleural line (*) in this longitudinal view

that reflected the ultrasound waves. The Continuous wave transducer must be held with an incidental angle of 0° or kept parallel with the interrogated structure. Due to the shape of the chest, this may limit the utility of Continuous wave Doppler for lung ultrasound. Additionally, continuous wave Doppler is displayed only as a waveform. In contrast, Pulse wave Doppler uses a single crystal that transmits the ultrasound wave, then "listens" to receive the returning Doppler information. The returning pulse is a snapshot of the position of the reflecting surface position within the sample. B mode images are displayed along with information about pleural movement in relation to the transducer surface. Pulse wave Doppler information is displayed acoustically or is converted into color. A color map indicates flow direction, as in a red and blue scale, or simply the presence of movement. Figure 3 demonstrates orange scale power Doppler as it detects pleural

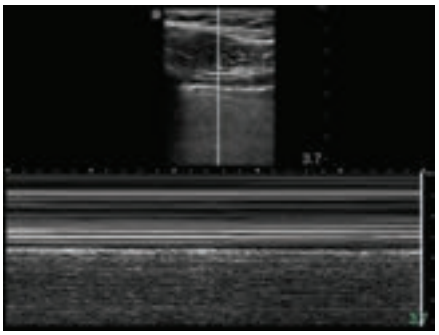

Figure 2: M mode imaging of normal lung

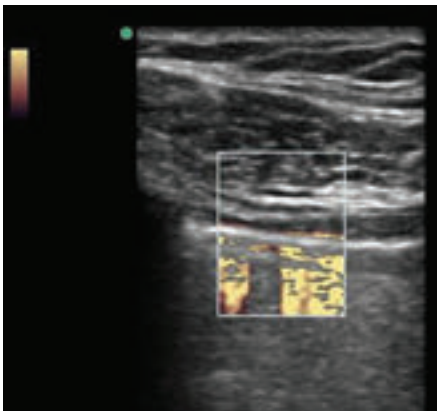

Figure 3: Power Doppler visualisation of normal lung

movement relative to the transducer surface.

Pulmonary Ultrasound Examination and Pathology

Air is a poor medium for an ultrasound wave due to its low density and slow propagation velocity. Healthy lungs contain air, and are surrounded by the highly reflective bones of the ribs. Rather than visualising lungs directly, pulmonary ultrasound is highly dependent on identification of various artifacts or detection of movement.

In a longitudinal view, the acoustic shadowing of the ribs marks the space where the pleural line may be identified. In Figure 1, the acoustic shadow of the ribs (R) is created by the strongly reflective bony cortex, and marks the pleural line (*). Since bone reflects ultrasound waves, no signal is detected behind the cortex, creating the dark shadowing.

Normal pleural movement demonstrates a "shimmer sign" with B mode imaging. Poor respiratory effort, operator experience, operator fatigue, and other factors may make the identification of a "shimmer sign" difficult. M mode imaging is used with a high frequency probe to depict lung movement. A normal lung that is moving has a homogenous granular appearance under the brightly visualised pleura. Figure 2 depicts this "seashore sign", with the homogenous granular appearing lung reminiscent of sand and approaching waves. The loss of granular appearing "sand" on the bottom half of the screen is indicative of pneumothorax. Lung sliding is also detected by Doppler. Power Doppler (Figure 3) utilises an orange scale to detect movement relative to the transducer surface, which is more sensitive for movement as compared to the red blue Color Doppler map. A patient with a pneumothorax will not have lung sliding relative to the transduce surface, and no color will be detected in the sample selected (Figure 4).

The pleura surface itself creates an ultrasound artifact. A reverberation artifact is created when the ultrasound beam encounters a strong reflective surface and there is a difference in acoustic impedance between two tissues, such as the pleural line and the less dense lung. The ultrasound beam is transmitted back to the transducer several times, and each time the signal is slightly weaker. This gives the appearance of the reflective surface being distal to, or in the far field from the actual structure. A lines are the reverberation artifact of the pleural line (Figure 5).

B lines, also known as comet tail artifacts, represent the common border between the interlobular septa and the alveolar wall.[1] B line artifacts start from the pleural line, and are hyperechoic, or brighter than the surrounding field (Figure 5). B lines move with lung sliding, whereas A lines are static. In normal lung the B lines appear to wipe side to side over the stationary appearing A lines. The lack of B line movement also indicates pneumothorax.

B lines are key to identification of interstitial lung disease due to pulmonary fibrosis, pulmonary edema, acute respiratory distress syndrome, and other pathologies.[2] Due to the pleural traction created from underlying fibrotic lung and thickening of the interlobular septa, B lines appear at least 7mm apart in interstitial lung disease.[3] Ground glass appearing lung on chest tomography appear on ultrasound as B lines that are at least 3mm apart.[4]

The lack of B lines is seen in pulmonary consolidation due to the replacement of the alveolar air with fluid or blood. Consolidated lung may appear homogenous or heterogenous. Doppler evaluation of lung assists with evaluation of a vascular blood supply indicating lung cancer rather than an infectious etiology of consolidation.[5]

A lung that is compressed from pleural effusion, tumor, bronchial obstruction, or other atelectasis

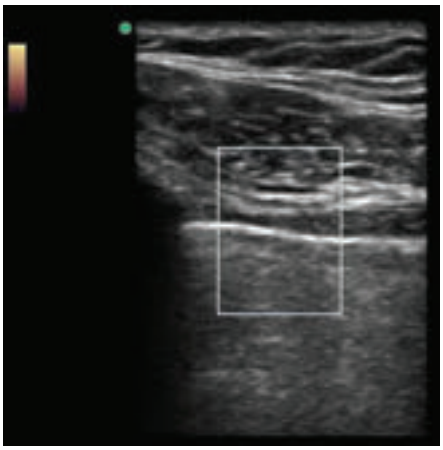

Figure 4: Power Doppler visualisation of pneumothorax

appears wedge shaped and brighter, or more echogenic. Pleural effusions and hemothorax are typically anechoic, or black, on ultrasound. Dynamic evaluation of the lung demonstrates lung floating in an anechoic effusion. Interpleural distance of greater than 50mm at the lung base represents a pleural effusion of at least 800mL.[6] Figure 6 demonstrates a pleural effusion with compressed floating lung.

Several scanning protocols exist for pulmonary ultrasound. As a general rule of thumb, it is recommended to visualise more than one lung field, and over any area where there is clinical suspicion for pathology. The BRIPPED protocol is a screening tool for undifferentiated shortness of breath that may be performed with the patient in any position, and utilises high and lower frequency probes using a portable bedside ultrasound machine.

BRIPPED Protocol:

The BRIPPED scan is an effective screening tool for undifferentiated shortness of breath that evaluates pulmonary B-lines, right ventricle size and strain, Inferior Vena Cava (IVC) collapsibility, Pleural and Pericardial Effusion, Pneumothorax, Ejection Fraction of the left ventricle, and lower extremity Deep Venous Thrombosis.

B-lines: Sonographic pulmonary B-lines have been shown to correlate with congestive heart failure.[2] A two-zone scanning protocol has been shown to perform similarly to an eight zone protocol.[7] A high frequency linear probe is used to evaluate at minimum two mid clavicular apical lung windows.

RV strain: Right ventricular (RV) enlargement can be caused by a Pulmonary Embolus (PE), acute RV infarct, Congestive Heart Failure (CHF), pulmonary valve stenosis or pulmonary hypertension, and is a risk factor for early mortality in PE.(8) A low frequency phased array probe is used to evaluate RV strain in an apical four-chamber view.

IVC-size and collapsibility: Using an IVC size cutoff of 2.0cm has been shown to have a sensitivity of 73% and specificity of 85% for a Right Atrial Pressure (RAP) above or below 10 mmHg. The collapsibility during forced inspiration of less than 40% has even greater accuracy for elevated RAP (sensitivity 91%, specificity 94%, NPV 97%).(9) A low frequency phased array or curvilinear probe is used to visualise the IVC long axis, and dynamic imaging is used to assess collapsibility as either complete or less than 40%.

Pneumothorax: Bedside ultrasound is more accurate than supine chest x-ray with diagnostic ability approaching that of CT. (9,10) The same windows for B-lines are utilised for pneumothorax screening. Additionally any area of decreased breath sounds, or crepitus palpated along the chest wall is evaluated for pneumothorax with a high frequency linear probe.

Pleural effusion: EUS has been shown to have an accuracy similar to a CXR for evaluation of pleural effusion.[11] A low frequency phased array or curvilinear probe is used to evaluate each mid axillary line at the costophrenic angle in the sitting patient.

Pericardial effusion: EUS has a sensitivity of 96% and specificity of 98% compared to formal echocardiography.[12] A low frequency phased array probe is used to evaluate pericardial effusion from an apical four-chamber view and a parasternal long axis view of the heart.

EF: The qualitative assessment of left ventricular ejection fraction by emergency physicians has been shown to correlate well with an assessment by a cardiologist.[13-15] The same low frequency probe and parasternal long axis used to evaluate pericardial effusion is used to evaluate ejection fraction. Dynamic qualitative assessment of ejection fraction is classified as normal, depressed, or severely depressed.

DVT in lower extremities: Ultrasound was performed by emergency physicians using a two-point compression venous ultrasound on patients with suspected lower extremity DVT. This approach had a 100% sensitivity and 99% specificity in diagnosing DVT, compared to a

Figure 5: A line artifact (A) and B line or comet tail artifact (B)

reference venous ultrasound in radiology.[16] A high frequency linear probe evaluates compressibility of the common femoral and popliteal veins with dynamic scanning. If pretest probability is higher for DVT, then additional fields are included, starting below the inguinal ligament at the common femoral vein, and each segment of vessel is compressed every 2cm to the trifurcation of the popliteal artery distally.

The BRIPPED protocol can be performed in its entirety from a head to toe approach, switching between transducers, or completing the exam with one transducer then switching to the next. An example of the latter would be to first use the low frequency probe to evaluate the parasternal long axis and apical four-chamber, noting the presence or absence of pericardial effusion, ejection fraction, and RV strain. Then the long axis of the IVC is evaluated for dynamic collapsibility. Moving laterally, the costophrenic angles are evaluated bilaterally for pleural effusion. The probe is switched to the high frequency probe to evaluate each lung apex is evaluated in the mid clavicular line for the presence of pneumothorax and B lines. Lastly, the dynamic two-point DVT screening is performed with compression ultrasound. The BRIPPED protocol and other bedside ultrasound resources can be viewed here:

http://www.anatomyguy.com/b-ripped-scan-for-evaluation-of-emergency-department-patients-with-shortness-of-breath/

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Wound Care – Challenges in the home care setting

Sebastian Probst, and Georgina Gethin at the European Wound Management Association outline the challenges of treating wounds in a home care environment...

The European Wound Management Association (EWMA) aims to promote best practice in wound management and to advocate for the rights of people with wounds, to receive the best possible care in a timely manner that meets the needs of the individual and the health service. The document Home Care-Wound Care (HCWC)[1] was developed by a group of experts within EWMA and supported by representatives of organisations in the UK and Germany, to provide a set of recommendations on wound care in the home care sector at a European level. The document sought to generate critical discussion and debate of what prerequisites, conditions and knowledge/skills of healthcare practitioners are required to manage wounds in the patients' home. The document provides examples of the organisation of wound care across Europe with 3 case exemplars.

The need for this document is underscored by rising costs of healthcare driven mainly by increased costs of medicines and devices, increased capital costs and an increase in the numbers of people with chronic conditions requiring primary and secondary healthcare support. In tandem with this has been the shift in the delivery of services from hospital to the home care setting and this shift is clearly seen in the field of wound management [2, 3]. The increasing pressures for early discharge from acute hospitals means that more wounds which heretofore were managed in acute settings are now being cared for in the community, and in patients own homes. In Europe today, it is estimated that around 70-90 % of wound care is conducted in the community, the majority of such being delivered by nurses [4, 5]. At least 50% of the work load of the primary care nurses is spent on provision of wound care, and a study from Ireland sets this figure at 68% [6].

The challenges of providing wound care in the home within Europe is underscored by the patient chronicity as 76% of patients with chronic wounds have 3 or more comorbid conditions including hypertension, vascular disease and arthritis and up to 46% have diabetes [7]. Home care clients today are becoming older and have more complex health needs than previously known. Thus, home care patients tend to require extensive help [8, 9].

"For most patients caring for a chronic wound in the home care setting is a challenge as all aspects of daily life are affected including limitations of mobility, personal hygiene and simple things such as choosing shoes and clothes."

The role of the patient and informal carers

There is a paucity of research which focuses on the subject of HCWC from a clinical perspective [10-14]. This gap can be illustrated by the fact that there are no guidelines or recommendations of minimum requirements for providing best care to patients with wounds and their families in the home care setting. Furthermore, there is some evidence to suggest that many patients receiving health care services at home never have their wound aetiology diagnosed [10, 11].

Patients' needs in chronic wound care often continue over weeks, months or even a lifetime. Therefore, planning wound care requires empowering patients and their informal carers by involving them and allowing them to contribute to decision making and ensuring that they are satisfied with the care they receive. Probst et al. [15] reported how patients and their informal carers receive little support and practical information from healthcare professionals. Other

literature shows that healthcare professionals need to include patients and their informal carers in their care by providing information and advising them on how to manage a wound in the home care sector, where to get dressings and how to choose the appropriate dressing, and how to cope with wound-related symptoms [16-18].

Chronic wounds are common in primary care settings and require a high level of resources, and can have a profound impact on a patient's quality of life. Hence, collaboration between the patient and practitioner is important. However, living with a non-healing wound at home can have a pervasive and profound effect on the daily lives of patients [19]. The impact of physical, psychological as well as social effects and quality of life are overwhelming. For most patients caring for a chronic wound in the home care setting is a challenge as all aspects of daily life are affected including limitations of mobility, personal hygiene and simple things such as choosing shoes and clothes[18].

We must recognise the challenges inherent to being treated in the home environment. Often, practitioners work alone, so they must adapt what they have to provide a suitable home care setting for delivery of wound care. Building a team approach with the expertise, views, and opinions of the patients and their informal carers are also critical. Together, team-building and adapting to the environment are important factors for successful HCWC. The HCWC document places specific emphasis on the under recognised role of the informal carer in the provision of wound prevention strategies and wound management. These carers are often family members with no formal training in wound care. However, this

group requires special attention as they may feel overwhelmed and overburdened by their new role and responsibilities.

Conclusion

Home care is organised and funded differently within Europe. In taking care of patients with a wound and in helping to prevent the onset of a wound, a needs assessment is mandatory and is best performed by specialists in wound management. Health care professionals need to acquire skills and knowledge on how to manage wounds in the home care setting, and develop a team based approach to care delivery. Inclusion of patients and informal carers is vital to the success of this process. Already this document has seen EWMA initiate a follow-up project in the UK to develop a network of experts and implement a UK-focused guidance document together with key players in the fields of wound care, home and community care, and patient organisations. Another project in Germany is also being planned and more national projects are likely to follow. ■

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HARNESSING THE EXPERTISE OF INDIVIDUALS TO FACILITATE BEST PRACTICE IN WOUND CARE

Clinicians who treat patients with wounds need access to the resources that will enable them to deliver the best and most appropriate treatments. Education is an increasingly important issue. Mölnlycke Health Care try to fulfil the demand for training and provide clear, comprehensive outcomes to educational objectives with a wide range of courses, seminars and online learning. A significant number of our field staff are clinically trained with registered nurse status. We share our clinical expertise by giving advice and our best practice to our customers. Continuously creating and delivering clinical education and evidence is one of the most important ways of securing that the products we offer are both safe and efficient.

Additionally Mölnlycke Health Care run a Wound Academy whereby we produce a library of educational materials and best practice documents through the working of Special Advisory Groups. We aim to disseminate these to healthcare professionals engaged in wound care across the UK. As part of the Academy every year we present a series of awards and scholarships to health care professionals which aim to celebrate innovation in patient care, whether through a patient case study or service improvement. These awards recognise some great developments in advanced wound care, and rewarding the winner with a bursary and providing mentorship through the academy enables them to carry out personal and professional development.

Helen's story, 2014 Scholarship Winner

(Helen Mountford, Staff Nurse, Acorns Children's Hospice, Walsall)

Acorns Children's Hospice in the Black Country provides both palliative and end of life care, and offers short breaks for families in the hospice and at home. We support children aged from birth to 18 years, covering a large geographical area within the West Midlands.

As a staff nurse at Acorns I feel very rewarded and satisfied as each day is different, offering new opportunities for learning, using new skills, facing new challenges and developing new therapeutic relationships with families and children. Care at the hospice is given to the highest standards and staff work together to ensure that individualised care plans are formulated for each child and family, recognising individual diverse needs and differences.

I have been able to focus and draw upon my interest and experience in tissue viability (TV), which I believe is essential during palliative/end of life care for children. Not only does it ensure that the child is as comfortable and as pain free as possible, but it also encompasses children's dignity and respect. As part of my role, I develop and update TV services which are evidenced based and current. This drive stems from witnessing poor care and prevention of pressure ulcers in children and seeing how a lack of care, knowledge and understanding prevented or delayed the healing process or caused unnecessary discomfort.

I entered for the Mölnlycke Scholarship to raise the profile of TV within paediatrics, particularly in palliative care, as I discovered that there is limited evidence, information and research within this field. I also wanted support from the specialists within the Academy network to help me develop both from a clinical and theoretical basis.

I was extremely pleased (yet stunned) to win and have already achieved success in many of the areas I had identified initially, and made advances in other areas. The objectives for the coming year include:

- *To provide a specialist TV trolley for staff to use in-house and in the community; this will facilitate assessment, monitoring and evaluation of individuals, choice of treatment, therapy or dressing for the child, contact details for help and guidance;*
- *To develop a new information leaflet to give to all parents and carers, outlining why TV care is so essential and who to ask for help and advice if they have any concerns;*
- *To ensure all staff are trained to a high standard using evidence based research;*
- *To ensure the organisation and all staff recognise and prioritise TV;*
- *For all staff to know who to ask for help both within Acorns and externally.*

I am hopeful that this year will be the basis for setting up the foundation and culture for the future where TV will be no longer an adjunct to care, but totally encompassed with generic care of the individual child.

Wendy Luke, Deputy Manager at Chester Court Care Home

Another one of the Mölnlycke Health Care Wound Academy winners this year was Wendy Luke, Deputy Manager at Chester Court Care Home. Wendy outlined a case study of a patient with Chronic Obstructive Pulmonary Disease. It showed how Wendy and the team had worked together to find a suitable dressing that would both maintain the seal on her ventilation mask, and allow treatment to be applied to the small pressure ulcer on her face. Mepitel® One as a primary dressing was used as it could be removed without pain or trauma. The wound healed, and the patient continued to use the dressing prophylactically.

Wendy was presented with her award by Dr David Foster, Deputy Director of Nursing for NHS England, who tweeted the Director of the Barchester Group (whom she works for), telling him about Wendy's achievement. We are delighted to report that, following her innovative achievements and award, and this further exposure on social media, Wendy Luke has been invited to 10 Downing Street to have tea with the Prime Minister, in recognition of her outstanding contribution to Nursing in the Healthcare sector.

Mölnlycke Health Care are tremendously proud of all our Wound Academy winners, and look forward to this year's applications. Innovation is part of our DNA and we will continue to invest in the future of wound care to keep delivering new cost effective solutions and continue to support both service improvements and patient case studies through the Academy.

Mölnlycke Health Care is one of the world's leading providers of wound care and surgical solutions to the health care sector. For more information please visit: www.molnlycke.co.uk

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MÖLNLYCKE HEALTH CARE

Taking action on e-cigarettes

Frédérique Ries, MEP at the European Parliament details what actions should be taken in regards to e-cigarettes and their regulation throughout Europe...

In April this year, MEPs and governments from the 28 EU Member States agreed a new law regulating tobacco sales across the European Union. They also used the pretext of the review for the Tobacco Products Directive to over-regulate e-cigarettes, in the opacity of trilogue meetings.

From the beginning the Commission and Council wanted to make life difficult for e-cigarettes, suggesting that similar rules should apply to them as to medicinal products, making them available only in pharmacies, on prescription by doctors. Not the easiest way to facilitate access to the market. After the deal, we now have a normative status on e-cigs made up of 1 article, 13 paragraphs and 33 provisions without any prior impact assessment.

The least we can say is that this is not an example of good legislation as the scope is really unclear and presents a real risk of overlapping. No less than 4 legal classifications are authorised: related tobacco products, medicinal products by presentation if claim of therapeutic added value are made by the manufacturer (this route was already foreseen in the original proposal by the Commission), and 2 other new routes: medicinal product by function (that the national agency of each Member State will decide) and fourthly, to classify e-cigarettes and their devices as medical devices if the cartridge is sold separately on the market.

However Member States retain broad discretion as to the legal classification given to the e-cigarette, which seems inconsistent with the stated goal of strengthening the internal market.

Amongst the main stringent provisions of the new Tobacco Products Directive:

- We have now an immediate ban for tanks bigger than 2ml to be used in rechargeable electronic cigarettes;

Frédérique Ries
MEP
European Parliament

- Audio-visual commercial communications such as advertising to the general public, are prohibited for electronic cigarettes and refill containers as of 20 May, 2016;

- Concerning the global category of refillables, the Commission shall report on health risks of refillables by 20 May 2016 and whenever appropriate thereafter;

- The addition of a safeguard clause on restriction of refillable cartridges and tanks in the market. In practise, where certain types of refillables have been prohibited in at least 3 Member States, the Commission shall be empowered to extend the ban to all Member States on justified grounds.

"Member States retain broad discretion as to the legal classification given to the E-cigarette, which seems inconsistent with the stated goal of strengthening the internal market."

This last measure means an application of the precautionary principle, only postponed in 2 years' time. It is regrettable that some lawmakers have forgotten that the main added value of the European Union's public health is to support patients who want to get rid of their addiction, which obviously is justified, not by measures of restriction or prohibition, but by incentives.

Hopefully, some of the Member States with a mature market such as the UK and France are taking a pragmatic view related to the "smooth" implementation of those provisions. On the other hand, the European Commission will have a second chance in 2016 with the adoption of secondary legislation foreseen under the TPD, to adopt a balanced position on this drug washout tool.

Not only because it makes sense to take into account scientific studies carried out by hundreds of pulmonologists and European researchers who found the electronic cigarette is a valuable tool in the fight against smoking, but above all because it is crucial for the EU to send the right message to 8 million of vapers that forever want to turn away from cigarettes and their addiction that slowly kills. ■

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ECITA and the British Standards Institute: PAS 54115

In February 2014, the British Standards Institute (BSI) approached ECITA to discuss the possibility of creating a standard for the electronic cigarette ('ecig') sector. Since ecigs are such an emerging technology, it was deemed unfeasible to create a full British Standard, so it was decided that a Publicly Available Specification (PAS) would be the best solution. ECITA's members agreed to sponsor this project in March 2014, and BSI invited ECITA's Tom Pruen and Katherine Devlin to provide Technical Authorship.

The base document was completed and submitted to the Steering Group in September 2014, and their amendments have now been incorporated. The Public Review phase will start on 3rd November 2014. The UK Department of Health has 'Observer' status over PAS 54115, and they have indicated that they would like to use PAS 54115 to help them with implementing regulations for the revisions to the Tobacco Products Directive. There will be final Steering Group consultation and review in early January 2015, and the PAS will be published on 15th March 2015.

This PAS is the first ever attempt to do a voluntary standard for ecigs. We have been delighted at the positive engagement from the vaping community, our industry colleagues, Public Health and the regulators.

The PAS gives recommendations for the manufacture, importation, labelling, marketing and sale of vaping products ("VP") including electronic cigarettes, e-shisha and directly related products, as well as recommendations for test methods to inform the safety assessment of both eliquids and hardware. The PAS recommends a test solution, a test bed atomiser, the method used to operate VP to gather emission samples, the method and materials for gathering such samples, and an outline for the toxicological and chemical analysis of the emissions from both eliquids and hardware separately. For these analyses, the emphasis is focussed on required outcomes of such testing, allowing a wide variety of testing houses to perform the tests, which should ensure that no producer wishing to have their products tested will have too long a wait.

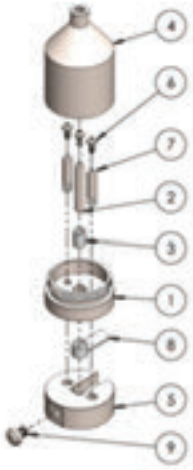
The PAS is applicable to producers and distributors of VP in the UK, and forms a Code of Practice for commercial operations in this sector. There are some exemptions from certain testing requirements for small producers manufacturing hardware exclusively. The PAS is also applicable to laboratories and testing houses engaged in, or planning to be engaged in, the testing of VP.

PAS 54115 is not intended to cover those VP which are licensed as medicinal products or medical devices, nor does it cover products which can be used in or as VP, but which are sold for other purposes, such as food flavourings sold in supermarkets.

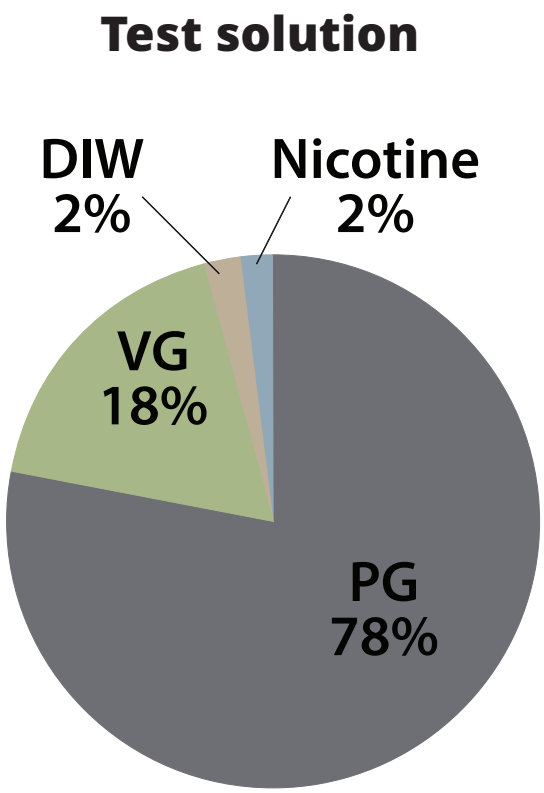
For all the emissions gathering tests, all the devices and eliquids are tested at a range of power inputs, to represent the range of product options available. This ensures that the testing is as representative as possible of 'real world' use of the products, and can fully inform the safety assessment of the products' toxicological profile.

A number of analytes of interest are listed, some of which should not be added to eliquids, e.g. formaldehyde

Test-bed atomiser



ITEM NO.	PART	QTY.
1	Base	1
2	Positive Pin	1
3	Positive Pin Isolator	1
4	Barrel	1
5	Stand	1
6	M1.6 x 4mm Stainless Pan Head	3
7	Negative Pin	2
8	Stand Isolator	1
9	M3 x 4mm Stainless Pan Head	1



(which will be present, since it is a ubiquitous chemical, but should not be added as an ingredient), respiratory sensitisers, etc., as well as some which should be monitored to ensure they are only present at appropriately safe levels, e.g. metals, etc. The testing of both eliquids and the emissions gathered from both eliquids and hardware is recommended to be carried out by gas chromatography/mass spectrometry (GC/MS), because we are looking for volatile emissions, although other analytical techniques may be used, providing they are able to offer sufficiently detailed analysis to the appropriate detection limits. Separate testing is required for the detection of metals, e.g. atomic emission spectroscopy/inductively coupled plasma (AES/ICP).

The PAS also gives recommendations for a test method for the safety of batteries and chargers – testing which ECITA has already introduced for its members, and made available to non-member companies, too. We identified that the existing British Standard for battery cells is not terribly well suited to the lithium ion batteries used in ecigs (and in mobile phones, laptops, etc.), so developed a variety of tests to ensure that batteries will both operate and charge safely, but also fail safely. It is our sincere hope that all industries placing lithium ion batteries on the market will adopt such rigorous testing, so that explosions and fires – and their associated injuries and deaths – can be avoided.

Perhaps the most significant test, therefore, is the 'bake-it-til-it-blows' test, where the battery is effectively baked in the scientific oven, with the temperature being gradually increased to just over the thermal runaway temperature, which is 150°C for cobalt chemistry batteries and 250°C for manganese chemistry batteries. This allows us to see exactly how the battery will fail. If it just vents, but does not explode, then this is regarded as 'failing safe'; but if it is unable to vent properly, and vents dramatically, possibly including light shrapnel and fire, this is a catastrophic failure. Such products should be recalled immediately from the market. (We have not identified a catastrophic failure in any ECITA members' batteries tested to date, but have been able to see just how dramatic this can be with some other products.)

We are working with our colleagues in other Member States, and together, we have discussed with CEN the possibility of starting the process to create a European Standard for this sector. We hope that this process can begin quickly, and run as smoothly and efficiently as our experience with the BSI has, so that an established European Standard is in place before the revisions to the Tobacco Products Directive destroy the sector. That said, the case for a Judicial Review of the legal validity of Article 20 of the Directive (which relates exclusively to ecigs) brought by Totally Wicked E-Liquid has been passed to the European Court of Justice, and is scheduled for a hearing in 2015.

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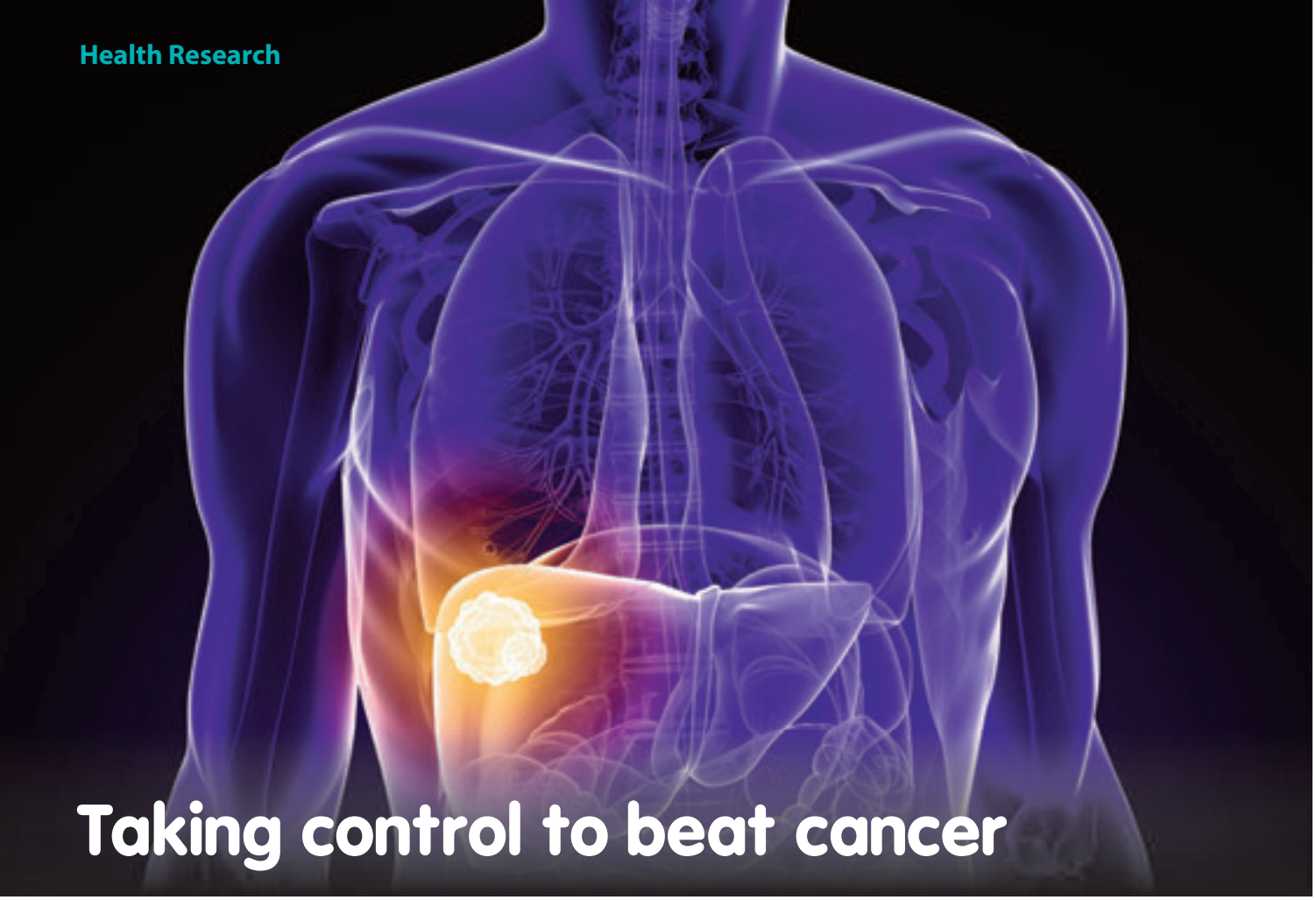

Taking control to beat cancer

Cancer prevention has never been more vital or urgent. Here Rachel Thompson and Sarah West from the World Cancer Research Fund – with a focus on liver cancer, explain why...

In the UK, cancer now affects at least 1 in 3 of us during our lifetime and the risk of being diagnosed is rising.

The good news is that there is a growing body of evidence on the factors that affect our cancer risk, providing us with increasingly robust information about how we can reduce our chance of developing the disease.

Reviewing cancer prevention research

World Cancer Research Fund's Continuous Update Project [1] is an on-going programme that analyses global research on how diet, nutrition, physical activity and weight affect cancer risk and survival. Among experts worldwide it is a trusted, authoritative scientific resource, which underpins current guidelines and policy for cancer prevention.

The findings from the Project are used to update our evidence-based recommendations for cancer prevention [2], ensuring that everyone, from policy makers to members of the public, has access to current information on how to minimise the risk of developing the disease.

As part of the Continuous Update Project, scientific research from around the world is collated and added to a database on an on-going basis and systematically reviewed by a team at Imperial College London. An independent panel of world-renowned experts then evaluate and interpret the evidence to make conclusions based on the body of scientific evidence. Their conclusions form the basis for reviewing, and where necessary revising, our recommendations for cancer prevention.

In the UK today we now know that around a third of cancers could be prevented through a healthy diet, physical activity and maintaining a healthy weight – that's around 89,000 cases of cancer prevented every year.

A focus on liver cancer – the facts

Liver cancer is the sixth most common cancer in the world, with 782,000 new cases diagnosed in 2012[3]. While the majority of cases (about 83%) are found in less developed parts of the world, over 4,700 cases of liver cancer are diagnosed every year in the UK, About two-thirds of these cases are in men.

Survival rates are often poor because symptoms often do not appear until the disease is advanced – just 5% of patients survive their disease for 5 years or more.

The liver is one of the largest organs in the body and has many important functions. It digests proteins and fats, removes toxins like alcohol and helps control blood clotting. Any cause of liver cirrhosis whether viral or chemical is likely to cause cancer of the liver.

Cancer prevention evidence on liver cancer

The global evidence on liver cancer was reviewed in 2007[4] (an updated report will be published next year). It showed strong evidence that drinking alcohol increases the risk of liver cancer. We estimate about 1 in 6 cases could be prevented if we all stopped drinking alcohol[5].

Smoking is another significant risk factor[6] – about 1 in 5 cases could be prevented if no one smoked in the UK. Alcohol, when combined with smoking is particularly harmful.

Other established causes include chronic viral hepatitis and liver flukes[2].

To reduce the risk of liver cancer it's best not to smoke and limit alcohol consumption. In our review of the evidence no safe level of alcohol was identified and so for cancer prevention the advice is to avoid drinking alcohol as much as possible.

If alcohol is consumed it should be limited to no more than 2 drinks a day for men and no more than 1 drink a day for woman. Tips for reducing alcohol intake include; opting for the smallest serving size, diluting alcoholic drinks, drinking low calories or low-alcohol alternatives and keeping a few days each week alcohol free.

Alcohol also increases the risk of other cancers, including: breast, bowel, mouth and oesophagus. Scientists are still researching how alcohol can lead to cancer. One theory is that alcohol can directly damage our DNA, increasing our risk of cancer.

While there is still much to learn about preventing cancer, we do have growing evidence available to help us take control and reduce our cancer risk. Cancer treatment alone will not free us from this epidemic. It's time to take control and stop cancer before it starts.

World Cancer Research Fund is the leading UK charity dedicated to the prevention of cancer through diet, weight and physical activity. We fund and support research, develop policy and provide health information so people can make informed lifestyle choices to reduce their cancer risk. ■

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Fatty liver and liver cancer:
Persistence of chronic inflammation matters

Alterations in the way we live including high calorie intake combined with a sedentary life style have augmented the incidence of overweight, metabolic syndrome (MS) and non-alcoholic fatty liver disease (NAFLD) in developed countries over the last few decades. Overweight, MS and NAFLD is becoming a relevant risk factor of developing several cancer types, especially malignant hepatic tumors – currently the second most common cause of cancer related deaths in humans. This frightening development is best observed and followed in the US, with approximately 90 million people currently suffering from NAFLD and at high risk of developing its subsequent pathological forms – the so called non-alcoholic steatohepatitis (NASH) and liver cancer. Liver cancer has become the fastest growing cancer in the US right now. In Europe a similar increase can also be observed. What does all of this mean for the future?

Hepatocellular carcinoma (HCC) is the most common primary liver malignancy. It is the fifth most prevalent type of cancer and the second most common cause of cancer-related death worldwide, with a rising incidence in developing and industrialised countries. The most prevalent risk factor for HCC development is still chronic hepatitis, mainly due to persistent infection with hepatitis B or C viruses (HBV or HCV) or long-lasting alcohol consumption. Importantly, a strong link between obesity and cancer is well-established and a body mass index (BMI) >25 substantially increases the risk for developing cancer. The latest WHO cancer report prospects a dramatic rise in cancer incidence – doubling within the next two decades – the great majority attributable to modifiable risk factors such as high caloric intake, smoking and sedentary lifestyle. Even a modest rise in BMI causes a significantly elevated risk for HCC and other cancers (e.g. pancreatic carcinoma, kidney and gastrointestinal cancers).

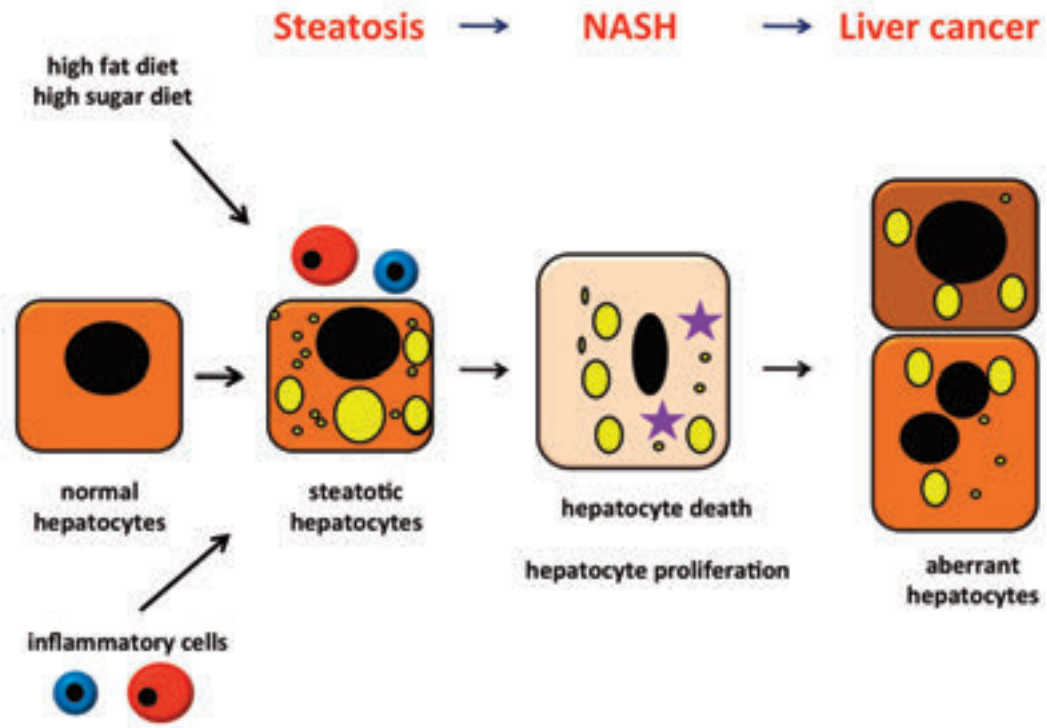
In recent years, obesity leading to metabolic syndrome, steatosis and steatohepatitis, caused by energy-dense food with high fat content, has attracted increased attention due to an increased HCC incidence in Western countries. In line, the most common etiology for HCC in industrialised countries has recently switched from viral infections to obesity, making HCC the most rapidly increasing type of cancer in the US. Similarly, incidence of NAFLD and NASH is dramatically rising in Europe with foreseeable consequences.

Today we know that enhanced fat uptake by hepatocytes leads to non-alcoholic fatty liver disease (NAFLD), comprising a spectrum of liver disorders ranging from fatty liver (steatosis) to nonalcoholic steatohepatitis (NASH) which can subsequently lead to fibrosis, cirrhosis and HCC. Thus, increased fat uptake, hepatic lipid accumulation and NASH represent incremental risk factors for HCC development, however at the same time there is no established pharmacological treatment for NASH, and currently established standard of care therapy for HCC is limited.

A “two-hit hypothesis” has been proposed for NASH progression from simple steatosis. Lipid accumulation in the cytoplasm of hepatocytes is considered the first step in NASH development, however, a second hit promoting oxidative stress, inflammation, DNA damage, hepatocyte cell death and fibrosis is needed.

In order to find novel drugs that could be applied to patients with NASH or even NASH induced HCC, experiments in rodents have been performed. In mice, NASH could so far be modeled by feeding them with special diets. However, although these mice develop NASH, all mice lack either obesity or metabolic syndrome, a key co-feature in human individuals suffering from NASH. Moreover, all these diets have to be discontinued after a few months due to weight loss (up to 40%) or occasional cachexia. Thus, in the past this approach did not recapitulate NASH and its consequences in humans.

Deficiency in the essential nutrient choline was described in NAFLD patients to exacerbate NAFLD and NASH. Moreover, humans with inadequate choline uptake were shown to have defects in hepatic lipoprotein secretion, oxidative damage caused



by mitochondrial dysfunction and ER stress. Deprivation of choline leads to fatty liver development and at least 90% of the US population (similar numbers exist for Europe) does not meet the recommended daily intake for choline.

Based on the above and the clinical observations of choline deficiency in NASH patients, we combined choline deficiency with a high fat diet (CD-HFD). Long-term CD-HFD led to steatosis, liver damage, fibrosis and NASH, thus delivering the 'second hit' promoting dietary-induced liver carcinogenesis – similar to the human situation. This model enabled us to investigate the relationship between chronic fat uptake, liver damage, immune activation and lymphocytic infiltration causing hepatic steatosis, NASH and HCC. Unexpectedly, in this study we could uncover the cellular and molecular mechanisms of NASH development and NASH to HCC transition (Wolf et al., Cancer CELL, 2014). This data, for the first time indicates that immune cells in the liver contribute to the development of a fatty liver and subsequent liver cancer. Potentially anti-inflammatory regimens or therapies that prevent an influx of inflammatory cells into the liver might be used in the future to prevent NASH and HCC.

It is foreseeable that within the next decade the incidence of NASH and HCC patients will rise enormously (similar to what has already happened in the US). Because of the fact that both diseases are currently hard to treat, it will be imperative to find novel therapeutic approaches to treat these diseases.

Still, this is not the only solution – preventive measures in relation to our life style and diet must be taken now to reduce the number of those individuals that will suffer from this disease. Unfortunately, the past preventive strategies in the US and Europe have shown that a lot of additional education is needed if we are to prevent or at least get this disease under control in the future in Europe.

Author: Mathias Heikenwälder

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How science is fighting cancer

Daniel Bridge, Policy Manager at Cancer Research UK gives consideration to how science has contributed significantly to cancer research...

Medical research provides the foundation of modern medicine; it is vital to tackling the health challenges of the future. We know this because of the remarkable results research has produced to date. Forty years ago patients' chances of surviving cancer was 1 in 4; now because of the advances driven by research 2 in 4 survive cancer.

The burden of cancer continues to rise nationally and globally. In the UK, more than 330,000 patients are diagnosed with cancer each year. As the population continues to live longer into old age we are expecting 425,000 patients to be diagnosed annually by 2030. Our ambition at Cancer Research UK is to accelerate progress through more research and see three-quarters of patients surviving the disease within the next 20 years.

The UK has traditionally been a powerhouse in terms of research. Considering our size and relatively modest investment in both public and private R&D we punch well above our weight in terms of research output and international recognition. From the discovery of DNA to leading mapping the human genome UK science has contributed significantly to the overall understanding of human health and delivered benefits to patients.

But research isn't a production line simply churning out breakthrough after breakthrough, delivering health gains at a consistent rate. Taking the findings and discoveries that are achieved in a lab, and translating them into treatments that help patients, is at the heart of medical research and is complex. Naturally

sciences of biology and chemistry lend themselves most closely to understanding biological systems and changes that take place in the body on a molecular level.

However we now know that relying solely on these traditional fields of science is no longer enough to continue to deliver progress on cancer. Most funders including Cancer Research UK are exploring models that include disciplines such as physics, engineering, materials science, mathematics and population sciences, to tap into their potential to deliver innovation by bringing multiple perspectives to bear on the cancer problem.

This has happened before. While physicists knew how to bend a beam of radiation, it took engineers, biologists and doctors working together to turn this into the radiotherapy machines that are so vital in treating cancer.

As we move forward into an era of genetic medicine it's clear that we need to draw in expertise from mathematicians and computer scientists to analyse vast quantities of data. Being able to process genetic data fast enough to assist clinical decision making will move us closer to personalised medicine where treatments are tailored to individual patients.

While organisations such as Cancer Research UK already fund this type of research more needs to be done to ensure that very different disciplines actively collaborate and are able to focus their efforts on a single problem. We have recently launched a new multi-disciplinary scheme to further encourage team working in this area.

Collaboration between researchers and different parts of the medical research/healthcare infrastructure drive forward new discoveries by sharing expertise and ideas. Having a collaborative healthcare system is critical to our success. Unlike other countries in the NHS we have an entire patient population under a single health system that could potentially participate in a variety of forms of research.

The problems lie with ensuring everyone within the NHS has the time and space to do research. And it's understandable why research can quite easily be seen as an extraneous activity on top of a workload for doctors and nurses who are already overburdened. But without research in the past we would not have the treatments we have today. We need to find ways to ensure that research is interwoven into all forms of care to make sure it doesn't fall off the agenda of anyone in the health services.

Hard-wiring research into the NHS has additional benefits. For example, over the past few years, Cancer Research UK studies alone have leveraged over £300m of free drugs given by pharmaceutical companies. This gives us an opportunity to understand the effects of drugs on particular groups of patients and opens doors to new treatment regimes.

While the importance of clinical research cannot be overstated it isn't the only important piece of the puzzle to beating cancer. Cancer Research UK, for example, funds studies that determine the lifestyle factors that cause cancer and explores ways to diagnosis patients earlier.

It is this multipronged approach that gives us better understanding of all forms of prevention, diagnosis and treatments that are driving up cancer survival rates. Investment across the research pathway and across different scientific disciplines needs to be maintained and increased to unlock the potential within the UK. ■

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Cancer and Cancer Stem Cells: New paradigms and approaches to therapy

Professor Alan Clarke, Director of the European Cancer Stem Cell Research Institute at Cardiff University, outlines the aim to develop more personalised therapies for patients with cancer and how targeting the cancer stem cell could be crucial in this development...

Cancer remains the second largest cause of death in the western world, and although we are continually and gradually increasing survival rates for most types of cancer, treatment for certain types remains remarkably poor, with a weak understanding of the mechanisms that underpin treatment failure. In approaching therapy, we currently tend to view individual patient tumours as single 'entities' which either do or do not respond to therapy and then subsequently either disappear or reoccur – a relapse. However, it is now increasingly clear that this is a somewhat naïve view, as each individual tumour is actually heterogeneous, comprised of subpopulations of tumour cells that differ in their growth characteristics, their ability to respond or indeed evade therapy and in their capacity to drive relapse.

Key to this understanding is that certain sub-populations may mimic some of the properties of normal stem cells and be ultimately responsible for tumour growth and treatment failure. It is this population that has been termed the 'cancer stem cell' and which opens up different perspectives for both basic cancer research and also the development of novel treatment strategies. For example, one of the key characteristics of a normal stem cell is its capacity to continually recreate a copy of itself – termed self-renewal. Given that cancer stem cells share properties such as self-renewal with normal stem cells, is it possible that the cancer stem cells may arise from within the normal stem cell population? In the intestine we have been able to ask this question experimentally and show that this is indeed the case, with the normal stem cell population serving as very effective 'cell of origin' for cancers if they become mutated. If this is true for many different cancers, it effectively identifies the subpopulation of cells which is likely to drive tumourigenesis and so changes our perspective on which cells we need to target to prevent tumour formation or relapse following therapy.

From the translational perspective, the 'cancer stem cell' concept also changes the way that we might evaluate how efficient a new therapeutic approach might be. Traditionally this is judged on relatively rapid shrinkage of tumours in a clinical trial. Therapies that do not achieve this are considered ineffective and discarded. However, if cancers are actually driven by a small population of cancer stem cells, as we believe is the case in many solid tumours, effective therapy resulting in the death of the cancer stem cell population may actually lead to very small changes in tumour size in the first instance, to be followed by a gradual reduction in tumour volume. In this scenario, effective therapies may be erroneously discarded and conversely poor therapies may be advanced because they initially shrink the tumour, but are ultimately ineffective as they do not kill the cancer stem cell.

A major objective of our current cancer research is to develop and utilise therapies tailored to individual patients. The ultimate goal here is to develop 'personalised medicine', based on the nature of each individual tumour. To reach this goal, several major hurdles must be overcome. First, we need to improve our arsenal of drugs so that we can target a wider range of molecular lesions. The current drug discovery pipeline fails to bring in new agents to the clinic in a timely and cost-effective manner. One reason for this failure is the poor match between compounds with activity against human cancer cell lines in vitro and their subsequent behaviour in patient trials, a disparity that may be reduced if drugs could be analysed in cellular systems that more closely mimic

Prof Alan Clarke
Director
European Cancer Stem Cell Research Institute

the normal and tumour state. A second issue arises from tumour heterogeneity, since, as described above, cancer stem cells are considered to be more effective drivers of tumourigenesis and relapse. It is therefore critical that we better understand the nature of tumour heterogeneity and that the drug discovery programme recognises and reflects this.

Cancer stem cells may again help us to address these issues, as great strides are currently being made in our capacity to grow tumours from patients back in the laboratory. Previously we have been limited to using cell lines that have been adapted to 2-dimensional culture conditions. As stated above, the power of these cell lines to predict drug-tumour interactions in patients is poor. However, recently, we have learnt how normal stem cells can be grown in 3-dimensional matrices to recapitulate normal tissue structures, and these techniques have subsequently been applied to tumours to allow 3-dimensional tumour 'organoids' to be grown and maintained in culture. These approaches therefore open the way to deliver personalised culture systems which better reflect the situation in the patient. Ultimately the aim is to develop this approach to provide platforms that allow basic biological questions to be addressed, more rapid and accurate drug testing, and the influencing of treatment options on an individual patient basis. For example, one potential endpoint would be to grow organoid cultures from a patients' biopsy at diagnosis, which could then be genotyped and challenged with a range of potential therapies in culture, the response to which would define the subsequent treatment regime – so truly personalising their therapy.

For the concept of 'stemness' to be fully exploited in cancer biology, we will need an approach underpinned by significant investment and multiple partners. Multiple potential scientific and translational endpoints are currently being pursued in individual laboratories and also, in some instances, by entire institutes such as the European Cancer Stem Cell Research Institute. However, even single institutes are limited in their capacity to efficiently unlock the full potential of cancer stem cells, and we need to foster the development of both national and international networks to fully exploit the potential these perspectives offer for new, and individually, tailored therapies. This will require crosstalk between all funders to deliver a mixed portfolio of support that will truly maximise the impact of this field on patient outcome. ■

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The therapeutic implications of Cancer Stem Cells

The cancer stem cell (CSC) concept hypothesizes that a malignant neoplasia maintains a similar hierarchical structure to the normal tissue of origin, i.e., the bulk of the tumor represents differentiated progeny of rarer so-called CSCs with self-renewal capacity. Chronic myeloid leukemia (CML) is universally regarded as providing the strongest evidence in support of the CSC concept.

Fialkow and his colleagues first suggested that CML arose from rare transformed hematopoietic stem cells (HSC) nearly 40 years ago, when they showed that both granulocytes and red blood cells from CML patients were derived from a common cell. The term tumor/cancer stem cell was also first coined nearly 40 years ago to highlight the observation that only a minority of multiple myeloma cells were capable of clonogenic growth. The last decade has witnessed an increasing re-appreciation of the role of these heterogenous cellular cues in cancer development and therapy. This re-evaluation represents a rather crucial detour from the widely held view that the neoplastic phenotype resulted from uncontrolled proliferation of tumor cells.

The CSC concept would explain not only the low clonogenic capacity of most malignancies, but also why complete treatment responses translate into cures in only a minority of cancer patients. Initial responses in cancer represent therapeutic effectiveness against the bulk cancer cells, while rarer resistant CSCs could be responsible for relapse. Accordingly, improving the results of cancer therapy would require identification and better understanding of the biology of CSC.

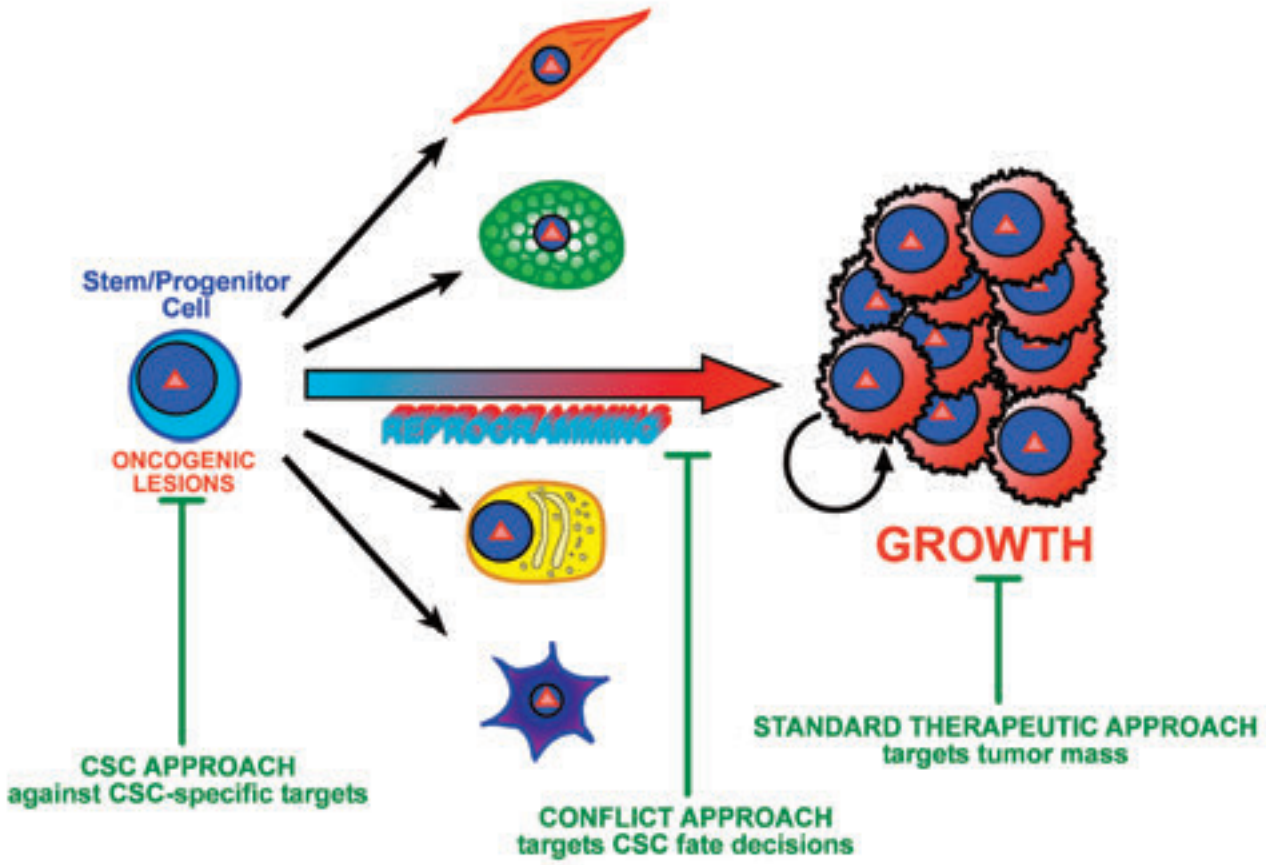
Within this framework, fundamental determinants of neoplastic disease are to be found within the CSC and, thus the role of CSC regarding cancer biology, management and therapy needs to be evaluated. It should be noted that partial tumor responses to therapy mean little if CSCs are the major cells determining outcome. Because of the difficulty of assessing the effects of therapies on the rare CSCs responsible for cancer maintenance and relapse, the development of new clinical approaches will require new clinical paradigms and methodologies that should rely heavily on preclinical modelling, using novel preclinical assays to evaluate the fate of CSC. Preclinical studies should assess the effects of therapies on CSC and differentiated cancer cell populations. This could allow us to take a fully functional new approach directly to the patient.

A related concept is that the exact definition of "stemness" is elusive and stemness may be more of a cotinuum or a property that may be regained in cancer, which would suggest that neither the hierarchical nor the stochastic model are exclusively right.

Furthermore, I must call the attention to the fact that the fundamental concept essential to the CSC hypothesis does not have anything to do with the absolute frequency of these cells within the tumour; indeed, what the model states is that there is a functional heterogeneity within the tumor cellular components, and that there is only a defined population of cells that can initiate/maintain malignant growth *in vivo* while the remaining cells cannot. Thus, the therapeutic implications of the CSC concept are equally important whatever their frequency is within each tumour type: they are the cells that must be effectively targeted to achieve a definitive cure in the long term. This may eventually allow correlation between CSC frequency and clinical outcome.

It is plausible that the clinical aggressive cancer types may also contain a higher proportion of CSCs. In this regard, it has been recently shown that the proportion of CSCs might underpin differences between poorly and well-differentiated breast cancers. Also a pending question is, would CSCs arising from transformation of a normal stem cell yield a more aggressive cancer than one derived from a more committed progenitor cell? It is our task not only to address this and other questions, but to determine the CSCs relative importance for each stage and type of cancer.

Our group has recently discovered that the growth potential of a cancer depends on CSCs and on oncogenes that can function by a tumor stem cell reprogramming mechanism, suggesting that genetic lesions that initiate the cancer process might be dispensable for tumor progression and maintenance. Thus, it seems important to know



how to eradicate and/or inactivate this tumor stem cell reprogramming mechanism. Similarly, assessing the ability of any candidate therapy to destroy these new mechanism of CSC formation would seem crucial to predicting its efficacy.

The evidence for the existence of CSCs and tumor stem cell reprogramming mechanism in human tumors is based on the creation of mice that are sufficiently immunodeficient to tolerate the growth of primary human cells into them. However, this growth does not exclude the possibility that engraftment rather than cancer stem cell activity correlates with a particular phenotype. Tumor stem cell reprogramming-based models allow bypassing the limitations and experimental variability of the xenotransplant models.

An enormous advantage of our tumor stem cell reprogramming-based models is that they not only enable syngeneic transplantation but they also allow studying the disease at its early stages in order to analyse the changes in CSCs long before the cancer can be phenotypically, i.e. clinically, detected.

Besides the therapy per se, an essential element in cancer management is the evaluation of treatment efficacy. Therefore, new clinical methodologies need to be developed to evaluate the efficacy of tumor stem cell reprogramming-based therapies and here again the tumor stem cell reprogramming-based models will be pivotal to achieve this aim.

It is to be expected that CSCs from different cancer types will share many similarities, implying that similar tumor stem cell reprogramming-based therapeutic approaches could be used in many different cancers.

The challenge now is to find a way to specifically target the tumor stem cell reprogramming mechanism without causing toxicity to normal cells.

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Stem Cells and immunity

Stem cells, Chromosomal instability and Cancer

Life expectancy in the western world has been on the rise, leading to an upshift in median age that will continue in the next decades[1]. As a consequence of population ageing, the incidence of ageing-related ailments has escalated; not only degenerative diseases such as Parkinson or Alzheimer, but also the number of people affected by cancers has risen drastically. Notwithstanding its impact on society, the underlying mechanisms are still not completely understood, translating into relatively coarse and unspecific cancer treatments. Only in the last few years has the treatment of some forms of cancer evolved into a more guided approach, and years of investigation will still be needed to design intelligent treatments for a wide variety of cancers.

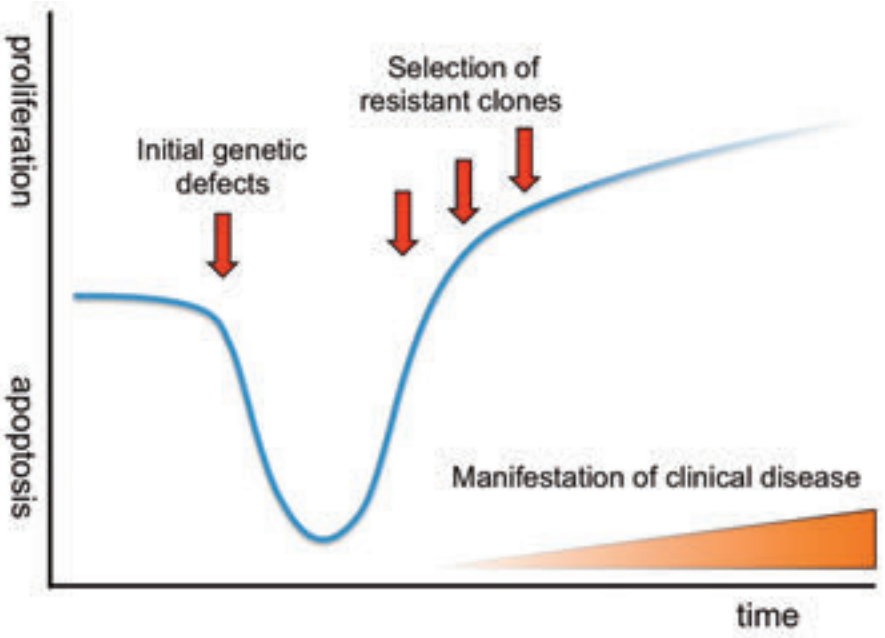

Figure 1. Stem cell depletion and cancer. Whereas the majority of ageing stem cells will enter senescence or apoptosis upon accumulation of genetic defects, a small proportion might survive and evolve into the rapidly dividing resistant population that causes cancer.

Stem cell biology of cancer

Stem cells have a central role in most if not all ageing-related ailments. In most of the diseases studied, the depletion of stem cells and reduction of their proliferative capacity seems to be the main cause of tissue degeneration. In cancer, however, excess growth is the central underlying mechanism. The role of stem cells in tissue homeostasis depends on the equilibrium between differentiation and self-renewal. Whereas stem cell differentiation into more specialised cell types is the mechanism that produces the somatic tissues, self-renewal assures the maintenance of an undifferentiated cell population that maintains a proliferative capacity. In cancer, the equilibrium between differentiation and self-renewal is disturbed, provoking the accumulation of a population of poorly differentiated but highly proliferative cells.

The identification of a stem cell population at the heart of tumor growth[2] comprises yet another link between ageing and cancer; the role of stem cells in cancer is just as important as in degenerative diseases. Whereas stem cell depletion and their uncontrolled growth appear unrelated phenomena, they are in fact closely related; whereas a proportion of stem cells are lost during ageing, the surviving stem cells have an increased chance of chromosome alterations.

Chromosomal Instability (CIN)

A key difference between healthy, normal stem cells and tumor cells is the acquisition of genomic alterations by the latter. Most carcinomas present some form of genetic instability, either as an accumulation of intragenic mutations or as a large-scale alterations – translocations, deletions and numerical changes – termed chromosomal instability (CIN). Although the hypothesis that CIN itself can cause cancer has taken a long time before being accepted, CIN is frequently detected in tumors before intragenic

mutations and thus comprises a driving force in carcinogenesis[3]. Current theories suggest that CIN can induce cellular transformation through gene dosage or gene translocation; the genome fragments gained or lost in CIN frequently contain hundreds of genes, each of which can affect a pathway regulation step. The extra copies of many genes in CIN cause a gross imbalance in cellular regulation, which easily spills over into other pathways including cell cycle control[4]. Pathway interconnectedness thus appears to be the Achilles´ heel of genomic stability in mammals.

Stem cells, CIN, and cancer therapy

Because of their unique role in tissue renewal, stem cells have a combination of characteristics that renders them susceptible to genetic damage, transformation, and tumor initiation. Stem cells not only undergo rapid growth and division, but also seem to be tolerant for gene dosage effects that would induce apoptosis in other cell types. Notwithstanding their resistance, cancer stem cell theory clearly indicates that this population must be targeted to treat carcinomas efficiently.

Traditional anticancer therapy depends on tumor cell eradication by cytotoxic drugs, through the induction of additional chromosome defects that lead to apoptosis or necrosis. Although the efficacy of the classical cancer treatments has advanced tremendously, they still suffer from side effects, such as the shutdown of stem cells in skin, intestine, and immune system. Thus, a drawback of many chemotherapeutics is the low capacity to distinguish between cancer cells and rapidly dividing non-cancer cells. In addition, most of the chemotherapeutic compounds favor selection of resistant and aggressive cancer cells.

The last decade has seen the development of new therapies, aimed at a more specific elimination of cancer cells while reducing toxic effects. One phenomenon in particular, oncogene addiction, might yield novel targets for anticancer therapies[5]. In oncogene addiction, the cancer's need for survival leads to activation of the corresponding signal pathways, to an extent where cells become completely dependent. Oncogene addiction has been characterised in only a few types of cancer so far, but preliminary results are promising. Oncogene addiction seems to increase with tumor progression, so targeting survival pathways might be the way to treat advanced cancer, where classical therapies loose efficiency. For example, the high level expression of HER that characterises the most aggressive forms of breast cancer is exploited for treatment with the neutralising antibody Herceptin®, improving the prognosis of HER-positive tumors. Novel targets in signaling pathways must be seen as an addition to classical therapies for now, but further characterisation of pathways might help to treat a wide range of cancers. Especially the targets that overlap with stemness and differentiation are interesting, for the possibility to attack cancer stem cells.

Concluding remarks

The fundamental way in which cancer is treated is just recently being modernised. New therapies will hopefully be able to discriminate better between cancer cells and healthy stem cells, and be tolerated better by the patient than current treatment schedules. The combination of data from stem cell biology, tumor evolution, and genetic analysis of patient material has greatly improved our understanding of cancer biology. Still, continued efforts are needed to use this knowledge for the benefit of cancer patients.

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Understanding organ and appendage regeneration

Permanent tissue damage to or partial loss of an organ or limb can be debilitating or lethal due to our limited ability to regenerate. Such outcomes therefore generate a need for therapeutic strategies to regenerate human tissues and restore their lost functions. These strategies can come from research into how other animals, such as the zebrafish, that regenerate their organs and appendages.

While the response of most human tissue injury is to produce a durable scar tissue – crucial for maintaining the integrity of the tissue, but not its function – the zebrafish responds by replacing the loss with regenerated tissue. Therefore, this fish will allow researchers to answer several fundamental questions that need to be addressed to promote adult human cells to regenerate adult tissues.

These fundamental questions are: 1) What can induce quiescent, differentiated adult cells to become progenitor cells (cells that behave like embryonic cells, which develop tissues); 2) What is needed to control the growth and correct tissue patterning of these progenitor cells to make structures, not tumours; and 3) What instructs these progenitor cells to stop regenerating once the correct size and proportions of the regenerated organ or limb to the body have been reached (so as not to regenerate one leg longer than the other leg, for example).

The laboratory of Christopher Antos at the DFG-Center for Regenerative Therapies is researching the cell biology and molecular mechanisms through which the zebrafish regenerates tissue: how the fish tissues "know" when to regenerate, where to grow, how to make the correct pattern, and when to stop growing after injury.

The zebrafish is a very valuable animal model to answer these questions for several reasons: First, this fish regenerates many of its organs and appendages completely e.g. heart, retina, pancreas, liver, fins, etc. Second, fish tissues are similar in their composition to human tissues. Third, subtle differences between fish cells and human cells should explain why many fish tissues regenerate and many human tissues don't. Fourth, two of the primary regeneration strategies to regenerate human tissues in culture (use of stem cells and conversion of differentiated adult cells in the residual appendage or organ stump into embryo-like progenitor cells) are used by the fish to restore lost tissue. Fifth, zebrafish are easy to maintain and can be used for genetic experiments to identify genes involved in regeneration. Sixth, many of the tools used to study mammalian biology can also be used to study regeneration in the fish. And, lastly, humans can regenerate certain structures such as the liver, hair, skin, blood vessels, blood, immune cells, which means that the genetic capacity in humans to regenerate exists, and work with the fish can lead to the knowledge required to expand this capacity to human organs and limbs that have "lost" the regenerative capacity.

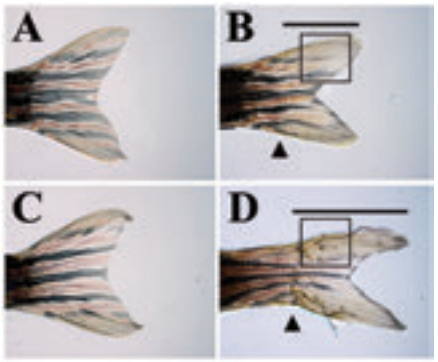

Figure 1: Calcineurin-regulated proportional growth control. (A) Like our limbs, zebrafish grow fins to a specific proportion to the body size, and after amputation (B), they regenerate their fins to the original proportion (C). (D) The original size of the adult caudal fin before treatment with the calcineurin inhibitor FK506. (E) After amputation, treatment results in the enhanced outgrowth of the regenerated fin beyond its normal dimension (F).

The Antos laboratory uses the zebrafish fin to learn how the fish activates, and controls the cells that regenerate new tissue and, importantly, determines when tissue regeneration needs to stop once the correct dimensions of the regenerating tissues have been achieved.

Although the fish fins are architecturally different from the human limbs, they contain almost all of the same tissues: bone, peripheral nervous system, vasculature, connective tissue, joints, skin, melanocytes, etc. Using the fin,

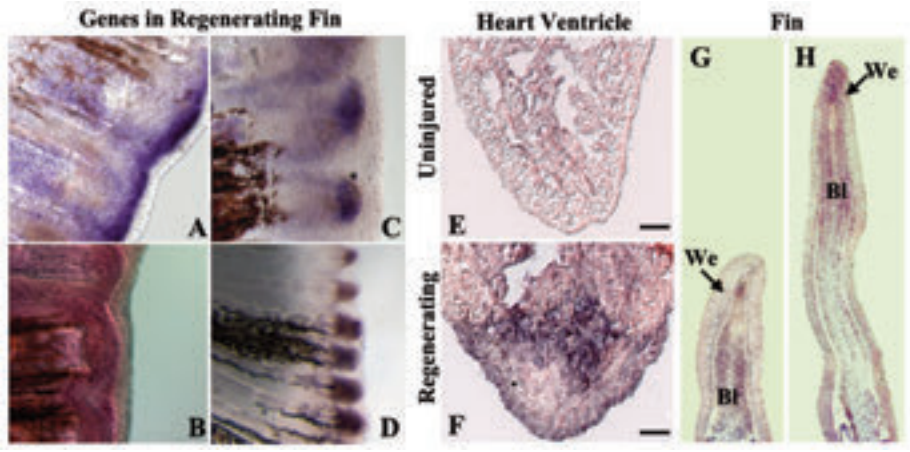

Figure 2: Expression of genes in different tissues during fin and heart regeneration. (A) Expression of a gene (blue) in a specific subset of progenitor cells of the regenerating fin. (B) Expression of a gene (purple) in the all progenitor cells of the regenerating fin. (C) Higher magnification gene expression in a subset of progenitor cells of the regenerating bone rays. (D) Expression of a gene in the all the progenitor cells of a regenerating bone ray. (E) The apex of the zebrafish heart ventricle. (F) The expression (purple) of the gene simplet/fam53b during the regeneration of the myocardium of the zebrafish heart. (G) The expression of simplet in the progenitor cells in the blastema (Bl) underlying the wound epidermis (We) of skin of the regenerating zebrafish fin. (H) As regenerative outgrowth progresses, the expression of the simplet gene is retained in the distal cells where the progenitor cells responsible for regenerative outgrowth are located.

the Antos laboratory discovered that an enzyme named calcineurin regulates the proportional regenerative outgrowth of the zebrafish appendages. Inhibition of this enzyme results in enhanced regeneration of the appendages so that they continue to regenerate beyond the normal dimensions of the original structure. Thus, the importance of this discovery is that it allows the Antos Laboratory to identify the molecular biology that regulates the size of an organ or limb to the correct proportions to the patient's body; that is, if you wish to regenerate an arm or leg, you need to know not only how to start the body's ability to regenerate the arm or leg, you need to know how to stop it once it has regenerated to the correct size.

This research also has implications on the biology of tumourigenesis and cancer. Furthermore, this enzyme is regulated by calcium, an ion, and calcineurin may also regulate the activity of enzymes that regulate other ions used by cells. Thus, this work has implications to determine how bioelectricity may be involved in tissue growth.

In addition to this work, the Antos group has identified several genes associated with regeneration; including those encoding growth-promoting proteins, chaperones that regulate protein folding, and proteins controlling cell proliferation. One gene that the Antos lab is working on is simplet/fam53b (smp). This gene is activated in the progenitor cells at the onset of tissue regeneration. The Antos lab also found that this gene is present in multiple regenerating zebrafish tissues: fin, heart, brain and liver. It is likely in other regenerating zebrafish tissues as well. The research in the Antos lab determined that this gene is required for the proliferation of the progenitor cells that regenerate fish tissues and that it is required for the correct expression of other genes that are important for regeneration.

To find out how the smp gene functions in progenitor cells, the Antos group subsequently determined that the gene regulates a component of a previously defined molecular mechanism that is involved in stem cell maintenance, tissue patterning and even cancer biology. Smp regulates this component by facilitating its accumulation in the cell nucleus, which promotes the activation of other genes associated with stem cell maintenance, tissue patterning and tumorigenesis. Consequently, by studying the activities of this gene, the Antos lab is not only dissecting the biology of regeneration, but it is also providing greater understanding on the biology of cancer and embryonic development.

Thus, the results coming from the Antos Laboratory at the DFG-CRTD are full of potential, and while tangible applications in humans still need to be developed, the remarkable physiology of the zebrafish is producing the potential to understand how to control human genes to induce and control regeneration of human tissues.

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Improving healthcare through chemistry

Adjacent Government highlights the work of the Royal Society of Chemistry (RSC) and how it supports chemistry's contribution to tackling major health challenges...

Chemical sciences play a major role in everyday life and are crucial to economic development. One area where they are key is the healthcare sector. Chemistry is vital in order to develop new treatments and drugs for major healthcare challenges such as cancer. Chemical sciences are also crucial in improving healthcare and helping doctors to understand an underlying disease and developing better diagnoses and treatments.

Cancer is a leading cause of death worldwide, and according to the World Health Organisation (WHO) accounted for 8.2 million deaths in 2012, with the most common causes being, lung, liver, and stomach cancer.

The Royal Society of Chemistry (RSC) is committed to ensuring that chemical science contributes its full potential to tackling the major global challenges of today and tomorrow. The RSC has been working with doctors, academics, and manufacturers since 1841 to help advance excellence in the chemical sciences.

As the world's leading sources of reliable chemical science knowledge, the RSC's global chemistry community contains the expertise of hundreds of thousands of people, and have over 170 years' worth of top-quality chemical science research publications, data, and reports stored in a cutting-edge online platform.

The goal of the RSC is to connect people with chemical science knowledge by harnessing their information and expertise and making it easily accessible. In order to help support the importance of tackling major healthcare challenges, the RSC understands the importance of drug discovery and new treatment methods for all areas of healthcare.

At the RSC they support the vital contribution that chemistry plays in medical research and drug development in the UK. The RSC believes that over recent years there has been an increasing acknowledgement that the pharmaceutical sector needs to change.[1]

Speaking at a seminar at the RSC in May 2014, Dr Mike Waring from AstraZeneca discussed the relevance of chemistry to the real world and explained how he believed chemistry plays a big role in the treatment of cancer.

"Cancer research is often considered the realm of biology and medicine – but chemistry is an equal player in that arena. History – a lot of people think of cancer as a modern disease but earliest reports go back to Egyptian scientists – Imhotep – to my knowledge that's the earliest written knowledge of cancer – under the therapy section he wrote 'there is none' which remained true for many years and of some cancers even now," he explained.

"One of the big problems is a number of people have said, it's a disease that has been encoded into our own DNA, so inevitable for some people really. I guess as I say in many cases you may say there is no adequate treatment.

"I hope and believe that one day we will beat cancer and certainly see great advances over the next few decades, but I also feel the solution to this lies firmly in the discipline of chemistry. The great advantage of

chemical treatments is you can treat the whole body and target the cancer cells wherever it is. "

As well as treatments for cancer, chemistry also plays a crucial role in developing antibiotics for bacterial infections that not only create healthcare challenges in the UK, but worldwide. The Royal Society of Chemistry also supports the development of antimicrobial resistance through chemistry. It is estimated that around 25,000 people a year die from drug resistant microbial infections in Europe alone.

The UK government have a five year antimicrobial strategy in place (2013-2015), which aims to accelerate progress made and build upon previous work done in the UK to tackle antimicrobial resistance.

UK Chief Medical Officer, Dame Sally Davies supports the strategy and has raised the issue in her own annual report.

"There are few public health issues of greater importance than antimicrobial resistance (AMR) in terms of impact on society," she said in the Foreword to the Strategy.

"Many existing antimicrobials are becoming less effective. Bacteria, viruses and fungi are adapting naturally and becoming increasingly resistant to medicines used to treat the infections they cause. Inappropriate use of these valuable medicines has added to the problem.

"Coupled to this, the development pipeline for new antibiotics is at an all-time low. We must therefore conserve the antibiotics we have left by using them optimally. The process of developing new antimicrobials and new technologies to allow quicker diagnosis and facilitate targeted treatment must be accelerated," Dame Sally Davies added.[2] ■

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A battlefield in glycomics

Ultrasensitive biosensors vs. biochips

Ultrasensitive biosensors vs. biochips

Use of biochips is behind fundamental discoveries of the role of complex sugars (glycans) in important processes inside the cell. Moreover, biochips together with other sophisticated instrumental techniques helped to discover new prospective disease biomarkers, so important in diagnostics. There are however some limitations of biochips including a need to use special fluorescent markers for signal reading, influencing reliability of assays and the method is not applicable for early stage disease analysis. Contrary biosensors can effectively address biochip limitations working in a sensitive manner without fluorescent markers, thus being a viable alternative to biochips for possible future diagnostics. A competition has started.

Glycomics

There is no doubt that glycans are involved in numerous physiological (i.e. classification of human blood into different blood types) and pathological processes (viral/bacterial infections, development and spreading of various types of cancer) in living organisms. Thus, glycomics, a scientific field studying the role of glycans, is developing at an increased pace. Every day new discoveries are emerging, further underlining essential functional role of glycans for the cell to stay fit and healthy. It is estimated that 70-80% of all proteins within and on the surface of the cell have this "sugary" coat. Attachment of glycans to proteins is quite time- and energy-consuming process with substantial involvement of the cell building machinery. Since evolution only preserves the most effective survival strategies this fact further points out to the importance of glycans for every cell. This "sugary" coat is kind of an identity key, which after being "hacked" makes the cell vulnerable to attack or change of this identity can be behind disease progression. Remarkable discoveries in the field of glycomics have been achieved using various types of sophisticated instrumentation, which had to be in many cases combined, to get information about function of glycans in the living system depending on a precise structure of glycans. These days' biochips and biosensors can provide useful information applicable for diagnostic/prognostic purposes without any need to apply quite complex instrumental techniques.

Biochips

Glycan and lectin biochips

DNA biochips are effective for high-throughput gene assays and currently two such small biochips contain the whole human genome i.e. 25,000 genes. There are two forms of such devices applicable in glycomics either glycan or lectin biochips developed from DNA biochips. Glycan biochips mimic the human cell surface and can be applied for analysis of proteins or cells (i.e. viruses) infecting our human cells. Lectin biochips utilise lectins, proteins binding to glycans, for specific analysis of changed glycans for example in human blood or tissues signalling presence of some disease including various types of cancer with possible utilisation in diagnostics.

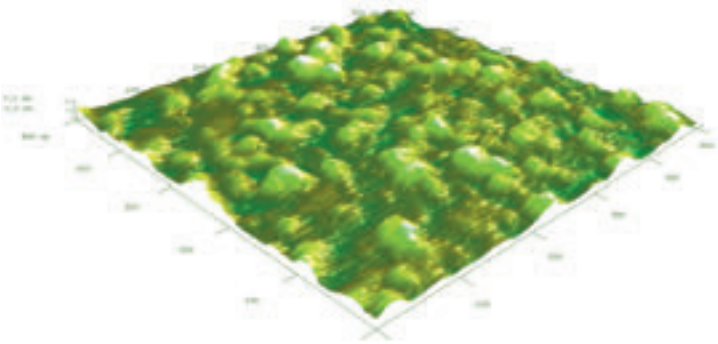
Two Affymetrix DNA biochips are shown. A match for size comparison is depicted, as well. Images were taken from Schutz: http://en.wikipedia.org/wiki/File:Affymetrix-microarray.jpg

The main problem of application of biochips is a need to use fluorescent markers, what can negatively influence reliability of detection and low sensitivity of analysis, what is the main drawback in application of this technology in early diagnosis of diseases. Thus, biosensors emerged as an alternative to biochips to address the main drawbacks of biochips.

Biosensors

Biosensors, devices integrated with biological molecules, can selectively detect a wide range of clinically important molecules (glucose, alcohol, but also disease biomarkers). Various different biosensor configurations are available and some of them are much more sensitive compared to biochips. Especially application of nanomaterials helped to provide detection limit of such devices down to detection of single molecules, what is amount much lower that the amount of disease biomarkers present in human blood. Thus, convenient and reliable early stage diagnostics is possible using some biosensor concepts. Moreover, some biosensor detections schemes (electrochemistry) allow detecting ultralow amount of disease biomarkers without a need to use fluorescent markers, enhancing reliability of analysis.

Biosensors with nanoscale controlled architecture



Nanoscale biosensors

There are two ways for nanoscale controlling a biosensor design. The first one is a careful density adjustment of molecules on the surface to achieve high sensitivity, selectivity and reliability of analysis. The second one is utilisation of nanoparticles, nanotubes and a hot material of today´s science – graphene to do the same.

Control over protein density on the surface with individual proteins (shown in the figure on the left) is achievable.

There are two students responsible for development of especially electrochemical glycan and lectin biosensors in the group Tomáš Bertók and Jaroslav Filip. The biosensor developed so far were applied in analysis of rheumatoid arthritis and systemic sclerosis, but our current effort is aimed to design biosensors for diagnostics of prostate and colon cancer; and for detection of various forms of viruses.

Acknowledgement

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Duration: 2013-2017

For more information:

http://www.adjacentgovernment.co.uk/stakeholders/electrochemical-lectin-and-glycan-biochips-integrated-with-nanostructures-elena/

It's all around us – Heterocyclic chemistry

No surprise that the public interest is readily attracted through the media to the latest fashions in science and it's good that there is a continual stimulus of discoveries and inventions to whet the practical and intellectual appetites. Behind all the innovations the basic rules of the chemical and physical sciences still apply governing what will work and what won't. It's the skill and imagination of the scientist and technologist that brings things together to create innovation. Or in the case of biology, it's time and evolution that work together. When I look out of my office window I see objects from both nature and technology: trees, flowers, painted objects, dyed banners, for example. I've picked or implied colours because colour is the visible manifestation of one of the most important branches of chemistry; scientists call it heterocyclic chemistry. Basically, it's defined as the chemistry of compounds containing atoms joined in rings, mostly with 5 or 6 atoms, most of which are carbon but others are nitrogen especially, oxygen, sulfur, or phosphorus and sometimes metals and other elements. I've worked in heterocyclic chemistry all of my research career from PhD onwards and for me, *heterocyclic compounds make things happen*. I can argue this both from the point of heterocyclic compounds that occur in nature and heterocyclic compounds that we have made in the laboratory.

Let's start with nature. Everyone has heard of DNA and knows that this is the molecule that codes the information that makes us, and all living things, what we are. Some people will know about the 'double helix' structure of DNA. Only a few will know DNA contains a heterocyclic component as the major part of its backbone (the sugar, ribose) and that four specific heterocyclic rings are responsible for carrying the information (the so-called bases, adenine, guanosine, thymidine, and cytidine). When DNA is active, its information is converted in a series of steps of copying and editing into the proteins of the organism, plant, animal, or microorganism.

Now let's jump into the laboratory to make some new heterocyclic compounds. One of our major projects at Strathclyde concerns designing and synthesizing small compounds that bind selectively to DNA and in this way can control its operation; this class of compound is known as a minor groove binder (MGB). The picture shows DNA in blue with one of our MGBs bound (green, red, white, yellow; the yellow atoms represent sulfur which is part of a heterocyclic ring, the other atoms being carbon, nitrogen and hydrogen). We've been able to obtain MGBs that act highly selectively to kill disease-causing bacteria and one of these has been taken forward by our partner company, MGB Biopharma, to clinical trials for *Clostridium difficile* infections. Because we can target DNA in different ways using MGBs we think that there are many diseases that will be susceptible to treatment with medicines containing MGBs. Indeed we have some early information that viruses such as hepatitis C virus can be attacked. This leads to the thought that even the infamous Ebola virus might be treatable with the right MGB. We're trying hard to set up the right teams with partners who can handle Ebola virus safely so that we can put heterocyclic chemistry to work challenging this global health problem.

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The role of chemistry in drug discovery and development

Sriram Radhakrishnan a Healthcare Analyst at Frost & Sullivan details the vital role chemistry plays in drug discovery and development...

Drug discovery and development is one of the most complex and expensive activities within the framework of the pharmaceutical industry. It encompasses a wide array of end-to-end activities with a plethora of supply chain and support services. It is estimated that the average cost to research and develop each successful drug is between $800m to $1bn. Drug discovery and development can be classified into discovery phase, preclinical phase and early stage development, mid stage development and late stage development. Drug discovery has undergone many changes over the years but the goal has remained same: to uncover safer medicines for all diseases. Drug discovery and development is driven by the knowledge of chemistry of the molecules and their association with life process.

The classical or traditional method adopted by medicinal chemists involves modifying bio-active molecules from natural products. These natural products are the source of active ingredients in most of the existing drugs. The current era has witnessed an ever changing role in modern drug discovery. The chemical methods adopted for the discovery of the molecules have also undergone changes leading to the development of technologies such as combinatorial chemistry (combichem), microwave assisted organic synthesis (MAOS) and high-throughput (HTS) biological screening. These new technologies have enabled medicinal scientists to accelerate the discovery process. Drugs are designed, synthesised and purified as the first stage of the development process. The medicinal chemist leverages knowledge of synthetic chemistry, medicinal chemistry and biology to achieve the lead molecule for further clinical development.

The contribution of chemistry is not confined just to the discovery stage. It carries its purpose along the entire spectrum of clinical development. Each and every stage of clinical development involves surplus amounts of formulated drugs for studying potential benefits in human trials. All drugs are manufactured under strict Good Manufacturing Practices (GMP) standards to ensure they meet the compliance requirements drafted by regulatory bodies. Drug developers leverage on the analytical chemical testing and process development for meeting the regulatory compliances. It is estimated that about 50% of the analytical chemistry services are outsourced. The majority of these support services are now being rendered by Contract Research Organisations such as Charles River Laboratory, Covance, Quintiles, PPD, Eurofins, SGS Life Sciences, Wuxi AppTech, etc. Analytical methods and instrumentation are regularly used in the preclinical testing, toxicity testing, ADME analysis, product release testing, formulation and quality control.

Various techniques are adopted by the pharmaceutical industry, commonly known as purification chemistry, to separate the large molecules like monoclonal antibodies, vaccines in order to meet the standards of the regulatory bodies. The current era is witnessing a growth of biologics such as vaccines, growth factors, monoclonal antibodies and biosimilars for the treatment of cancer, diabetes, asthma, rheumatic arthritis, etc. The complexity here is multifold owing to the high degree of purification standards that are required to develop these biologics.

In short, chemistry remains the most invaluable science and plays the most critical role in the drug development process. It serves as the backbone to framework the drug discovery and bolstering the growth of the pharmaceutical industry. ■

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The need for special education in biobanking

Tanja Macheiner, Berthold Huppertz & Karine Sargsyan from Biobank Graz explain the importance of knowledge transfer and education for the future of biobanking...

Human biospecimens in combination with their associated data derived from certified biobanks serve medical research in a pivotal way, leading to a better understanding of diseases and improvement in diagnosis and treatment [1]. The eminent benefit of supra-regional biobanks and biobanking networks can be illustrated by the rapid set-up of large cohorts for investigations on rare diseases or genetic association studies, all of which need large numbers of subjects to deliver significant findings. Likewise, studies using epidemiological information of a population over time benefit from a broad collection strategy. Moreover, biomarker research for personalised medicine heavily relies on biobanking [1].

Standardised sample quality is essential for efficient use of biospecimens, even if collection is performed by various biobanks. One way to reach this goal is the development of standard operating procedures (SOPs) for collection, processing and storage of samples and data. Such SOPs are already in place in some large biobanks [1] and represent an important topic within the European infrastructure "Biobanking and Biomolecular Resources Research Infrastructure – European Research Infrastructure Consortium (BBMRI-ERIC)" and the "International Society for Biological and Environmental Repositories (ISBER)" [2].

However, the demands on biobanks increase consistently with the growing number of biospecimens and scientific applications. The preservation method combined with the storage type is often pivotal for further use of a biospecimen. In correspondence to challenges in cryopreservation, quality control of cryoconserved biospecimens represents an important research topic. An interruption of the cold chain may have ruinous effects on a sample. At the same time quality monitoring of samples stored long-term is difficult to perform [3]. Therefore, biobanks have become a real scientific battlefield, which is proven by increasing numbers of publications on biobanking science and procedures in the last decade.

Here we discuss the increasing amount of know-how and knowledge of biobanking science to be transferred and the necessity of experts in biobanking in the future.

Biobanking science and the demand for experts in future

The high demand for educating experts in the field of biobanking creates the need for a well-structured postgraduate training and education system [4]. Such occupational education should include the following key aspects:

- Handling of different types of samples and storage conditions (pre-analytical chain);
- Cryobiology;
- Research knowledge in e.g. molecular biology, biochemistry, -omics and histology;
- Workflow creation skills;
- Knowledge about clinical trials and scientific applications;
- Quality management, quality assurance and quality control;
- IT and data management;
- Ethics and law;
- Risk management and disaster planning;
- Biostatistics;
- Epidemiology;
- International networks.

Currently, there are few opportunities for such biobanking courses. Approaches to teaching in biobanking include (a) the traditional face to face

teaching and (b) online teaching, the latter becoming more and more common. Both types can be combined with workshops or placements in the field of biobanking. These educational opportunities are (1) postgraduate master education with academic courses teaching all technical, scientific and legal/ethical aspects of human and environmental biobanking, or (2) specific biobanking training modules or workshops without academic graduation.

Examples of biobank education already in place

The postgraduate biobanking education at the Catholic University of Lyon (France) offers a traditional education which includes hand-on training for 9 months within a period of 2 years and a diploma which is equivalent to the Master of Science. Generally, this education is taught in French with the exception of methodological tools, which are also taught in English. Likewise the King's College London (UK) offers a postgraduate biobanking education in English which includes 2 five-month placements. The course is focused on sample preparation, preservation, staining techniques as well as collection and storage techniques for oncology. Additionally, students learn how to prepare and analyse circulating DNA and tumor cells. However, only 6 to 8 students are accepted per year.

The University of Luxembourg offers a certified biobanking course for three weeks in a face to face style, while Biobank Graz (at Medical University of Graz, Austria) offers biobanking training modules and workshops related to collection and biopreservation of biospecimens and their associated data for their national and international cooperation partners.

In contrast, some biobanking training courses are primarily performed online. For example the biobanking training of the University of British Columbia (Canada) is available online year-round.

This overview of biobanking education opportunities demonstrates that only a small number of institutions offers a solid education that contains practical placements and theoretical units during longer periods for a sustainable and solid biobanking education. Training, workshops and courses represent ideal supplemental education for scientists. However, they cannot replace a professional biobanking education for biobank personnel, since those people need to know everything about sampling, storage, ethics, applications and management.

Europe is now going towards a first agreement on minimal standards for such education strategies within biobanking networks such as BBMRI-ERIC to yield a better harmonisation in the field of biobanking. First efforts in this direction have already been successful creating a white paper for biomarker research standards within BBMRI-ERIC at the workshop "Tissue-based Biomarkers for Advancement of Personalized Cancer Treatment", held on March, 28 to 29, 2014 in Graz.

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Defining Myopenia and Myosteatosis

Muscle mass and strength are critical components for maintaining physical function, here Dr Vera C Mazurak from the University of Alberta explains why...

Muscle mass and strength are critical for maintaining physical function, mobility and vitality. Sarcopenia was first coined to represent the loss of muscle that normally occurs during the aging process. Loss of muscle as a result of disease can be referred to as myopenia, keeping in mind that many older individuals may have lost muscle due to co-morbidities (chronic disease), recent hospitalisation, or medications. Regardless of the cause, or how it is defined, individuals with severe muscle wasting have difficulty performing daily tasks.

Disability, poor functional capacity and shorter survival contribute to high costs as a result of reduced quality of life, increased caregiver burden and health service utilisation. It has been revealed that low muscle mass is prevalent in every body size. Function of muscle is dependent in part on muscle quality.

Muscle tissue normally contains only small amounts of fat not intended for long-term lipid storage, but rather as a short term energy source for skeletal muscle contraction. Myosteatosis, characterised by excess deposition of fat into muscle, is considered to be a pathological phenomenon. The more fat a muscle contains, the less dense it becomes, and low density muscle is poor quality muscle. Low muscle density has been described in conditions of aging, detraining, various types of muscle atrophy, insulin resistance, Type 2 diabetes and most recently, cancer. Both low muscle mass and myosteatosis have been identified to increase the risk of poor function and death in a variety of patient populations.

The causes of myopenia and myosteatosis are multifactorial and may share common pathways for development. The complexity of relationships between various tissues is emerging. There is communication (cross-talk) between tissues through the release of mediators from one organ system to another in response to physiological stimuli. Involvement of other tissues to alter amount and quality of muscle adds several orders of complexity to the problems of myosteatosis and myopenia. Many underlying factors contribute to a decline in muscle health, including catabolic humoral mediators (i.e. pro-inflammatory cytokines), anabolic failure (i.e. insulin insensitivity) and activation of proteolytic systems.

Finding a treatment for low muscle mass is on the agenda of many pharmaceutical companies. To date, there are no approved drugs to reverse muscle loss, however several phase 2 and 3 trials are in progress investigating promising potential treatments for muscle loss that occurs during aging and disease.

The ability to modify muscle wasting and intramuscular fat accumulation has a broad scope of application to aging, diabetes, obesity and various forms of muscle atrophy, which share these common features. While treatment for these conditions remains limited, a number of mechanisms may contribute to the ability various drugs and nutrients to alter body composition, however, a more complete understanding of the features of the muscle characterised by wasting and fat infiltration is required. ■

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Reducing the risk of Ebola with strong health systems

Zsuzsanna Jakab, WHO Regional Director for Europe details the measures being taken by WHO to help combat the Ebola virus and how strong health systems are crucial...

The current outbreak of Ebola virus disease in West Africa is the largest in history. But why are we facing so serious an emergency that WHO calls it a "humanitarian crisis"? Many are asking this question.

This is the first outbreak involving movements of large groups of people and affecting big cities and multiple countries at once. It is the first to make around 13,000 people sick in so few months and kill 5,000 of them.

Countries' coping capacity has not been adequate to face such a large outbreak. The response efforts required go beyond medical needs; they need to take account of the social, economic, development, logistic and security challenges that are affecting these countries and the region as a whole. Having only recently emerged from long periods of conflict and instability, Guinea, Liberia and Sierra Leone have weak health systems, lacking infrastructure and human resources. All these factors have led to a crisis that is running ahead of control efforts.

Another question WHO often receives is: "What risk does Ebola pose to Europe?" The answer is that the risk of it spreading in Europe is very low. This assessment is centred on the role of health systems in responding to Ebola. A strong health system will be able to prevent the disease from spreading, and European countries have a high standard of preparedness for viral haemorrhagic fevers, which include Ebola.

I am glad to see that this focus on strong health systems is in line with Health 2020, WHO's European health policy framework, launched in 2012. Health 2020 calls on European countries to strengthen their

health systems and public health capacity, including preparedness for and response to all health threats and emergencies. This in turn builds on the requirements for countries to enhance surveillance and response under the International Health Regulations (2005). This call has never been more relevant, or more urgent.

Stronger health systems to respond to Ebola mean strong surveillance systems; laboratory capacity for safe, rapid and reliable detection; arrangements for tracing and following contacts; case management; and risk communications. They mean well equipped hospitals with isolation wards; trained doctors and nurses; and strict adherence to infection prevention and control measures, such as correctly using protective gear.

"The response efforts required go beyond medical needs; they need to take account of the social, economic, development, logistic and security challenges that are affecting these countries and the region as a whole."

While a traveller may bring Ebola to Europe and health care workers treating an infected patient may be exposed to the disease, good preparedness makes each European country ready to detect, investigate and treat Ebola cases in people coming to or living in Europe.

All this tells people in Europe that they should not worry, as they have an extremely low risk of being infected. They need to stay informed of developments and follow the advice of their health authorities. If they travel to affected countries, they should avoid all contacts with infected people or animals, living or dead, and carefully follow routine hygiene practices such as washing their hands. Any who develop Ebola-like symptoms should immediately see a doctor and say that they have just returned from a country with Ebola.

The WHO Regional Office for Europe is working closely with partners in the European Commission and the European Centre for Disease Prevention and Control (ECDC) to provide guidance to countries in the WHO European Region – which includes 53 countries extending from the Atlantic Ocean in the west to the Pacific Ocean in the east –on a number of issues, including disease surveillance, diagnostics and management of people suspected to have Ebola at airports, sea ports and land crossings. The Regional Office is also assisting European countries in investigating suspected cases originating from West Africa and evacuating patients infected with Ebola. An Ebola core team is now available upon request to assess country preparedness and to be deployed to European countries at need.

But the real fight cannot be conducted in Europe. The most effective way to prevent Ebola infections in Europe is to control the epidemic in the heavily affected West African countries. That is where efforts should focus now. That is why the Regional Office has sent its experts to support the Ebola response in West Africa since spring 2014, and will continue to do so. That is why the international community is massively scaling up the response: an increasing number of countries are deploying their experts, their doctors, nurses and military forces to build treatments centres, make beds available, diagnose Ebola and support logistic. They are ensuring their people are trained and protected to do so. But we need to act much faster and stronger if we are to stop the spread of Ebola. ■

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STAY SAFE!
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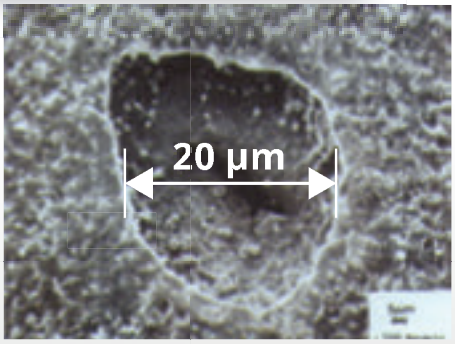
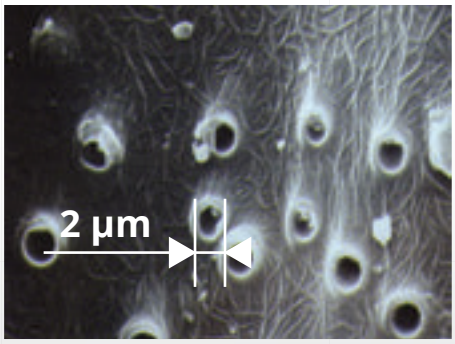
Gloves do not provide 100% safety.

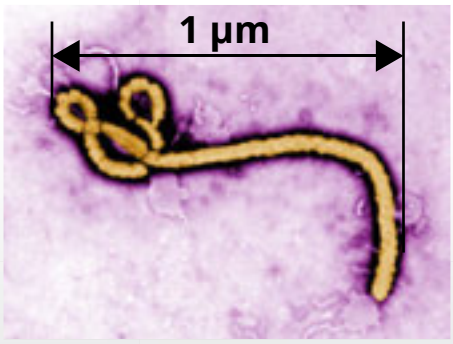
Proper hand hygiene is essential in fighting Ebola.



Latex glove micropores



Vinyl glove micropores



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Working towards a vaccine for HIV

Professor Tomáš Hanke of the Jenner Institute at the University of Oxford details the difficulties in developing vaccines for HIV...

Since the first report of AIDS in 1981, an estimated 60 million people have become infected with HIV, of whom some 25 million have died. Over 90% of new infections take place in countries with limited resources. Despite proven methods of prevention, all efforts to slow the rate of new HIV-1 infections are failing in most countries around the world.

Over 30 drugs have been developed inhibiting a number of essential steps in the HIV growth; these can be used to treat HIV infection thus prolong lives of HIV-positive individuals and can also serve as a prevention of HIV acquisition. Indeed, optimism has been spreading that the control of AIDS epidemic has become possible: it is now a matter of a 'business plan' to provide drugs to everybody who needs them. However, still almost half of people who are infected with HIV do not know their HIV status. In addition, because of drug unavailability on a regular reliable basis particularly in resource-poor settings, long-term side effects, requirement for rigorous daily compliance, potential development of resistance and unwillingness to take drugs in a surprisingly large proportion of infected individuals even in the US, a safe, effective, accessible vaccine against HIV-1 infection will be key to any solution of the AIDS epidemic.

Developing a vaccine against HIV is not easy. Traditional vaccine approaches cannot be used for HIV: killed HIV does not work and live attenuated HIV is too dangerous. Thus, safe subunit vaccines represent the most explored

current strategies. These consist of small parts (subunits) of HIV, typically a protein or polysaccharide, which the immune responses learn to target, and a means of the subunit delivery and presentation to the immune system, often using other safe non-replicating viruses, which determines the magnitude, type, location and durability of the elicited immune responses. Both the subunits and their delivery have to be right to achieve protection against either infection or development of disease.

The difficulties in development of an effective vaccine are numerous. First, HIV infects and destroys the very cells in the body, which orchestrate the generation of protective responses against invading microbes and cancer. The biggest challenge for development of an effective HIV vaccine is the HIV variability, which allows HIV to change and escape (become unrecognisable by) the mounted immune responses; escaped HIV variants rapidly overgrow their parental strains suppressed by existing immune responses. Furthermore, HIV has evolved in a way that during natural infection, the generated responses first target the most variable parts of HIV, which HIV can easily change and become invisible. By the time the immune responses refocus on the functionally conserved regions of HIV proteins, which HIV either cannot change or can change at a great cost to its fitness, it is too late, because the damage to the body's ability to fight infections has been incurred.

"Developing a vaccine against HIV is not easy. Traditional vaccine approaches cannot be used for HIV: killed HIV does not work and live attenuated HIV is too dangerous. Thus, safe subunit vaccines represent the most explored current strategies."

My research focuses on development of HIV vaccines targeting precisely this Achilles heel of HIV, the most conserved regions on HIV proteins, which are required for proteins' structure or function in order for HIV to survive. These conserved parts are common to all global HIV variants and also escape mutants in infected individuals. Therefore, if this conserved subunit approach works, we would have a vaccine, which could be deployed in Africa, Asia, Europe, America and Australia: it would be universal.

My group has done lots of pre-clinical refinement and optimisation of this vaccine design, and have together with colleagues pioneered the conserved region strategy into clinical trials in humans. The initial results are highly encouraging in terms of safety and induction of robust immune responses in human volunteers. Now, we have a platform that can be tested in high risk, but HIV-negative adults as a preventive tool. Because also over 700 children are infected with HIV every day mainly with their mother's virus, we also plan to test this approach in the paediatric setting to protect neonates against mother-to-child transmission of HIV through breast milk. The same approach is very appropriate for studies aimed at controlling or even eliminating HIV from the body in conjunction with antiretroviral treatment and reactivation of the latent virus. Here, refocusing killer T cells to conserved regions of the HIV proteome is greatly preferable to simply boosting the pre-treatment responses that had failed to control the virus in the first place.

An effective HIV vaccine would have a dramatic impact on the quality of lives of millions of people, social structures and economies in the most affected countries. HIV-1 vaccine development is admittedly of high risk, but vaccines cannot be discovered without testing novel ideas and technologies backed by a sustained financial and political support. ■

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Tackling farming and human health challenges

Using tech that's clean and green

Taking care of people includes caring for the environment. Healthy ecosystems support global security by providing us with the resources we need to thrive. But sometimes advances can come at the expense of the environment. This means we need to find ways of addressing public health and agricultural challenges without the big environmental price tag. Investing in new environmentally friendly technologies that help us achieve our Sustainable Development Goals[1] is a clear way forward. The Oxitec control of insect pests is a good example of this kind of technology because it has a light environmental footprint.

Insect pest control solutions for farming and public health can be both effective and environmentally friendly

A major challenge that cuts across environmental protection, human health and agriculture is the effective control of insect pests. Insect pests spread disease and damage crops, creating a massive burden for healthcare systems and farmers.

One example is the *Aedes aegypti* mosquito that carries dengue fever, yellow fever and chikungunya virus. This mosquito has spread to over 100 countries and because the females blood-feed predominantly on humans they quickly transmit diseases from person to person, leading to epidemic outbreaks. A popular method of control is fogging with insecticides, but these mosquitoes live inside houses, close to their human meals, and can reproduce in little pools of water just about anywhere, so there are lots of breeding sites that never get treated. There's understandably a big demand for better control methods.

Another major pest is the diamondback moth that destroys brassica crops and costs farmers billions of dollars each year. These moths have been developing resistance to insecticides, which makes them difficult to control. Plus, consumers are increasingly demanding foods with less spray residues, so new environmentally friendly control options are needed as part of integrated pest management systems.

This is where Oxitec comes in – a spinout from Oxford University – whose scientists have developed an effective and safe method of pest control for insects such as the dengue mosquito and diamondback moth. The idea is based on the Sterile Insect Technique (SIT) which has been used for the last 50 years to sterilise insects with radiation. The insects are then released to mate with wild ones to prevent them from having offspring. One drawback of radiation is that it can reduce the fitness of the insects, limiting their mating effectiveness. This inspired Oxitec scientists to adapt the SIT approach by using genetic engineering, which is more carefully targeted than radiation, and produces a highly effective and stable form of control.

One of the insect pests Oxitec has developed a solution for is the diamondback moth (*Plutella xylostella*)

To tackle wild pest populations, Oxitec has genetically engineered insects such as the *Aedes aegypti* mosquito by introducing two genes – a colour marker to track the insects, and a self-limiting gene that prevents the offspring from surviving. Oxitec releases male mosquitoes because they don't bite or spread disease, and they do all the hard work of finding the wild females to mate. Their offspring don't survive, so after successive releases the pest population is reduced and this means fewer mosquitoes to bite humans and transmit disease. The system is similar for agricultural pests except that the self-limiting gene technology specifically targets the females that lay eggs and damage crops.

Oxitec has done mosquito outdoor trials in several countries, and in every case the local *Aedes aegypti* population was reduced by at least 90%. In cage experiments with agricultural pests such as diamondback moth and Mediterranean fruit fly, the pest population was completely suppressed, so the technology is extremely effective. But what makes this solution even more appealing is its light environmental footprint. The insects die and do not persist in the environment. The modified insects target their own species so the genes do not spread. And this species-specific targeting along with reductions in insecticide use allows beneficial insects like bees to thrive.

Several Oxitec insect pest control strains are now in field trials and more are in development, with collaborations in countries such as the US, Panama, Brazil and India.

"In cage experiments with agricultural pests such as diamondback moth and Mediterranean fruit fly, the pest population was completely suppressed…"

The philosophy in designing the Oxitec approach was to place ecological considerations on the same level as efficacy. With many technologies, such as insecticides, efficacy and the environment are trade-offs that are weighed against each other. But by using a self-limiting approach, which does not 'spread' in the environment, and by combining it with an in-built monitoring system, the twin objectives of combatting insects and improving our environment can be met at the same time.

[1] Open Working Group proposal for Sustainable Development Goals http://sustainabledevelopment.un.org/focussdgs.html

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Leading in learning

Learning & development plays a vital role in enhancing employees and organisational performance, as detailed by Ruth Stuart, Research Adviser at CIPD...

Learning does not stop when you leave the classroom. It's a life-long continual process of insight, reflection and growth. Increasingly organisations are tapping into this potential for development and connecting learning to tangible business outcomes.

The CIPD 2014 Learning and Development (L&D) survey report[1] (completed by over 1000 learning professionals) finds that greater integration of L&D activity and business strategy is the most anticipated change in the next 2 years. Also expected is more emphasis on monitoring, measuring and evaluating training effectiveness.

Some organisations are already making progress. Greater business focus is cited as the number one change for organisations over the last year. This is a welcome development. Business and learning leaders are recognising that in order to enhance employee and organisational performance they need to work hand in hand. But doing so may require a shift in mindset in some organisations and increased focus on measuring the impact of L&D activity, for 3 key reasons.

1. Demonstrating value can help to enhance L&D credibility across the organisation.

2. Evaluating true learning impact means investment can be justified, and made where it's needed most.

3. Data can help you to understand what works, so you can stop/start/continue activity to achieve maximum business impact.

In this regard the findings of the report initially appear to be promising. The research shows that organisations are investing significantly more time and attention on measurement. The 2014 survey findings

Ruth Stuart
Research Adviser – L&D

show a marked improvement in assessment methods used to measure the impact of learning. The proportion using business metrics (such as profitability, revenue and market growth) increased from 38% (in 2013) to 54% in 2014. Those calculating the return on investment (ROI) of interventions increased from 26% to 48%.

So we are increasingly measuring impact. However, this isn't the end of the story. 60% of organisations say that they have difficulties measuring the effectiveness of L&D activity. While a quarter rarely use the data they collect. The old adage of 'what get's measured get managed' may not be true in this case.

So what stops us?

- Two-thirds say that managers and leaders don't prioritise L&D evaluation.
- 60% feel it's difficult to access data consistently.
- Almost half admit that they don't have the skill or resource to focus on metrics.
- Over a third can't get access to key business information and data.

It seems that the key to solving these challenges is collaboration and integration. L&D departments need to build relationships across the organisation to ensure they understand the business model and have the skills to interpret business data. In many cases this may mean further integration into the heart of the business.

The benefits of doing so can be substantial. When aligned to business priorities learning and development activities have the potential to help organisations transform performance. Leadership development activities can help set a new direction to forge a new culture and focus. Raising the skills of the workforce can lead to enhanced engagement, commitment and ultimately individual performance. Whatever the business challenge it is highly likely that effective L&D interventions have a role to play. With this in mind we offer '2 calls to action' reflecting the findings of our latest report, in collaboration with Towards Maturity, Aligning business and learning[2].

Call to action to business leaders

- Embrace your L&D team as a partner in change;
- Demand that your L&D function focuses on outcome measures, not just inputs;
- Recognise your own power to role model effective learning.

Call to action to learning leaders

- Build relationships at the heart of the business;
- Align all activity to business priorities;
- Demonstrate value. ■

[1] CHARTERED INSTITUTE OF PERSONNEL AND DEVELOPMENT. (2014) Learning and development annual survey report 2014 [online]. London: CIPD. Available at: http://www.cipd.co.uk/L&Dsurvey

[2] CHARTERED INSTITUTE OF PERSONNEL AND DEVELOPMENT. (2014) Aligning business and learning: Why now, what's next? [online]. London: CIPD. Available at: http://www.cipd.co.uk/hr-resources/event-summaries/aligning-learning-business.aspx

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Making business improvement enjoyable and sustainable

Benefitting from business process management

The only constant in business, private or public, is **Change**; and most people whether they admit it or not do not like change enacted upon them. It is therefore important as you approach designing and implementing a Continuous Improvement (CI) programme that you fully recognise and manage the change aspects. Continuous improvement is not a new concept, well promoted in manufacturing businesses; it requires intensive teamwork with team members that have the delegated responsibility to improve the processes they are part of.

Leadership is key in selling the vision of the future beyond the proposed improvements and designing a reward and recognition scheme that has a personal dimension to it. Change Management is multi-dimensional including education and training, business process modelling, and communications. All of these elements are then designed to match the organisational culture.

External Intervention and facilitation can be effective, in challenging the status quo, providing analysis tools and programme management; but sustainability can only be achieved from within and enthusiastic participation can only be guaranteed if the process is enjoyable.

Making this process enjoyable requires that you ensure that each of the participants:

- Has a sense of control over the outcome.
- Understand their personal benefit.
- See how they will improve their skills making them more employable inside or outside the organisation.
- Receive recognition of their achievements through the monitoring of benefits and the difference the change has made.

Why does this make it enjoyable?

Firstly, if you can see and feel in control of your own destiny you are more likely to participate in changing it. This means leaders need to be able to project a vision of where they think continuous improvement is going to take the business, and then what part the participants will play in it. Leaders also need to emphasise and promote the personal benefits such as training as well as monetary rewards.

For example demonstrating that by participating in programmes such as this so they can progress within the business and in some cases this progression might be significant enough that they move out of the business into a new career.

Sustainability requires that the business:

- Provides a strategic framework in which continuous improvement is

managed through process improvement targets set over a 3-5 year period.

- Provides for the monitoring of these targets as part of departmental 'business as usual' activities.

- Continues to provide training in analysis, communication and decision making skills perhaps using the early practitioners to develop others.

- Communicates regularly describing how the business is progressing and the contribution from CI.

What are the key elements of a successful CI programme?

We consider the corner stone to be a dynamic business process model. By understanding the present maturity of the processes, comparing to best practice provides the 'Gap' that must be closed by the CI programme. We debate process performance in a qualitative manner in cross-functional workshops. The maturity of these processes will vary and this will lead to different categories of improvement such benchmarking, step change and break through.

When redesigning processes we take into account that different processes have different values within the business, therefore there should be little discussion about streamlining activities and removing rework from back office processes and can be set to a 'best practice' standard; whereas 'added value' processes need careful design to ensure we deliver the most beneficial outcome.

The benefits model of the continuous improvement programme will directly be related directly to these processes also. Executive workshops enable senior managers to define the type of benefit and the degree of difficulty to achieve it. We use 3 categories Displaced Costs, Improved Productivity and Increased Revenue; and three degrees of difficulty High, Medium and Low to enable mangers to allow for the level of control they have in implementing the process improvement. This qualitative method engages managers better than traditional single target benefit measures.

Throughout a CI programme a significant level of honest communication is required, all stakeholders need to be understood and communication will vary from results notification to visioning. All the communicators will need to have a good level of skill and be able to address their work colleagues and senior managers in equal measure.

This ability requires structured training and to ensure good 'internalisation' of change we use workshops to engage the change agent in all participants; other skills training will include the ability to communicate with colleagues, facilitate workshops and present analysis and assessment results to senior managers. The senior managers role in this is to be listening, facilitating and mentoring, guiding; not managing and implementing.

In Summary

Throughout the next 12 months we will be looking at some of these techniques and approaches in more detail, but in conclusion the implementation and management of a successful continuous improvement programme requires good planning, a shared vision of the future, skilled internal change agents and extensive open communication.

We hope that we have shown that the human element is the key issue in the whole process; take your staff with you. In addition do not think you can delegate the whole process to outside agencies though they can help to provide tools and techniques and create initial momentum. For example there are many examples of where a change have been made without performing business modelling and in some cases this has resulted in extremely effective, short term cost reductions in head count, but an inability to perform the processes effectively after the programme stops.

Finally CI should be seen as redirecting your resources to add more value in activities that you may not be able to perform effectively because they are either not recognised, there is not enough resource in the business to do them or they are being protected by departmental approaches to process design and management that are ineffective in today's agile business climate.

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The trouble with Continuous Improvement!

The top 5 reasons why organsations resist embracing continuous improvement.

How many times have you heard the words continuous improvement in the last twelve months?

Here we look at the upside and downside of continuous improvement, as provided by the people we come into contact with. At the end we summarise these findings from which you can make up your own mind. Let's start with the negatives:

- **"It is too costly to train and implement continuous improvement"**
- **"It can be a complicated tool to understand and implement"**
- **"It takes too long to see a return on investment"**
- **"We want to do it, but our senior management don't"**
- **"Our people don't like change!"**

These are the most common reactions we hear when the words continuous improvement is spoken and we have to say that we agree with some of them – but only some!

If we deal with each in turn, then, emanating from this we can see that there are opportunities to overcome all of these.

1. It's too costly to train and implement continuous improvement

It is well documented that the public sector are challenged with huge cost reductions. Efficiency is the name of the game right now and will continue to be for years to come. But... given the budget constraints it makes it very difficult to justify this investment. Why? Because typically organisations lack confidence in the realisation of a return on investment.

Consider this: A healthcare provider recently invested £5k in continuous improvement training (Lean Six Sigma) and realised a return on investment of almost £100k – in just a few months.

2. It can be a complicated tool to understand and implement

We agree! It can be complicated. With the vast array of tools and techniques that Lean Six Sigma brings it is often difficult to understand which tool to use and when to use it – particularly those within the Six Sigma tool-box! The question is' "Should it be complicated?" Our answer to that is no! It is only complicated if you allow it to be. We have come across some organisations that try to deploy every tool available! The message quite simply is keep it simple. Try using the simplest of tools in the early stages e.g. 5S or Value Stream Mapping rather than trying to create excessive control charts or process capability analysis.

Consider this: An administrative centre decided to implement 5S as a means to gaining buy-in from the team and to demonstrate the power of clean efficient processes. This was a huge success (the importance of implementing ALL components of 5S and sustaining is key) from which they achieved strong engagement and the appetite from the team to progress with other continuous improvement tools. Result: great engagement and a total of 18 hours saved per day.

3. It takes too long to see a return on investment

It can take some time to see a return on investment depending on your project(s) and the complexity that resides within them. Major transformational projects will undoubtedly take far longer than those

that can be considered as functional or local projects. However, there are many small projects that can be undertaken which can realise fast results – quick wins or the 'low hanging fruit.' Like above, the key is to start off with these smaller projects (it really helps the learning), get some quick results under your belt and then progress to the larger projects. Rapid Action Teams (RAT's) and Kaizen events are great for achieving this!

Consider this: As shown by the healthcare project illustrated in point 1, results CAN be achieved a lot quicker than some may think. It is all about choosing your projects carefully at the outset and then ramping up the larger projects as you become more and more familiar with the application of the methodologies i.e. Lean and Six Sigma.

4. We want to do it, but our senior management don't!

Without senior management demonstrable commitment to continuous improvement, your ventures are likely to fail. Fact. This is not a question of whether members of senior management do not wish to embrace continuous improvement, rather, as is often the case, cost springs to mind instantly. How often have you heard the question "How much is this going to cost?" Wouldn't a better question be "How will this investment help the organisation become better?" It is the fear of investment that in our experience is usually the root cause of this lack of 'commitment.' The key here is to provide evidence of success through the deployment of quick wins as described above.

Consider this: A site general manager was very keen to introduce Lean Six Sigma into his site to the extent that he funded his training himself – all as a means of 'proof of concept.' Armed with his newly acquired 'Belt' he set about a project with his team and achieved (as he put it himself) "Results beyond his wildest dreams!" Result: A saving of almost £500k, with an investment of just under £10k AND an increase in yield of almost 17%.

5. Our people don't like change!

Not many people do like change. There is always resistance to change due to many reasons (far too many to mention here!). One of the most common reasons is that the change is imposed on them – they are/were not part of the solution (they don't see the problem or they see the problem but they don't see the solution). But we all know that change is inevitable, because if organisations don't change they fall behind, play catch up and continue to firefight. However, there is one overriding factor as to why people don't like change – because they are not involved in the change process.

Consider this: A head of department made a decision to change the way invoice processing was undertaken. She communicated the changes that were to take place through an e-mail. Resistance was so rife that the unions demanded the proposed changes be withdrawn. As a consequence, the head met with the union leader and outlined the reason for the changes. The union representative accepted the reason for the changes after considerable probing and the $million question "Why?" After detailed explanations on the value to the people as well as the organisation, arrangements were made for the head of department to communicate the benefits to the people as the prime motivation for the change. The fear factor that instigated the resistance had now been virtually eradicated. Result: engagement of the people and their inclusion in the change process (the Voice of the People) resulted in improved working conditions and the achievement of the project objective: reduce invoice errors by 25% within the next quarter (in fact this target was exceed to a 34% reduction).

So, whichever way you look at it, it is fair to say that the trepidation that commonly exists when considering deployment of continuous improvement can – and indeed will – be overcome. It just needs the right approach!

Dembridge
LEAN SIX SIGMA TRAINING & CONSULTING

Leadership skills for a high performance team

'High Performance Team' is a concept that refers to groups that are highly focused on their goals and that achieve superior business results. The High Performance Team outperforms all other similar teams and they outperform expectations given their composition. Which all sounds very good!

With increasing pressure on budgets, efficiency and performance, the term 'High Performance Team' is often used in the context of increased output: i.e. High Performance Teams deliver more, faster – so let's crank the wheel and get things moving! But there's more to it than that.

A High Performance Team can be defined as a group of people with specific roles and complementary talents and skills, aligned with and committed to a common purpose, who consistently show high levels of collaboration and innovation that produce superior results. Team members are so devoted to their purpose that they will surmount any barrier to achieve the team's goals.

And I'm sure each and every one of us can think of teams in our own organisations who would count these qualities as their own.

But what fosters the dedication, the desire to meet the goal? What separates the High Performance Team from any other team? The single most critical factor is the Leadership Skills of the manager.

BENEFITS OF BEING IN A HIGH PERFORMANCE TEAM

Those times you were at your best, performing with ease and feeling part of a motivated team are examples of when you were in the high performance zone – in what we would term Flow – and it's most probable that your manager was a key part of that experience.

During that time, several things were going on:

- Your productivity was much greater
- You had higher levels of accuracy
- People really trusted you to get on with the tasks you had
- It was a pleasure to come to work
- You were so absorbed in your role that you sometimes didn't even notice the time
- You felt both valued and valuable to the organisation
- Stress [the opposite of Flow] was all but non-existent
- You had an overwhelming sense of Wellbeing

Not only did it not feel like hard work,

but it all came so naturally. By being focused on a task or role that played to your natural strengths, doing the things that you loved to do, in a team of like-minded individuals you found yourself on the path of least resistance. You were highly motivated and engaged. People trusted you to get on with your job and do it really well – and this you did.

By contrast, if a team is out of sync – or out of Flow – things happen slowly or at worst not at all. Accuracy levels decrease, absence increases, motivation is lacking and an unhealthy degree of competitiveness can enter the workplace. If Trust levels are low, the team fails to work effectively and performance suffers.

But everyone has the ability to be in a High Performance Team, especially when their manager puts in place the environment that will make Flow most likely.

THE HIGH PERFORMANCE LEADER

Leadership of a High Performance Team starts with four key characteristics:

TEAM IN FLOW: staff confidence in a leader who understands their qualities and has the abilities to get each individual into Flow.

CLEAR DIRECTION: staff knowing what is expected from them – unambiguous goals and quick feedback on performance.

LOCUS OF ATTENTION: staff perceiving that their leader/manager is interested in them, in what they are doing in the present, in their feelings and experiences now.

UPWARD MOMENTUM: staff experiencing that their leader/manager is dedicated to providing adequate opportunities for team members to grow.

THE DIFFERENCE THAT MAKES THE DIFFERENCE

A High Performance Team needs a very talented leader and as a starting point it is absolutely crucial they understand their team and how to draw the very best from each individual member.

To grow your understanding of different working styles and personality traits, please go to our website www.wellbeingdynamics.com and download the content rich and ***FREE*** Wellbeing Dynamics e-guide: *Building Trust the Natural Way*.

Here you will gain insight into embracing and working with the four different processing styles and eight talent profiles that are the very strength and foundation of your High Performance Team.

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Using Lean to deliver successful change

Fin Miller, Change Consultant at the University of St Andrews underlines the value of Lean and its impact within an organisation...

It is fair to say that change for change sake is unlikely to achieve anything. But bearing in mind how averse most organisations are to change, even when the many reasons are staring them plainly in the face, it is also fairly unlikely to take place.

Much more likely, when an organisation can indeed muster the desire and courage, is change aligned to strategy, driven by an understanding of business needs with at least some idea of the benefits being targeted.

And this will carry a change initiative some distance, but in terms of having a significant and sustainable impact on an organisation's overall efficiency and effectiveness, this business centred approach will always fall short.

Unfortunately, the problem is that just as common-place as strategy alignment and the like, is for change to be designed by a small team of senior managers and delivered in a boom and bust cycle.

For change to have the greatest impact however, and this is often left unconsidered, it has to empower the organisation, or to put it another way, be people centred.

From the boardroom to the frontline, no brain should be left unturned.

When the structures are in place for change to be initiated and led at all levels, for the affect implemented ideas have on performance to be understood in real time, and for all staff to receive recognition for their part, significant impact will be witnessed.

When it becomes part of what all staff do every day, embedded within a culture of innovation and creativity, change can start to transform.

Lean

Lean, done properly, can benefit all sectors in exactly this way, by providing both the philosophy and methodology to enable staff to more fully engage with improvement.

By focusing on the encouragement and release of individual creativity, enabling people to realise their full potential as part of a team that works together for mutual benefit, the Lean approach can revolutionise.

People make organisations. To leave their problem solving abilities untapped is to rob the business of huge amounts of value and the staff who work there, of a happier, more fulfilling work life.

It is quite simply the choice between embedding a negative cycle or a positive one.

One lesson we can learn from organisations who have seen transformation through the application of Lean thinking is that when the ideas for change and improvement are born by all staff, iteratively, without fear of error, mountains can be moved.

Fundamentally, it's about changing how people feel and think about their work and then giving them the means to do something about it, and indeed vice versa.

Lean helps organisations focus on the customer and what adds value from their perspective, it centers in on the removal of activities that don't contribute to this and as a result optimises flow, whether it be on the production line or the delivery of service.

Yet despite how obvious these principles are, they are too easily forgotten or assumed.

Another lesson we can learn from organisations that have implemented Lean, therefore, is that common sense is not so common and in fact in some cases is a radical shift.

Lean success

But of course doing Lean 'properly', as mentioned so nonchalantly above, is not easy. So what must organisations do to ensure success?

Well first off, they must support the endeavor from the very top – publicly, and this endorsement must be constant because culture change is not achieved overnight.

Organisations must trust and support their staff and commit to a culture of taking risk and time in the pursuit of improvement – using data to measure success.

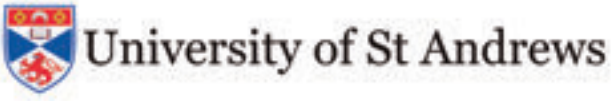
It is important also to ensure participation is broad based, internally across all levels of an organisation including supporters and doubters but also beyond the enterprise boundary with suppliers and customers.

Lean gives the chance to move away from the creativity of the few to the agreed cohesive creativity of the many and from a management model of control, to one of facilitation.

Lean is about creating capacity for growth, not for reduction and so it is vital organisations never lay people off as a result of Lean. Instead they must use their staff to improve what they do.

What follows from this then is promotion based on interpersonal skills and commitment to improve the work area.

Finally, organisations must strive to decompartmentalise Lean. Even to the point where they stop 'doing Lean' or 'being Lean' and start seeing observers coining new phrases for how they work. ■



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NHS – both sides keep getting it wrong

Recently, Jeremy Hunt claimed that "basic mistakes in hospitals in England cost the NHS up to £2.5bn a year" and "the NHS could afford to hire more nurses if the errors were cut out"[1].

He's right of course.

However, he went on to say that "more resources should be invested in improving patient care rather than wasted on picking up the pieces when things go wrong"[1].

Which is not right.

You need to pick up the pieces when things go wrong. And when things are going wrong a lot, you have many pieces to pick up. You can't stop wasting money on picking up the pieces until you spend some money figuring out why the pieces needed picking up in the first place.

And has the Government done this? Have they figured out the root causes of poor patient care through a dedicated Lean improvement programme? Have they designed and implemented improvements to eliminate the root causes of poor patient care that is costing loads of money?

No.

What they are doing though, is spending money on a poster campaign warning staff about the financial problems basic errors cause[1].

Let's think about that for a moment. Are we suggesting that nurses are making mistakes because they fail to realise that this costs the taxpayers money? That by somehow letting them know it costs money (with shiny posters!) that will make them less likely to make a mistake?

So the next time a nurse decides to fit a catheter incorrectly, they'll think twice. All because of our shiny new posters advising them that mistakes cost money.

It's this kind of management thinking that does precisely nothing. The reason this does nothing, is that you haven't correctly identified the root cause of the issue and therefore you haven't fixed the problem. The root cause of poor patient safety is most definitely not 'because nurses are unaware this costs us money'.

The counter-point to this line of thought was offered by Dr Peter Carter from the Royal College of Nursing who said "the government needed to invest in more staff before patient care can be improved". They argue that "mistakes were the result of understaffed wards"[1].

This is also not right.

Dr Peter Carter makes the assumption here that we don't have enough staff and that this is the cause of the problem. But this line of thinking assumes that the staff we do have are working efficiently and effectively.

In the business world, high performing operational environments will measure something called 'shrinkage'. This is broadly defined as the percentage of time colleagues spend NOT doing the productive work they are there to complete. In a call centre, this would be all the time spent not taking calls. In a retail shop, this might be all the time spent not serving customers.

Every organisation has shrinkage.

In the case of nurses, this would be any and all activity not spent directly on patient care. It includes discharges, admissions, report writing, one-off projects, chasing authorisations, fetching supplies, chasing doctors and supervisors, care plans, incident logging, appointment making, checking others work, rostering, timesheets... I could keep going.

How much time is lost to these activities? How much more time could be invested in direct patient care if less time was spent on the above?

Then there are all the policies that create waste. For example, when my wife and I were expecting our first child we called up the hospital to book in our 12 week appointment. We were speaking directly to the nurse responsible for booking these appointments. But could we make an appointment?

No. We had to wait until a referral had been received (via the post!) from our GP. The very same GP who we told

we were pregnant. The GP who didn't perform any tests or check to see if we were actually pregnant. They simply accepted our word for it. But the hospital wouldn't accept our word for it – the policy was to wait until they heard it from the doctor (who heard it from us).

This is waste. In the time the nurse was speaking to us to tell us they couldn't make an appointment, they could have just made the appointment. Instead, we needed to waste the doctors time writing a referral. The GP surgery staff wasted time sending the letter to the hospital. The hospital wasted time receiving that letter and delivering it to the correct person. The person wasting time processing the letter and making a booking. The hospital then wasting time contacting us to advise the time of the appointment.

There are literally thousands of poor policies like this that drive waste into our hospitals. Waste that is more often than not, absorbed by our wonderful nurses who could better spend the time doing what they do best – caring for all of us.

I love the NHS. I'm proud that we have a service like this available to all of us here in the UK. It frustrates me that despite the huge amount of money we spend on it, it's not as good as it could be.

Silly hospital policies waste time which means we don't have enough time to look after patients properly.

Maybe THAT should go on a shiny new poster, Mr Hunt.

[1] Source - http://www.bbc.co.uk/news/uk-29639383

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Building a culture of health in the workplace

Rebekah Haymes, Senior Consultant at Towers Watson outlines the importance of wellbeing programmes in organisations to ensure employees remain productive and engaged...

More employers are turning their focus to the preventative measures offered by health and wellness benefits rather than their traditional reactionary provisions. For many employers, taking steps to help employees develop a healthier lifestyle in order to reduce the risk of illness has now taken on greater importance. It is widely considered that employers should share the responsibility with employees for their health and well-being. However, many employers are unclear how to plan and deliver programmes that will engage employees and demonstrate value to the business.

Employers have many reasons for introducing well-being programmes, the advantages ranging from: increased engagement and productivity; lowered health and disability insurance claims; reduced absence rates and promotion of corporate social responsibility. But, how can employers ensure these programmes are effective and are aligned with employees' wants and needs?

The Towers Watson 2014 Global Benefits Attitudes Research explored employee opinion towards wellness and suggested that they are unclear about the role of their employer in encouraging a healthier workplace. A third of employees, who do not take part in a health and wellness activity, report that they manage their health on their own. This reinforces the point that employees are unclear about what employers can do to help them lead a healthier lifestyle. This clearly suggests that some work needs to be done by employers to consider their position as a supporter of well-being in the workplace and the message they want to give out to employees on this subject.

Employees certainly believe that a good health status equals greater efficiency, with 63% stating that people who are in good health are more productive at work than those in poor health. However, a lower 43% say that employees who live a healthy lifestyle (for example, those who exercise regularly and maintain target body weight etc) are more productive at work than those

Rebekah Haymes, Senior Consultant

who don't. Clearly there is a lack of understanding among employees about their current health status and the additional personal and professional benefits of adopting a healthy lifestyle. These results suggest that there is a need for greater employee education in this regard to enhance awareness.

The research also highlights a clear association between unhealthy workers and employee engagement. When looking at the correlation between work-related stress and engagement, 57% of employees with high stress are also disengaged. Furthermore, 49% of employees with low stress are highly engaged versus only 8% of those with high stress. When work-related stress is low, absence levels nearly halve. High stress also results in increased levels of presenteeism (where employees are deemed ill and should not be present in the workplace but are, leading to decreasing productivity) – our report showed 15.9 days for employees with high stress, versus 10.6 days for employees with low stress. And all of this is of course likely to impact upon employee performance.

So how do companies develop a culture of health? Despite many employers identifying the need to develop and communicate a clearly defined wellness strategy, our research tells us that half have no such plan in place. Often initiatives have been implemented to be seen to offer some wellness support, although in the absence of a considered and comprehensive strategy, the effectiveness of this approach will certainly be limited.

It is important that employers establish what they are trying to achieve through a well-being programme upfront – both to help build the business case and identify appropriate measurement mechanics. Having a well-defined strategy with leadership buy-in goes a long way to increasing engagement in the programme.

To ensure money is well-spent, employers should build a clear understanding of the most significant actual and potential health risks to their business and then implement targeted initiatives.

Communication and even branding is key to the success of any well-being programme; not just to promote the initiatives available but to ensure the business objectives are understood and that behavioural change is encouraged.

Finally, although lack of evidence of the financial return on investment has not proved to be the primary barrier to developing wellness programmes, in order for any budget allocation to be sustainable, employers need to be mindful that at some point they need to demonstrate in a tangible way that wellness positively impacts on absenteeism, engagement and productivity. ■

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Pension reforms for everyone

Steve Webb, Minister for Pensions at the Department for Work and Pensions (DWP) details how the government's pension reforms will offer new opportunities...

This government has overseen major pension reforms that will leave this country's retirement prospects in a much stronger position.

The demographic changes and challenges we face are stark; 1 in 3 people born in 2016 are expected to live to 100 and the average time spent in retirement for a man is now 22 years and for women is 26 years.

Improvements in life expectancy offer new opportunities, but they also present new challenges.

Across our reforms we are working to make pensions – both the state pension and private saving – simpler for people to understand so they can build up their own savings with confidence with the future.

I am proud to say that our work means that people will know far more clearly what they are going to get from their State Pension and they will know that when they save extra for retirement to build on their State Pension, their hard-earned cash is safe and working for them.

The long-standing trend of falling pension saving is now turning. But there is much hard work still to do. Millions are not saving enough for a comfortable retirement – but we are working to close the gap.

The starting point is the new State Pension.

The new State Pension – to start in April 2016 – will provide clarity about what individuals can expect from the state as well as benefiting many women, self-employed people and the low-paid.

We are setting the full level of the state pension above basic means-tested support. This should give people greater confidence in the value of saving into a private pension.

Just like today, the amount received will depend on how much National Insurance is paid. Many public sector workers will have paid lower levels of NI – something known as contracting out.

This is something that few people have heard of, but it will actually affect many. Three-quarters of those reaching State Pension age in the first 2 decades of the new State Pension will have been contracted-out at some point in their working lives and around 6 million people are still contracted out today.

Generally, this means that employees have paid lower National Insurance contributions and paid that money saved into a workplace or personal pension instead.

During the time they were paying those lower National Insurance contributions, they weren't paying in to the government additional State Pension, also known as SERPS or State Second Pension. So their new State Pension may reflect this.

That's why we're encouraging everybody who is approaching retirement in the next few years to check out what they'll be entitled to under the new system, and are in the process of rolling out a service through which people can ask for a personalised statement.

Anyone who has been contracted out should be reassured that, generally, they will have additional income from a workplace or personal pension. And most people will be able to boost their State Pension

Steve Webb, Minister for Pensions
Department for Work and Pensions (DWP)

income, beyond the level they could have expected in the current pension system, by continuing to work, or claiming National Insurance credits.

"The new State Pension – to start in April 2016 – will provide clarity about what individuals can expect from the state as well as benefiting many women, self-employed people and the low-paid."

The concept of contracting out is a complexity which we're abolishing under the new system, but in the transitional period. It's essential that we ensure fairness across the board, and that everyone gets what they have paid towards in National Insurance contributions.

Alongside the new State Pension, we are helping millions to save more – and get the benefit of an employer and government tax relief contribution – through their own workplace pension.

The roll-out of automatic enrolment continues at pace – 4.7 million people are now in, with all of Britain's large employers on board. We are expecting to enrol around 6 million more people in the coming years.

Of course, these new savers need to be able to save with confidence, and that is why we will bring in a cap on charges on default funds in defined contribution pension schemes. This will do even more to ensure fairness and good value.

The final piece of the puzzle is the ground-breaking pension freedoms we introduced in the last Budget.

I believe people should have the power to make their own decisions about how they spend their money – money that they have earned and saved over their working lives.

Ending the effective requirement to purchase an annuity is a massive game changer and there are already signs that people are now more willing to save more for a pension as a result.

We need to ensure these big decisions for people about how best to use their savings are supported with clear impartial guidance, and we will with our free 'guidance guarantee' which will be available from April 2015, giving people the help and support they need to take advantage of these new freedoms.

Our reforms represent some of the biggest changes in the world of pensions in over half a century.

Over time, they will create a fairer society so that people in Britain can look forward to a better retirement. ■

Steve Webb
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Streamlining local government

Research shows that Buckinghamshire's local government system would see savings of £20m a year by restructuring to one council, if politicians are brave enough – something the local business community crowd-funded £25,000 to discover. Guy Lachlan, Spokesman for Buckinghamshire Business Group, explains...

Devolution has never been as prominent in the national psyche as it is now that the Scottish government is gaining more control of its affairs.

For years, counties, districts, towns and parishes across England have wanted their own version of 'Devo max'; to benefit from decentralised and devolved powers and budgets so that they control more of their own affairs – this no longer seems a pipe dream.

Devolution with confidence will require the streamlining of local government to make sure it is fit and able to take on a wider role. To put it another way: does it make sense in a place like Buckinghamshire to run 5 local authorities when you can do the job with 1 and have a singular strategic vision? This is a question now being asked by business leaders and councillors across the country. In Buckinghamshire, a county of 500,000 residents, the unnecessary costs of local government have now been independently estimated at £20m per year.

The business community in Buckinghamshire desperately wants a more effective and efficient government system to reduce costs and increase outcomes. So much so that they stumped up £25,000 in addition to their taxes to crowd-fund research into different local authority models for the county.

The conclusion of the report? Buckinghamshire would save over £20m a year by streamlining 5 local authorities – down to 1 or 2, with all up-front costs of implementation being repaid after one and half years or earlier. The report concludes that no change is not an option.

The district councils' response to this report has been predictably cautious. They recognise that something can be done – but not on their watch. Councils' budgets are diminishing nationwide but they cannot cut back

Guy Lachlan
Spokesperson – Buckinghamshire Business Group

services and then ignore £20m of yearly savings staring them in the face.

Were we living in times of unbridled prosperity we would still be looking for ways to make our local authorities more streamlined and efficient, but with austerity still the name of the game for the foreseeable future shouldn't a ticket that offers £20m savings a year be a winning ticket?

Businesses were forced into action to fund this research as they were concerned by further funding cuts on the horizon and the knowledge that if it were their business facing changing financial pressures, they would at least have a look at their business model to see if they could be more efficient. They would also do this while getting on with business as usual and not use the work they need to do as an excuse for inaction.

We now need an independent commission to look into the best option. The money that taxpayers have stumped up to fund the research should neither be wasted nor ignored by councils.

Buckinghamshire is not alone in its thinking. Cheshire's East and West have floated combining into a unitary authority; local authorities in Cumbria, Leicestershire and Oxfordshire are discussing similar proposals; Chorley Borough Council has recently suggested a local referendum on the issue; and an MP in Lancashire has called for an East Lancashire unitary. Ask around, this is a popular idea for good reason, with few seeming to believe that a two-tier system is affordable or sensible, doubtless because it will create the potential for stronger local economic and social leadership.

We are just months away from a general election, enough surely to focus the minds of sitting representatives and potential candidates on where they stand on this issue. Should local candidates running for election not be asked to make clear to their constituents where they stand on this issue in time for the ballot boxes to be ticked? It would surely be anti-democratic to plan to reconsider the constitution in which they would be personally conflicted at a later date and behind closed doors.

In an age of transparency, we need a system of local government that is focussed on the most effective impact possible on local economic and social realities and priorities.

We need action as soon as possible, not when it's too late. We need reformers and visionaries, not a passing of the buck to the next in line. Those in power should not be able to dictate the terms of that power, that right surely belongs to the residents and businesses they serve.

I've yet to see a majority vote in the hen-house for Christmas and I don't expect one to come without a lot of clucking, but let's at least ensure the power stays where it should – with local people and businesses who pay for our government. ■

Read the full report online at: www.bbf.uk.com

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The Future for a digital EU

In order to secure a digital future for Europe, investments in this area are crucial. Neelie Kroes, former Vice President of the European Commission responsible for Digital Agenda gives her view on achieving this...

Europe needs to make massive investments to secure its digital future. Those investments are often linked in interesting ways and will need to be funded from a wide range of private and public sources. Two of the core areas of investment will be smart cities and connecting rural and regional areas to fast broadband networks.

The Commission is therefore using its convening power to attract finance and interest to these topics, and today's 2 examples are the seminar "Aligning regional investment to digital enablers for future growth" [1] organised in co-operation with the Committee of the Regions and the European Economic and Social Committee which examined the economic and societal potential of ICT infrastructure investment.

The other meeting was of the High Level Group of the European Innovation Partnership for Smart Cities and Communities [2]. The partnership brings together cities and businesses which now includes 360 innovative plans for smart city work and some 3,000 organisations who will work together on common challenges including standards and interoperability of systems with a view to reduce costs and raise funding more easily. Special guest, architect and urbanist Rem Koolhaas underlined the great potential of Smart Cities for innovation, economic growth and really tackling societal issues.

Neelie Kroes, Former Vice President responsible for the Digital Agenda for Europe

The benefits of going digital are clear: cities need to be more sustainable and productive, and communities that are not cities need to be connected to them to be sustainable in a social and economic sense.

As the current Commission hands over to President Juncker's new team, we also know that the European Structural Funding Programme for 2014-2020 is just beginning with some 800 billion of investments to increase Europe's competitiveness and quality of life, reduce inequalities between regions and improve and develop our infrastructure. Digital investment must be at the core of that spending.

Member States, the European Parliament and the Commission have already agreed that the priorities for this programme include ICT as a growth enabler and the reduction of energy use and of CO_2 emissions (where ICT plays a significant and growing role especially in a Smart City context.)

President-designate Juncker has outlined his ambitions for a further 300 billion of public and private investment with his proposed Jobs, Growth and Investment Package focusing on investment priorities in ICT, energy and transport infrastructure.

I welcome these approaches, and encourage the marriage of these perspectives with the digital communities of interest that are already organising for a smart and connected future.

I am optimistic that the money will be found to build the solid foundations of a universal digital Europe and that European Society and the European economy will get the boost it needs." ■

[1] https://ec.europa.eu/digital-agenda/en/news/aligning-regional-investment-digital-enablers-future-growth

[2] http://eu-smartcities.eu/content/presenting-european-innovation-partnership-smart-cities-and-communities

This comment piece was taken from the European Commission website - http://europa.eu/rapid/press-release_STATEMENT-14-284_en.htm

Neelie Kroes
Former Vice President responsible for the Digital Agenda for Europe
European Commission
http://ec.europa.eu/commission_2010-2014/kroes/

Digital technology, data and future cities

Tom Saunders, Senior Researcher at Nesta details the impact digital technologies can have on the way our cities are governed...

Rio de Janeiro offers one vision of how digital technologies might be used to create cities of the future. Hundreds of cameras spread throughout the city transmit live feeds to a command and control centre with a giant video screen where staff in white lab coats monitor and rapidly respond to events as they happen across the city. In the future, these city managers even plan to use the data they gather to spot trends and predict problems before they happen.

Sensing, (big) data, modelling and visualisation are all part of a vision of what cities might look like in the future known as the smart city. It is a vision driven by large IT corporations and its main goals are efficiency and more effective decision making.

While it is difficult to argue with a vision which sees cities wasting less of their resources, there is little evidence so far beyond the anecdotal that sensing, modelling and visualisation can be used to achieve this. Computer aided decision making is also problematic. Data dashboards can oversimplify the vastly complex nature of life in cities and there is a real danger that users of these digital tools will be unaware of the subjective decisions that have gone into selecting and processing the data.

Top down visions of smart cities often view citizens as passive data points to be aggregated and crunched in large urban models. While they are the implicit beneficiaries of local government efficiency drives, they are given no active role in the life of their smart city.

But as the great urbanist Jane Jacobs famously said "cities have the capability of providing something for everybody, only because, and only when, they are created by everybody." Thankfully, mirroring this drive to create smart cities by diktat is a grassroots movement which seeks to use similar technologies to create them from the bottom up.

This movement is characterised by citizens, entrepreneurs and activists using digital technologies to generate and share data, advocate for change and share and reuse resources. Examples include the Smart Citizens Kit, an Arduino based sensor that provides citizens with sophisticated but low cost tools to measure pollution and share the data online and Peerby, a collaborative consumption platform which connects people who want to lend and borrow items from their neighbours.

"Data dashboards can oversimplify the vastly complex nature of life in cities and there is a real danger that users of these digital tools will be unaware of the subjective decisions that have gone into selecting and processing the data."

At the moment, most of these bottom up approaches are small scale and their effects on the way cities work could be said to be fairly negligible. They may become more effective in the future, but in the meantime another approach seems to have more promise of achieving real world impact. This involves citizens and governments working together: governments collect data from citizens through apps and online platforms and citizens participate in order to improve their communities. One of the oldest examples of this type of cooperation is FixMyStreet, a platform which allows citizens to bring local issues such as potholes and abandoned cars to the attention of local councils. Another example is Boston StreetBump, an app which sends data to the city government when a driver hits a pothole. This approach has many benefits, from savings that could result from working with citizens and existing technologies to gather data (rather than embedding new sensors, at a huge cost, in every inch of the urban fabric) to giving city managers a more granular, qualitative picture of their city and its problems.

When talking about how governments and citizens can use digital technologies to improve the way their cities function we often have to rely on a handful of examples, with FixMyStreet being one of the most cited. But beyond Western Europe and America many countries are experimenting with new approaches. One example is China, where local governments across the country use Wechat (a cross between WhatsApp and Facebook) to gather opinions from citizens on urban planning issues. Looking beyond the familiar can provide a wealth of inspiration when thinking about how digital technologies might impact our cities in the future.

Digital technologies and new ways of gathering and processing data have the potential to affect almost everything that happens, from transport and planning to waste management and governance. But the starting point always has to be the needs of citizens. Top down attempts to track, measure and predict the behaviour of citizens may yield some useful insights, but a much richer understanding of the complex life of a city can be gained by using new digital tools to engage directly with the people that live, work and play there. ■

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Realising the benefits of a digital criminal justice system

Nigel Rees, Director at Airwave details how police forces across the UK are embracing technology...

Police forces are embracing mobile data technology in the move to a fully-digitised end-to-end Criminal Justice System (CJS). Moving from a world of carrying around pocket notebooks and a myriad of forms, to adopting electronic notebooks and truly embracing paperless policing.

The results have shown a dramatic reduction in time spent on processes, the removal of mistakes and duplication of information, leading to more time on the frontline.

Freeing up police time

Providing officers with electronic notebooks ensures that the process of digitising the CJS begins on the frontline. Officers can gather and check information, issue tickets, take notes and fill in pre-configured forms that support their daily operations. By completing these activities whilst out in the community, police officers can significantly reduce their time in the back office, enabling them to be more visible.

While using the electronic notebook, forces have also been able to transform a range of other activities by using features such as the camera and Bluetooth.

The camera can capture and embed photos into business processes. For example, embedding photos within a Domestic Abuse, Stalking and Harassment application is proven to deliver swifter justice and better outcomes for victims. An electronic notebook with specialised policing applications and software allows officers to record information, for example an on-the-spot ticket, and by using Bluetooth, the ticket can be printed and given to the recipient immediately. Compare this with the previous process of waiting up to 7 days to receive a ticket via the post and the benefits are immediately visible.

Accessing operational databases through the specialised police applications enables officers to conduct on-the-spot checks in a matter of seconds rather than through a third party (such as via the control room) which could previously take up to 20 minutes.

A CJS which is faster and right first time

The way in which the specialised applications have been designed means that they will not allow an officer to miss mandatory fields nor enter incorrect information into fields, which ensures the establishment of a full and complete database of information and evidence. This meticulous attention to detail in the development of the software has already demonstrated its benefits – prior to using this technology, there were mistakes on over 60% of tickets and form filling, now mistakes have been eradicated.

Police Services continues to find new uses for mobile technology to further improve the efficiency of operations. Similarly, technology evolves rapidly, for example, video (body worn, fixed and mobile) and geo-fencing mapping capabilities to enhance effective use of resources and proactively provide front line staff with the right information at the point of need. Forces should continue to explore further benefits and ways to develop applications to enable a full end-to-end digitisation of the CJS. ■

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A North East digital revolution

Sunderland City Council outlines how it has embraced change to win a Digital City of the Year award...

Sunderland in the North East of England has long been known for its manufacturing prowess, home to Nissan UK, the largest automobile plant in Europe. It's also been forging ahead as a base for many other hi-tech, digital and IT-based ventures in the both the public and private sectors.

So much has been happening digitally that Sunderland has now been crowned The Municipal Journal's UK Digital City 2014.

Progress so far

"This is all about embracing change and challenges," explains Sunderland City Councillor Mel Speding. A councillor since 2000, Cllr Speding, who is also a Cabinet member, has seen many changes in local government including in Sunderland.

"As a city, we're very good at embracing change, being flexible, being innovative, and being resilient. Plus, in the current fiscal climate, I think we've all got to be more and more flexible in local government to keep up with the pace, and the increasing pace of technological change.

"So, I think being recognised and awarded Digital City 2014 showcases how these areas were brought together – change, flexibility and technology."

The roots of the award going to Sunderland can be traced to at least 2000 when the council realised the potential of creating the infrastructure needed for a digital city. It developed a core internal ICT hub and built a council data centre with the capacity to support commercial needs for the region and beyond.

One of the key drivers of success in the digital and software sector in Sunderland has been Sunderland Software City (SSC), a support, training and advice service for digital and technology businesses.

It has provided support to over 350 software businesses and 150 start-ups – helping them realise their potential and enter national and international markets.

David Dunn, Chief Executive of Sunderland Software City attributes the organisation's success to the unique partnership that brings together the best of the public, private and education sector.

David said: "Sunderland Software City brings together Sunderland City Council, the University of Sunderland and the North East Business & Innovation Centre (BIC).

"This partnership allows the organisation to draw on the deep knowledge and understanding of business skills, market understanding, investment and innovation that exists within our partner organisations, and has helped create more than 310 new jobs and contribute an estimated net increase of £14m in regional GVA in the last 5 years.

"As well as supporting businesses at a local level, Sunderland Software City are spearheading a number of national projects that are driving investment and strengthening the city's growing prominence in the global technology landscape."

As a council, Sunderland then began introducing and putting more and more of its services online and embracing the digital age. The city boasts 95% plus hi-speed internet connections, as good as the best or the rest of the UK, and in 2011 started developing and rolling out its Cloud technology.

Also, while the council was embracing the digital age, residents were blazing a trail with Sunderland becoming the Facebook 'capital' of the UK, and the best 'digitally connected' city, according to surveys. *

This success hasn't just been in homes or with public services though because in 2010 the council's economic master plan recognised how Sunderland could broaden its commercial base. One way to put some more diversification into the local economy was with more hi-tech business start-ups, and more incubator units and space for companies such as at the centrally-based Sunderland Software Centre or the North East Business and Innovation Centre.

There have been successes as through 2013/14 there were more than 400 jobs created in the city's software and IT sector leading to the perhaps inevitable' 'silicon' headlines as Sunderland companies won contracts with global brands such as Hertz and Sony, and found contract work in Dubai.

Cllr Speding said: "There's been a lot of support across the city and through the North East for the aims that we set down in our master plan. While we were driving forward with our automobile and manufacturing strengths, the council and its partners in the public and private sectors have also been nurturing and encouraging the growth of software and IT companies, and residents themselves have embraced new digital technology.

"Therefore, as a council, we've taken advantage of the growing digital market, and made that a staple part of the Sunderland economy. We've been using innovative digital technology to overcome the challenges of budget constraints, meet community needs, and help promote it as part of our economy.

"Now, all this work has been recognised by the UK Digital City Award. It's very much an award for everyone in Sunderland." ■

Key benefits to date:

- Sunderland already boasts the highest number of tech start-ups outside -London;
- Sunderland was described as a "world-class centre of excellence for digital technology" in a national report by UK Trade & Investment (UKTI) focussed on attracting foreign investment;
- The 100+ software companies based in Sunderland are responsible for an annual turnover of £65m and the creation of over 1000 jobs;
- The city has more than 95% coverage of superfast broadband connectivity making it one of the most connected cities in the UK.

Digital City Council services include:

- Bereavement services – a bespoke web service used by all Funeral Directors in the city for booking the cemetery and crematorium;
- School admissions – a bespoke web service to apply for school places;
- Library services, children's centres and waste permits also benefit from their own bespoke digital services.

* In 1998, the annual communications market report from telecoms regulator Ofcom found that Sunderland had the highest percentage of homes connected to Broadband internet and multi-channel Digital television. And in 2010, survey work for BBC2 series The Virtual Revolution found more people in Sunderland were logging into Facebook than elsewhere in the UK.

Sunderland City Council
www.sunderland.gov.uk

Achieving Digital by Default:

Creating Digital Boardroom Processes in the Public Sector

In 2010, a proposal was put to UK Government to transform the delivery of its public services. The proposed recommendations were for a 'revolution' in the public sector, to deliver services as 'digital by default'. The change started within government websites, streamlining systems and shifting departmental web information into one place – gov.co.uk – making services easier to find for citizens, and saving an anticipated 50% of publishing costs[1].

Achieving a paperless public sector takes real organisational change. It has to start from the top: senior-level internal processes and business structures can be enhanced and improved by a digital approach, moving away from long-held paper-based systems. It just isn't feasible to deliver public-facing services digitally, and still retain old systems internally.

Every board or trustee meeting in the public sector requires packs of information to be prepared, distributed and reviewed in advance. Traditionally, this has been a paper-heavy process, both time-consuming and costly, when organisations are trying to reduce both budget and carbon footprint. It also has privacy and security implications: carrying confidential papers from place to place poses an obvious risk.

Innovation has come in the form of **board portals:** secure technology that enables the compilation and distribution of board-level information to public-sector trustees, directors and senior management teams. A board portal can help improve governance and all senior-level communications across the organisation, reduces staff and IT resources needed to prepare previously paper-based board documentation, and delivers significant savings in terms of paper, couriers and postage.

Diligent Boardbooks is the most widely used of these portals, working with over 87,000 directors, leaders and administrators worldwide, including 37 of the FTSE 100 and almost one-third of the Fortune 1000. Aneurin Bevan University Health Board, a Diligent customer, said: "The main driver for going digital was cost and efficiency. Before using Diligent Boardbooks, we used paper copies for our board packs but this involved a considerable amount of administration. We want to be seen as an organisation that embraces new technology to deliver an efficient service."

Seven Best Practices in Transitioning to the Paperless Boardroom

Attaining a paperless boardroom requires planning. If you don't take into account how your board members and trustees use information and interact with technology, half-hearted attempts to get rid of paper can backfire. Information that is emailed or stored in a shared file will inevitably be printed out, PDFs or document readers aren't very user-friendly, and with all of these factors, version control is a real headache. The solution is to use a board portal – a secure way to access, review, annotate and vote on board information.

Once you've made the decision to go digital, how do you shift thinking away from paper and towards an alternative? The idea of 'doing things on paper' can be deeply embedded within an organisation and its members. They'll need help, support and

coaching, and to take small steps at a time. Diligent has identified a number of best practices to help ensure that the transition to a paperless boardroom is successful.

Be committed. If you're going to go paperless, you need commitment from your fellow directors. Changing habits can be hard without it.

Map your information flow. If you understand how your board packs are compiled, distributed and updated, the new paperless platform can be designed to replicate the current process as closely as possible. It is the paper you're changing, not the entire board process.

Don't skimp on training. Proper training on the new system should be straightforward (and can be done online or over the phone). Although digital skills of directors will vary, most carry an iPad or other tablet device and embrace technology that makes their lives easier. Training, and the ability to test the new system in private, will help adoption.

Insist on 24/7 support. If you're about to go into a board meeting, and you have a question on the technology, you need to speak to someone immediately who can help you there and then, not call you back within four or even 24 hours.

Don't treat all information the same. If you're viewing detailed architectural drawings, for example, you may need them to be displayed on a bigger screen than is possible on a tablet or laptop. Be flexible in the format you use.

Take your time. Give yourself and your fellow directors time to adapt to the new system. For the first meeting, you might choose to distribute paper packs as well as using the portal, and then poll the board about which system they prefer. If training has gone well, most directors we work with prefer the digital system within a couple of meetings.

Peer pressure is stronger than decree. Even if you do have one or two colleagues who want to continue to receive paper packs, it probably won't be for long. Once they see how easily their peers are navigating information, for example, they won't want to be responsible for slowing down the meeting.

Ultimately, switching to digital must improve processes and efficiency for the organisation, and provide a better experience for individual users. For committee members, trustees, board directors and the administrative staff supporting them, replacing paper-based meetings with those enabled by digital technology makes it quicker to prepare for and manage meetings. ExtraCare Charitable Trust, a charity that supports older people in homes and communities in the UK, found that it reduced the time it took to prepare board materials for meetings from 1.5 days per meeting to just half an hour, an annual saving of up to three weeks.

The Digital by Default initiative set out to achieve savings in the billions of pounds from the move to digital services. But it's not just public services that could save money by switching.

Further Resources:

ExtraCare Charitable Trust Case Study

Viridian Housing Case Study

See Diligent's iPad App in Action

By switching internal boardroom processes to digital, the cost savings – both financial and environmental – can be significant, meeting key requirements of public-sector organisations.

Download the full white paper 'Attaining the (Truly) Paperless Boardroom'

[1] https://www.gov.uk/government/news/new-digital-advisory-board-supports-government-to-deliver-online-services-revolution

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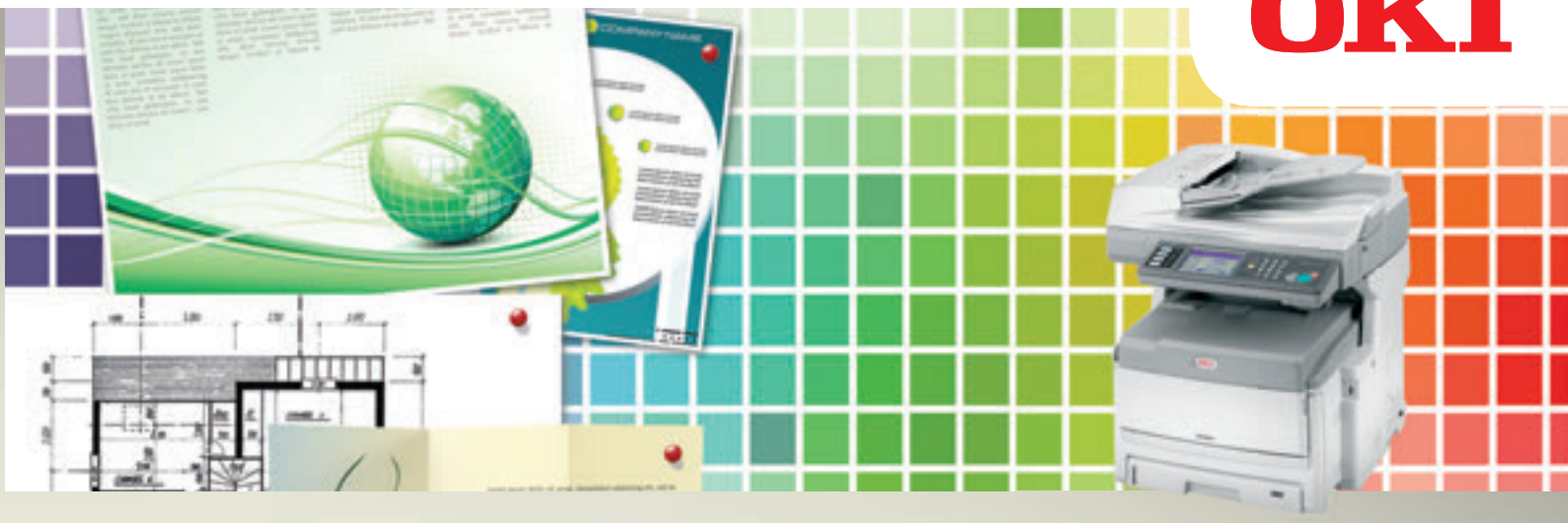

Make the most of a Managed Print Solution?

More businesses are becoming aware of the potential savings they can be making by improving the efficiency of their printing operations and may be tempted by the benefits provided by a managed print solution.

If implemented correctly, such an initiative can greatly help businesses reduce the costs associated with printing, including paper and toner usage, energy and hardware requirements. With a large number of companies now offering a **Managed Print Solution**, how can you be sure that you'll actually be getting the best deal? To help businesses make the right decision when identifying a potential solutions provider, **OKI** has identified key points that need to be offered.

Understanding the Need

- A full print audit of your current printing situation
- A detailed report on the current situation
- Propose a strategy to maintain and improve the cost sustainability
- A 'balanced development' that considers your needs for document security, convenience and quality

Streamlining your Processes

A strong package will mean you'll never have to order toner again, worry about engineer call outs or servicing of the machines – it is all handled by the solutions provider with simplified monthly billing

Check the details

Before entering into any contract, it's also important for businesses to understand exactly what SAVINGS they can expect to receive from their provider. This will include knowing what consequences there will be if you decide to leave a contract early and help guarantee they will be getting the most up-to-date equipment.

"Organisations offer a variety of different products and services, consequently, organisational printed requirements differ too," OKI noted. "Knowing your managed print service provider allows your organisation to take control seamlessly."

Contact us on 01784 274 378 or hello@okieurope.co.uk

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Mathematical climate modelling

Weather extremes

Extreme weather events may cause severe damage to our society. Examples are hurricane Sandy in 2012 (the second-costliest hurricane in United States history), European windstorms Lothar and Martin in 1999, and, more recently, the exceptional sequence of floods in southern England in the winter of 2014. Insurance companies need to reserve sufficient capital to cover claims following an extreme weather event. Estimates of expected losses due to catastrophic events crucially depend on the tail width of the probability distribution describing the likelihood of extremes. Hence, understanding the typical tail behaviour of time series generated by climate models is a pressing challenge for the insurance industry and forecasting agencies.

Our research

The Johann Bernoulli Institute for Mathematics and Computer Science (JBI), based at the University of Groningen, actively participates in current mathematical research on extreme events. The mission of the JBI is the cross-fertilization by modelling of the disciplines mathematics and computer science both with other sciences and with the outside world.

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EUROACADEMY participates in the Erasmus and DoRa Programmes of the European Commission promoting student and lecturer exchanges, takes part in the co-operation between states of the Baltic Sea Region regarding sustainable development, publishes scholarly contributions by staff and students as well as The Baltic Horizons, a journal known in many countries.

EUROACADEMY'S RECTOR, since its inception, is Jüri Martin, Academician of the Estonian Academy of Sciences, DSc. The vice-rector is Peeter Karing, DSc.

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